PFAS Detailed Site Investigation

Ayr Fire Station, 47-49 Soper Street, Ayr, Queensland

Queensland Fire and Emergency Services

06 February 2020

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PFAS Detailed Site Investigation

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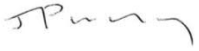
0	06-Feb-2020	Final	James Peachey Project Manager	

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Abbreviations

AFFF	Aqueous film forming foam
AHD	Australian height datum
ASC NEPM	Assessment of Site Contamination National Environment Protection Measure 1999 (as amended 2013)
ASRIS	Australian Soil Resources Information System
ASS	Acid sulfate soil
CLA	Contaminated Land Auditor
CLID	Contaminated land investigation document
CLR	Contaminated Land Register
COPC	Contaminants of potential concern
CSM	Conceptual site model
DES	Department of Environment and Science
DO	Dissolved oxygen
DQO	Data quality objectives
DQI	Data quality indicator
DSI	Detailed site investigation
EC	Electrical Conductivity
EMR	Environmental Management Register
EPP	Environmental Protection Policy
ESA	Environmentally Sensitive Areas
EV	Environmental Values
GDE	Groundwater Dependent Ecosystems
HEPA	Heads of Environmental Protection Agencies Australia and New Zealand
LOR	Limits of reporting
mbgl	Metres below ground level
mbtoc	Metres below top of casing
NATA	National Association of Testing Authorities
NDD	Non-destructive drilling
NEMP	National Environmental Management Plan
NEPC	National Environment Protection Council
NMI	National Measurement Institute
NRME	[Department of] Natural Resourcing, Mining and Energy
ORP	Oxidation reduction potential
PFAS	Per- and poly-fluoroalkyl substances
PFHxS	Perfluorohexanesulfonic acid
PFOA	Perfluorooctanoic acid

PFOS	Perfluorooctanesulfonic acid
PSI	Preliminary site investigation
QA/QC	Quality assurance / quality control
QFES	Queensland Fire and Emergency Services
SAQP	Sampling analysis and quality plan
SIR	Site investigation report
SOP	Standard operating procedure
SWL	Static water level
TDS	Total dissolved solids
TOPA	Total oxidisable precursor assay
USCS	Unified soil classification system
USEPA	United States Environmental Protection Agency

Glossary of Terms

Term	Definition
Aquifer	Geologic formation, group of formations, or part of a formation capable of transmitting and yielding economic or significant quantities of water.
Bore	A cylindrical drill hole sunk into the ground from which water is pumped for use or monitoring.
Borehole	A hole produced in the ground by drilling for the investigation and assessment of soil and rock profiles.
Discharge	A release of water from a particular source.
Drainage	Natural or artificial means for the interception and removal of surface or subsurface water.
Finished Foam	Finshed foam is formed following aeration of the foam concentrate.
Groundwater	Water located within an aquifer; that is, held in the rocks and soil beneath the earth's surface.
Groundwater monitoring well	A bore which has been specifically constructed to allow groundwater measurements to be taken and groundwater samples to be collected.
Groundwater recharge	A hydrologic process by which water enters the aquifer by moving downwards from surface water to groundwater.
Hydrogeology	The study of subsurface water in its geological context.
Hydrology	The study of rainfall and surface water runoff processes.
Impact	Influence or effect exerted by a project or other activity on the natural, built and community environment.
Pollutant / contaminant	Any matter that is not naturally present in the environment.
Primary Source	A primary source is a storage vessel or area where there is the potential for a contaminant to be directly released to ground (e.g. by leaks or spills or by direct release).
Runoff	The portion of water that drains away as surface flow.
Saturated zone	This portion of the subsurface below the groundwater table in which all pores in the soil and rock are completely filled with water.
Secondary Source	A secondary source is an area impacted by a primary source that has the potential for ongoing release of contaminants. For example, contaminants adsorbed to soil could act as a source of contamination to groundwater.
Stormwater	Water that travels through drains following precipitation events.
Surface water	Water flowing or held in streams, rivers and other wetlands in the landscape.
Tributary	A river or stream flowing into a larger river or lake.
Unsaturated zone	The portion of the subsurface above the groundwater table. The soil and rock in this zone contain air as well as water in its pores.
Water table	The surface of saturation in an unconfined aquifer at which the pressure of the water is equal to that of the atmosphere.

Executive Summary

Background

AECOM Australia Pty Ltd (AECOM) was engaged by Queensland Fire and Emergency Services (QFES) to undertake an evaluation of the concentration and distribution of per- and poly- fluoroalkyl substances (PFAS) at Ayr Fire Station, located at 47-49 Soper Street, Ayr, Queensland (the Site). The location of the Site is shown in **Figure 1** in **Appendix A**.

QFES is conducting the PFAS environmental investigation at Ayr Fire Station using a staged approach. Stage 1 consisted of a preliminary Site investigation (PSI) and sampling, analysis and quality plan (SAQP), which was completed in April 2019 (AECOM, 2019). Under Stage 2 of the project, a Queensland Contaminated Land Auditor (CLA) reviewed and endorsed the works completed in Stage 1. Following completion of Stages 1 and 2, QFES has engaged AECOM to undertake Stage 3 of the project, which is the delivery of the PFAS detailed site investigation (DSI) to implement the scope of work identified in the SAQP.

This report forms the Site Investigation Report (SIR) for the DSI and is consistent with the requirements of a Contaminated Land Investigation Document (CLID).

Key Findings of the PSI

The PSI (AECOM, 2019) was completed to understand the potential for PFAS contamination to be present at the fire station based on a review of Site and environmental setting and historical operations and practices. The PSI identified that firefighting training using aqueous film forming foams (AFFF) containing PFAS occurred infrequently at the fire station between the 1990s and 2003. Firefighting training was conducted across the grassed areas (sealed with concrete between 2000 and 2005) located on the southern and eastern portions of the Site. The Station frequently used non-fluorinated training foams or detergent for training across the grassed areas. The volume of foam used was not known. Firefighting foams were stored in a shed located in the southern corner of site. The areas formerly used for firefighting training exercises and foam storage areas were identified as potential PFAS source areas.

On-Site water sampling conducted in 2016 (QFES, 2016) reported PFAS concentrations in the water samples from the Case 4 Pit (a concrete in-ground water tank formerly used for pump testing and water drafting training), located in the southern portion of the site, and from the on-Site tap, located adjacent to the wall of the workshop. PFAS concentrations (sum of perfluorohexanesulfonic acid (PFHxS) and perfluorooctanesulfonic acid (PFOS), ∑(PFHxS+PFOS)) in a water sample from the Case 4 Pit exceeded the PFAS National Environmental Management Plan (NEMP) (HEPA, 2018) human health guidelines for drinking water, but were below the recreational water guidelines. Concentrations of PFAS (∑(PFHxS+PFOS)) detected in the tap water sample were below the Australian drinking water guideline value (HEPA, 2018).

The Queensland Government website[1] indicates that PFAS was detected in groundwater in two bores that form part of Ayr's town water network in May 2018. The locations of these bores are not known. The information on the Queensland Government website indicated that the PFAS concentrations in the groundwater samples were below Australian drinking water guidelines (HEPA, 2018).

Objectives

The objectives of the DSI were to characterise potential PFAS impacts in soil, groundwater, tap water, surface water and sediment including concentration and distribution, within and at the boundaries of the Ayr Fire Station to assess the potential risks to human health and the environment and to update the PFAS conceptual site model (CSM) for the Site.

Investigation Scope

The DSI was completed between July and August 2019. The DSI scope of work was completed in accordance with the SAQP (AECOM, 2019) and included drilling four soil bores on the Site that were converted to groundwater monitoring wells (drilled to approximately 8.3 metres below ground level,

[1] https://www.qld.gov.au/environment/pollution/management/disasters/investigation-pfas/ayr

mbgl), advancement of two shallow soil bores to 0.5 mbgl, collection of soil and groundwater samples from the bores and wells, collection of sediment and co-located surface water samples from the on-Site drains and collection of one tap water sample, with laboratory analysis for PFAS and preparation of this interpretative report.

Key Findings of the DSI

The key findings of the DSI are presented below.

- Groundwater elevations in August 2019 indicated a shallow sandy aquifer is present beneath the Site. Depth to groundwater was approximately 4.5 mbgl. Groundwater was inferred to locally flow towards the southeast.
- The main PFAS compounds present in the soil samples analysed were PFHxS and PFOS. The soil samples collected were from bores in potential source areas (the two areas formerly used for foam training exercises) and at locations up-gradient and down-gradient to these potential source areas. The highest ∑(PFHxS+PFOS) concentrations detected were in the shallow soil (1 mbgl) at the soil bore located within the former foam training area on the southern portion of the Site (AY_BH04). The soil samples analysed indicated that soil PFAS (PFHxS and PFOS) concentrations decreased with increased depth, with higher PFAS concentrations in the near-surface material.
- None of the soil samples analysed exceeded the NEMP (HEPA, 2018) health guideline values for commercial land use. Two soil samples (AY_BH03 and AY_BH04) contained PFOS concentrations that exceeded the guideline level for ecological indirect exposure for commercial land use. The exceedances were reported from two soil bores located beneath concrete. Landscaped/grassy areas, potentially accessible to ecological receptors are located on the northwestern portion of the Site adjacent to Queen Street. Analytical results for eleven soil samples detected PFOS concentrations that exceeded the guideline level for ecological indirect exposure for residential land use. Three of the bores containing exceedances were located in landscaped/grassy areas. The fire station is immediately surrounded by industry / commercial premises except for Queen Street where residential properties are located across the road. Due to the urbanised setting of the Site, it is considered that the ecological receptors would be transient in nature, and comparison against the residential land use guideline is considered to be an appropriately conservative approach.
- Elevated PFAS concentrations in groundwater, i.e. exceeding NEMP (HEPA, 2018)) drinking water and recreational water quality guideline values for ∑(PFHxS+PFOS) and for perfluorooctanoic acid (PFOA), were detected in groundwater samples from all four newly installed monitoring wells. The two groundwater samples (collected from approximately 4.5 mbgl) with the highest ∑(PFHxS+PFOS) concentrations (54 µg/L[2] and 43 µg/L, respectively) were located adjacent to or within the former areas used for foam training exercises (AY_MW01 and AY_MW04). Groundwater monitoring well AY_MW01 was also located adjacent east of the Case 4 Pit. The predominant PFAS compound detected was PFOS. The groundwater sample (AY_MW02) collected from the monitoring well located up-gradient of the former foam training areas reported PFAS concentrations which were an order of magnitude lower (2.1 µg/L ∑(PFHxS+PFOS)), which indicates the primary source of PFAS in groundwater is likely to be located in the southern portion of the Site, in the vicinity of the former foam training exercise areas and the Case 4 Pit.
- The laboratory analytical technique for total oxidisable precursor assay (TOPA) is used to detect certain harder to analyse PFAS precursor compounds that may be present. TOPA analysis was undertaken on one soil and one groundwater sample. The soil results did not identify the potential for PFAS precursors, while the groundwater results indicated a low potential for precursors. The results indicated a degraded PFAS product. Overall, it is considered unlikely that PFAS concentrations will significantly increase or alter through biotransformation or oxidation processes.

[2] Quality assurance samples were analysed for monitoring well AY_MW01 with ∑(PFHxS+PFOS) in the primary sample reporting 54 µg/L, the intra-laboratory (duplicate) sample reporting 64 µg/L and the inter-laboratory (triplicate) sample reporting 49 µg/L. The results indicate variability in the samples.

- Based on the inferred groundwater contour data, PFAS may migrate in groundwater in a south-easterly direction. The lateral extent of the area of groundwater impacted with PFAS is uncertain and potentially extends off-Site to the southeast within the shallow sandy aquifer at concentrations in excess of NEMP (HEPA, 2018) human health and ecological guideline values. A commercial property is present adjacent to the southeastern Site boundary and the closest water supply bore is located approximately 175 m to the southeast. The closest surface water receptor (Nelsons Lagoon Park) is located approximately 700 m southeast of the Site.
- The on-Site tap water sample collected from the outdoor tap located on the wall of the workshop in the central portion of the Site contained a ∑(PFHxS+PFOS) concentration (0.11 µg/L) which exceeded the NEMP (HEPA, 2018) human health drinking water guideline value. PFHxS and PFOS were the main PFAS compounds present. Analytical results for a water sample from the on-site hydrant reported 0.067 ug/L ∑(PFHxS+PFOS), which was approaching the drinking water guideline of 0.07 µg/L. The PFAS composition of the hydrant water was similar to the tap water.
- The tap water is reticulated and supplied by Burdekin Shire Council from the Ayr water supply network (sourced mainly from either Nelsons Lagoon or South Ayr Borefield). Council were notified of the PFAS detection by the Queensland Government. The Queensland Government reported on 20 September 2019[3] that follow-up testing was completed with results indicating all drinking water taps at Ayr Fire Station did not exceed national drinking water guidelines. The Queensland Government website reported that two bores (locations not known) in the Nelsons Lagoon Borefield were disconnected in 2018 following PFAS detections. Further results in May 2019 indicated PFAS concentrations exceeded NEMP (HEPA, 2018) drinking water guidelines in one of the bores, implying that one of the bores was reconnected. The website reports that further water sampling of the water supply bores is being conducted by the Queensland Government.
- One surface water sample was collected from the concrete-lined drainage pit in a central location adjacent to the storage room awning. The results indicated the main PFAS compounds present in the surface water sample were PFHxS and PFOS, however the results were below the adopted human health guidelines for recreational water. PFOS was reported at a concentration (0.074 µg/L) which exceeded the adopted ecological guideline (0.051 µg/L). The stormwater drainage line traverses the centre of the Site from the Case 4 Pit with flow directed to the northwest of the Site before discharging off-Site. The sediment samples from the drainage lines had PFAS concentrations relatively close to the limit of reporting indicating sediment in the drains is unlikely to act as a source of PFAS.
- Based on information provided as part of the PSI, the source of the PFAS detected in soil, groundwater, sediment and surface water samples is considered likely to be related to the historical firefighting training practices at the fire station and/or spills from storage containers, product transfer and other maintenance activities. The PFAS detected in tap water is understood to be sourced from water supply bores in the Nelsons Lagoon Borefield or South Ayr Borefield. As the location of the off-Site water supply bore impacted with PFAS is not known, the potential source cannot be ascertained.

Based on these key findings, the PFAS CSM developed for the PSI has been updated. A number of possibly complete exposure pathways for PFAS sourced from the fire station to impact off-Site human and ecological receptors have been identified. The significance of these potentially complete source-pathway-receptor linkages is uncertain and further investigation is required to understand the potential risks to off-Site receptors.

[3] https://www.qld.gov.au/environment/pollution/management/disasters/investigation-pfas/sites/ayr

1.0 Introduction

1.1 General

AECOM Australia Pty Ltd (AECOM) was engaged by Queensland Fire and Emergency Services (QFES) to undertake an evaluation of the concentration and distribution of per- and poly- fluoroalkyl substances (PFAS) at Ayr Fire Station, located at 47-49 Soper Street, Ayr, Queensland (the Site). The location of the Site is shown in **Figure 1** in **Appendix A**.

Historical practices and operations at QFES facilities including Ayr Fire Station may have involved using firefighting foam containing PFAS. PFAS are an emerging family of compounds that are highly soluble, persistent and bioaccumulative in the environment. Following release to ground, they can be readily mobilised from soil source zones, and migrate significant distances in surface water and groundwater.

1.2 Background

QFES is conducting the environmental investigation at Ayr Fire Station using the following staged approach:

- Stage 1: Development of the preliminary Site investigation (PSI) and sampling, analysis and quality plan (SAQP). This stage was completed in April 2019 (AECOM, 2019).
- Stage 2: Review and endorsement of the PSI and SAQP by a Queensland Contaminated Land Auditor (CLA). This stage was completed in April 2019.
- Stage 3: Implementation of the scope of works identified in the SAQP by conducting a detailed site investigation (DSI) and completion of a draft site investigation report (SIR).
- Stage 4: Review and endorsement of the SIR report by a CLA.
- Stage 5: Provide the final SIR to the regulator (DES) and subject to any further requirements, procure a suitable environmental consultant to design an investigation plan to measure and assess offsite impacts.
- Stage 6: Engage an appropriately qualified third party CLA to audit the suitability of any off-site investigation plan to meet the requirements of DES prior to implementation.

This report forms the SIR for the Stage 3 DSI and has been prepared to meet the requirements of a Contaminated Land Investigation Document (CLID).

1.3 Objectives

The objectives of the works were to characterise potential PFAS impacts at Ayr Fire Station, to assess the potential risks to human health and the environment and to update the PFAS conceptual site model (CSM) for the Site.

The key outcomes / deliverables of the Stage 3 works were as follows:

- Undertaking soil, groundwater, sediment, surface water and tap water sampling at Ayr Fire Station, in accordance with the SAQP.
- Preparation of a draft SIR detailing the implementation of the DSI, in accordance with Australian guidance for investigation of sites potentially impacted by PFAS including the National Environmental Protection Council (NEPC), National Environmental Protection (Assessment of Site Contamination) Measure (NEPM) (1999, as amended 2013) (NEPC, 2013) and the PFAS National Environmental Management Plan (NEMP) (Heads of Environmental Protection Agencies (HEPA), 2018).

  The stage 4 deliverable will be a final SIR that incorporates any comments/ corrections from the QFES review and inclusion of all the requirements of the audit by the CLA.

1.4 Scope of Works

The scope of work undertaken to meet the objectives of the PFAS DSI were as follows:

- Completion of fieldwork in accordance with the CLA-endorsed SAQP (AECOM, 2019) which included the following activities:
    - Drilling of four soil bores (AY_BH01 to AY_BH04) to approximately 8.3 metres below ground level (mbgl), which were converted to groundwater monitoring wells (AY_MW01 to AY_MW04). Collection of soil samples at approximately 1.0 m intervals. Development of groundwater monitoring wells.
    - Collection of soil samples from two shallow soil bores (AY_SS1 and AY_SS2) to 0.5 mbgl advanced in unsealed grassy areas on the northwestern portion of the Site adjacent to Queen Street and a small elongate area between the car park awning and the southwestern boundary of the Site.
    - Collection of groundwater samples from the four new groundwater monitoring wells.
    - Collection of three sediment samples (AY_SED01 to AY_SED03) from on-Site stormwater drainage pits. One surface water sample (AY_SW02), co-located with sediment sample (AY_SED02) was also collected. No other surface water samples were collected as the remaining drains were dry at the time of sampling.
    - One tap water sample (AY_TAP01) was collected from the outdoor tap located on the wall of the workshop in the north-central portion of the Site.
    - Surveying of the top of the casing at each monitoring well to MGA94 coordinates and Australian Height Datum (AHD).
    - Laboratory analysis of soil, sediment, groundwater, surface water and tap water for PFAS, with all water samples analysed for trace level concentrations.
- Preparation of a SIR (this report), which includes an update of the PFAS CSM.

1.5 PFAS Analysis

Aqueous film forming foam (AFFF) manufactured over the last 50 years are estimated to contain between 200 and 600 possible PFAS compounds of varying signatures / composition (PFAS NEMP, HEPA, 2018[4]). However at present, Australian commercial analytical laboratories, using National Association of Testing Authority (NATA) accredited methods, are currently able to analyse for around 28 PFAS (see **Table 1**). This analytical limitation is not considered significantly influential as the current PFAS laboratory analytical schedule includes the compounds that have guidelines available. These compounds were also the primary ingredients of AFFF and are more likely to be encountered where AFFF was used, stored and/or discharged.

[4] Noting that the NEMP Version 2.0 is expected to be published in 2020.

Table 1 Compounds analysed in the PFAS suite

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

1.6 Relevant Regulation and Guidance

This PFAS DSI has been developed considering the following legislation and guidance.

- *DES, Queensland Auditor Handbook for Contaminated Land, Module 6: Content requirements for contaminated land investigation documents, certifications and audit reports (2018)*
- *Environmental Protection Act, 1994*
- HEPA 2018 *PFAS National Environmental Management Plan (NEMP)*
- NEPC (1999) *National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended 2013) (ASC NEPM 2013)*
  - *Schedule A Recommended general process for assessment of site contamination*
  - *Schedule B1 Guideline on Investigation Levels for Soil and Groundwater*
  - *Schedule B2 Guideline on Site Characterisation*
  - *Schedule B3 Guideline on Laboratory Analysis of Potentially Contaminated Soils*
- Standards Australia (AS4482.1-2005) *Guide to the sampling and investigation of potentially contaminated soil. Part 1: Non-volatile and semi-volatile compounds*
- Standards Australia (AS 4482.2-1999) *Guide to the sampling and investigation of potentially contaminated soil, Part 2: Volatile Substances*

A summary of guideline values adopted for this investigation is presented in **Section 5.0**.

2.0 Site Setting

2.1 Site Identification

Ayr Fire Station is located in central Ayr, with the main entrance via Queen Street. Site identification details are shown in **Table 2**.

Table 2 Ayr Fire Station site identification

Item	Details
Site Address	47-49 Soper Street, Ayr, 4807
Registered Site Owner	State of Queensland (Represented by Department of Community Safety, now Public Safety Business Agency)
Registered Address of Site Owner	Public Safety Business Agency, L13 Makerston House, 30 Makerston Street, Brisbane, Queensland, 4000
Site Occupier	QFES
Local Government Area	Burdekin Shire Council
Zoning	Public Purposes
Future Zoning	No change
Lot and Plan	Lot 95 / RP702279
Tenure	Freehold
Latitude / Longitude	-19.57163, 147.40968
Site Area	2,023m^2
Current / Future Site Use	Current land use is commercial/industrial use as a fire station. The future site use is commercial/industrial use as a fire station.
Environmental Management Register (EMR) / Contaminated Land Register (CLR)	A search of the DES EMR and CLR for Lot 95 / RP702279 as part of the PSI (AECOM, 2019) indicated that the Site is not included on either the EMR or CLR.
Environmentally relevant activities or notifiable activities	The PSI did not identify any environmentally relevant activities or notifiable activities at the site.

2.2 Site Layout and Features

The Site layout is detailed on **Figure 2**, **Appendix A**. Site features include a two-storey fire station on the northeastern portion of the Site that has three engine bays, housing two firefighting appliances. Offices, a workshop and a breathing apparatus room are attached to the north side of the Engine Room with a mess hall attached to the south of the Engine Room (see Photographs 4 and 5 in **Appendix C**). Buildings used for storage are present in the southern and western portions of the Site with an area used for car parking present between the storage rooms.

The station is crewed by four firefighters in a continuous day shift roster system in addition to auxiliary firefighters. All training activities are conducted in the large open space concreted yard to the south of the Engine Room.

A concrete in-ground water tank (Case 4 Pit), with dimensions of 900 mm diameter x 2300 mm deep and a capacity of 1460 L, was used for pump testing and water drafting training. This is present in the centre of the open concreted area. The Case 4 Pit was covered by a steel plate to prevent water ingress and has since been decommissioned, filled with sand and capped with concrete.

A storage shed was formerly present, which was located to the south of the Case 4 Pit and north of the southern storage room. This building was removed in 2000.

A stormwater drainage line traverses across the centre of the Site from the Case 4 pit with flow directed to the north-west of the Site, before discharging off-Site at Queen Street. A second stormwater drainage line is connected to the sewerage inspection pit, located near the southwestern boundary line and traverses east and north through two drainage pits on the southern portion of the Site, and through the drainage pit adjacent to Queen Street. A sewer line is present in the southern portion of the site traversing from the southwest to the southeast.

Backfill associated with underground services such as the sewerage line is likely to consist of bedding sands which have the potential to act as preferential pathways for contaminant migration in the unsaturated zone. Backfill around the Case 4 Pit also has the potential to act as a preferential pathway.

Vegetation is present covering approximately one-third of the Site, with two grassed, landscaped areas present either side of the driveway from Queen Street in the northwestern portion of the Site. A further small open grassed area is located adjacent to the awning / car park area, adjacent to the southwestern Site boundary.

No information was identified in the PSI (AECOM, 2019) on the emplacement of fill at the fire station.

2.3 Surrounding Land Use

The Site is surrounded by a mixture of commercial businesses and residential properties. Soper Street bounds the Site to the north-east and Queen Street to the northwest. The Kalamia Hotel and Home Hardware/Garden Centre store bound the Site to the southwest and southeast, respectively. Details of surrounding land uses are provided in **Table 3** below.

Table 3 Ayr Fire Station surrounding land use

Direction	Land Use
Northwest	Adjacent to the Site to the northwest is Queen Street, beyond which are residential properties. Two service stations (BP and Caltex) are located approximately 700 m to the northwest.
Northeast	Soper Street bounds the Site to the east, beyond which is a commercial property and are residential properties. Approximately 1.1 km to the northeast of the Site is an unnamed channel and lagoon/pond.
Southeast	Adjacent to the Site to the southeast is a Home Hardware/Garden Centre store, with residential properties adjacent to the south beyond which is MacMillan Street and then more residential properties. Nelsons Lagoon, situated in Nelsons Lagoon Park, is located approximately 700 m southeast of the Site.
Southwest	Adjacent to the Site to the southwest is the Kalamia Hotel and car park, beyond which is a shopping plaza. A service station (Coles Express) was present historically approximately 400 m to the southwest. The service station has since been closed.

2.4 Previous Environmental Investigation

A PFAS PSI was completed in 2019 (AECOM, 2019). The key findings of this investigation are summarised below.

- Based on aerial photographs and anecdotal information, the fire station has been present since 1955 (approximately 64 years). The landuse prior to fire station development is not known. The Site has historically been surrounded by commercial and residential properties.
- Based on the interview information, firefighting foams have been used at the Site. Firefighting foam containing PFAS (3M Lightwater) was used at the Site between the 1990s and

approximately 2003. Protein-type foams were used prior to the use of 3M Lightwater. The type of protein foam has not been identified and the potential for this foam to have contained PFAS is uncertain. Since 2003, Solberg foam has been used, which is PFAS-free[5].

- There is no information on the types of foam used prior to the late 1980s and the potential for use of other types of foam concentrates containing PFAS cannot be discounted.
- The inventory in February 2019 was 600 L Solberg foam which includes stockpile supply of class A foam for five rural fire stations. Foam concentrate is stored in 20 L containers. No infrastructure (e.g. tanks) is known to have stored foam at the site historically. Lower volumes of foam concentrates were stored historically compared to present volumes stored in 2019.
- AFFF foams were reportedly too expensive to be used regularly on-Site. The station frequently used non-fluorinated training foams or detergent for training in the grassed areas in the central portion of the site, which was concreted between 2000 and 2005. Based on anecdotal evidence, foam training exercises may have occurred to unsealed surfaces prior to the placement of concrete and likely continued following hardstand placement. The volume of foam used has not been specified. It is understood that foams were used prior to their use by date. No inadvertent releases of foam concentrate were identified.
- Water sampling was conducted in 2016 (QFES, 2016) with a total of five water samples collected, two Case 4 Pit samples, two tap water samples from town water supply and a rinsate sample. All samples were analysed for PFAS and TOPA. The Case 4 Pit samples indicated a total PFAS concentration of 0.98 µg/L. PFOA (0.031 µg/L) was below the Australian health-based guidelines for both drinking and recreational water (HEPA, 2018). The ∑(PFHxS+PFOS) (0.12 µg/L) was above the drinking water and below the recreational water guidelines (HEPA, 2018). TOPA results suggested the potential presence of precursors.
- Concentrations of PFOS and PFHxS were detected in the tap sample (0.012 µg/L and 0.01 µg/L respectively) but concentrations of all other PFAS analysed were below laboratory LOR. The concentration of ∑(PFHxS+PFOS) was below the Australian drinking water guideline value (HEPA, 2018). The report indicated that the 1,460 L Case 4 Pit was used for pump testing and water drafting training and was covered by a steel grated plate to prevent water ingress. At the time of sampling the tank was 90% full.
- The Queensland Government website[6] reported that in 2018, two groundwater bores that previously supplied part of Ayr's town water network contained perfluorinated substances. Water sampling undertaken by Queensland Health showed levels of PFAS above Australian drinking water quality guidelines (HEPA, 2018) in these two bores, in results received on 25 May 2018.
  - Burdekin Shire Council ceased sourcing water from the affected bores on the same day as the results were made available.
  - Council undertook further water testing, with results received on 30 May. It notified the Queensland Government that elevated PFAS levels remained in only one bore, and that the Ayr town water was within Australian drinking water quality guidelines, posing no immediate health risk to people.
- The locations of the two bores that reported detectable concentrations of PFAS are not known. According to the Burdekin Shire Council website[7] the Ayr water supply network consists of six bores at Nelsons Lagoon, twelve bores at South Ayr Borefield and one bore at the Council Chambers.
- A review of the area within 4 km of the site identified the potential for off-Site sources of PFAS including:
  - Two current service stations are located 700 m to the northwest. A service station was historically present 400 m to the southwest.

[5] Reported by the manufacturer at https://www.solbergfoam.com/Foam-Concentrates/RE-HEALING-Foam.aspx
[6] https://www.qld.gov.au/environment/pollution/management/disasters/investigation-pfas/sites/ayr
[7] https://www.burdekin.qld.gov.au/

- a sewage pump station approximately 770 m south next to Nelson's Lagoon
- an old fuel depot approximately 815 m west
- a concrete plant and hydraulic machinery workshop are approximately 1.3 km northeast
- an old Esso fuel depot located 1.6 km southwest
- a BP depot and adjoining old BP depot located 1.7 km west-northwest
- a metal fabrication plant approximately 2.1 km northwest
- an old landfill approximately 2.4 km northwest and adjoining new waste transfer plant
- a sewage treatment plant located approximately 3.1 km northwest
- an old Ampol fuel depot and adjoining fuel depot (Tropic) located 3.5 km southwest.

3.0 Environmental Setting

3.1 Climate

A summary of the monthly climate statistics is presented in **Table 4** below, based on information available on the Australian Government Bureau of Meteorology website[8] for Ayr Research Station for the period 1951 to 2019. Ayr has a tropical climate, characterised by distinct wet and dry seasons. The wet season occurs between December and April. Mean annual rainfall is 944.7 mm.

Table 4 Summary of monthly climate at Ayr 1951 to 2019

Month	Mean maximum temperature (ºC)	Mean minimum temperature (ºC)	Mean rainfall (mm)
January	31.8	22.8	216.4
February	31.6	22.8	235.3
March	30.9	21.6	155.0
April	29.6	19.0	46.8
May	27.7	16.2	40.2
June	25.5	13.0	24.0
July	25.2	11.8	15.2
August	26.3	12.7	15.3
September	28.2	15.1	9.8
October	29.9	18.1	26.7
November	31.2	20.6	45.0
December	32.1	22.1	99.8

3.2 Site Topography

Queensland Globe online interactive mapping indicates the Site is relatively flat, and between 0 – 10m above sea level.

Stormwater drainage consists of a series of interconnected concrete lined drainage pits with flow directed to the north-west of the site before discharging off-site towards Queen Street.

3.3 Soil Type and Acid Sulfate Soils (ASS)

Mapping from the Australian Soil Resource Information System (ASRIS) indicated the Site is underlain by soils of the Burdekin Delta, comprising alluvial sediments. ASRIS indicated that there is an extremely low probability of occurrence of ASS at the Site.

3.4 Geology

Geological mapping (Queensland Globe) indicates that the majority of the Site is underlain by Quaternary Flood Plain Alluvium, comprising clay, silt, sand and gravel.

The bore card for the closest registered bore to Site (RN153347) indicated the geology consisted of silty sand, overlying fine to medium grained sands which are underlain by medium to coarse sand and gravel (Burdekin River Formation).

[8] http://www.bom.gov.au/climate/averages/tables/cw_033002.shtml

3.5 Hydrology

The closest water feature to the Site is an ephemeral creek or overland flow channel identified as Nelsons Lagoon, situated in Nelsons Lagoon Park, 700 m southeast of the Site. The channel appears to flow into a lagoon/pond located 1 km east of the Site. Further south of Nelsons Lagoon Park is Plantation Creek (1.5 km south of the Site), which trends in a broadly north easterly direction. The creek appears as a series of connected or non-interconnected standing water areas and discharges to the Coral Sea approximately 10 to 12 km to the east of the Site.

Approximately 1.1 km to the northeast of the Site is an unnamed channel and lagoon/pond which appears to flow into Lilliesmere Lagoon, 2.5 km north of the Site boundary. Lilliesmere Lagoon flows north into Kalamia Creek.

There is a drainage channel located approximately 1.8 to 2.1 km east of the Site that runs in a north-south orientation between Chippendale Street and Cornford Crescent. This connects with unnamed surface water bodies to the northeast of the Site.

The Burdekin River is the main water course in the area and is located approximately 5.3 km to the south of the Site.

Burdekin Regional Council online interactive mapping indicates the Site and adjacent land is within a 'Blue Storm Tide Evacuation Zone'. Residents in the Blue Zone face a low risk of flooding from a cyclone storm tide. The Blue Zone may experience storm tide flooding higher than approximately four metres above Highest Astronomical Tide.

3.6 Hydrogeology

Groundwater Resources of Queensland 1:2,500,000 mapping indicates that the aquifer beneath the Site comprises unconsolidated sediments, with a yield of >15 L/s and salinity of 1500 - 5000 mg/L. The groundwater is noted to be suitable for most stock, some domestic use and irrigation.

A search of the Department of Natural Resources, Mines and Energy (NRME) registered groundwater bore database was completed in February 2019 (AECOM, 2019) and identified 29 bores within 1 km of the Site, with five bores within 500m of the Site. All five registered bores are potentially used for water supply and are summarised in **Table 5**. The registered bore locations are also shown on **Figure 1, Appendix A**. Bore logs were included in **Appendix G** of the PSI report (AECOM, 2019).

Table 5 Registered groundwater bores within 500m of Ayr Fire Station

Bore ID	Distance and Direction	Screened Depth	Additional Comments / Use if Known
RN153347	140 m north-east	10 – 11m within Burdekin River Alluvium (sand and gravel)	Water supply, quality potable, static water level (SWL) 4.8 mbgl, yield is 2.0 L/s
RN96317	175 m south-east	7.9 – 8.5m within sand, gravel and clayey sand.	Water supply, SWL 5.7 mbgl, yield is 2.5 L/s
RN96606	360 m north-west	11.9 – 12.2m within fine to coarse clayey sand.	Water supply, SWL 7.7 mbgl, yield is 2.0 L/s
RN125197	445 m north-west	9.3 – 12.5m within sand and gravel.	Water supply, SWL 7.3 mbgl, yield not stated
RN125601	500 m north-west	10.85 – 11.5m within Burdekin River Alluvium (sand and gravel).	Water supply, SWL 6.6 mbgl, quality listed as potable, yield is 2.0 L/s

Local groundwater flow is potentially directed to the southeast, towards Nelsons Lagoon.

3.7 Environmental Values

Environmental Values (EVs) and water quality objectives for the Haughton Basin area under EPP Water are under development. As per DES guidance, in areas where no water quality objectives are scheduled, the Queensland water quality guidelines apply as default objectives and these include aquatic ecosystems, irrigation, farm supply/use, stock water, aquaculture, human consumer, primary recreation, secondary recreation, visual recreation, drinking water, industrial use and cultural and spiritual values.

3.8 Groundwater Dependent Ecosystems and Environmentally Sensitive Areas

A search of the Groundwater Dependent Ecosystems (GDE) database[9] did not indicate aquatic, subterranean or terrestrial ecosystems are present within 4 km of the Site.

A search of the Environmental Sensitive Areas database[10] indicated that the Site is classed as a river improvement area (Category C).

Areas along the Burdekin River and Plantation Creek (to the south of the Site) are classed as Category B endangered regional ecosystems (biodiversity status).

[9] http://www.bom.gov.au/water/groundwater/gde/map.shtml
[10] https://environment.des.qld.gov.au/licences-permits/maps_of_environmentally_sensitive_areas.php

4.0 Fieldwork- DSI

4.1 Overview

Fieldwork was completed between July and August 2019 in accordance with the scope and methodology outlined in the SAQP dated 2 April 2019 (AECOM, 2019). The tasks completed are summarised in **Table 6**.

Table 6 Summary of fieldwork

Activity	Dates
Service clearance and drilling of four soil bores (AY_BH01 to AY_BH04), collection of soil samples, conversion to groundwater monitoring wells (AY_MW01 to AY_MW04), well development	23- 24 July 2019
Advancement of two shallow soil bores (AY_SS01 and AY_SS02) and collection of soil samples	23 July 2019
Recording of groundwater elevation and collection of groundwater samples from the four newly installed wells (AY_MW01 to AY_MW04)	06 August 2019
Surveying of the groundwater wells	06 August 2019
Collection of three sediment samples (AY_SED01 to AY_SED03) and one surface water sample (AY_SW02)	06 August 2019
Collection of one tap water sample (AY_TAP01)	06 August 2019

4.2 Sampling Rationale

An overview of the rationale for sampling locations is presented in **Table 7**. The sampling locations are shown on **Figure 2**, **Appendix A**. The coordinates of sampling positions are shown in **Table T1**, **Appendix B**. Photographs taken during the fieldworks are shown in **Appendix C**.

Table 7 Sampling rationale

Location ID	Location/Rationale
BH01/MW01	In the central portion of the Site adjacent to the east of Case 4 Pit.
BH02/MW02	In the northern portion of the Site in a grassed area, up-gradient of foam training areas at the Site.
BH03/MW03	In the eastern portion of the Site near the location of the former small grassed area that may have been formerly used for foam training.
BH04/MW04	In the southern portion of the Site at location of the former large grassed area that may have been formerly used for foam training. The location is also adjacent to the former foam storage shed.
SS1	To assess potential PFAS impacts in shallow soil in the unsealed grassed area in the western portion of the Site, to the northwest of the area where foam training may have formerly occurred.
SS2	To assess potential PFAS impacts in shallow soil in the unsealed grassed area in the southern portion of the Site adjacent to the area where foam training may have formerly occurred.
SED01	A sediment sample from a drainage pit which may have received finished foam (see Plate 8 in **Appendix C**).
SED02/SW02	Sediment and surface water samples from a drainage pit which may have received finished foam (see Plate 9 in **Appendix C**).
SED03	A sediment sample from a drainage pit which may have received finished foam.
Tap 01	The sampling location is the tap on the workshop room outside wall (see Plate 7 in **Appendix C**). PFAS was detected in a sample of water from this tap in 2016.

Due to the ubiquity of PFAS used in a variety of everyday products and the potential for cross contamination during sampling activities, the recommended mitigation practices identified in the NEMP (2018) and Western Australia's Department of Environmental Regulation (2017) were implemented during the sampling program as stipulated in the SAQP (AECOM, 2019). Further details on the QA/QC practices employed are provided in **Appendix G**.

4.2.1 Soil Investigation

Sampling methodologies and details relating to laboratory analysis of samples are described in the SAQP (AECOM, 2019). The soil investigation methodology is described in **Table 8**.

Table 8 Soil investigation methodology

Activity/Item	Details
Service location	AECOM obtained on-Site utility plans and Dial-Before-You-Dig service before the start of the works. A contractor (Copp and Co Civil & Plant Hire Pty Ltd) conducted service location and cleared proposed bore locations for services. Concrete coring was conducted at three of the locations (AY_MW01, AY_MW03, AY_MW04). All soil bores were advanced by non-destructive digging (vacuum extraction using a water lance) to 1.5 mbgl to confirm the absence / presence of underground utilities. The two shallow soil bores were advanced using a hand auger to the target depth of 0.5 mbgl.
Drilling method and target depth	Soil bores (for conversion to groundwater monitoring wells) were advanced by a contractor (Proactive Drilling Services Pty Ltd) with a Geoprobe drilling rig using solid stem augers to the target depth (approximately 8.3 mbgl).
Soil logging	Soil logging was in accordance with the unified soil classification system (USCS) and AS1726-2016. The soil profile(s) encountered are provided in bore logs in **Appendix D**.
Soil sampling	During drilling, samples were obtained at the depths specified in the SAQP. To reduce the likelihood of cross contamination, soil samples were collected using new nitrile gloves and placed into laboratory prepared PFAS sample containers. All samples were filled to the top and securely sealed. The field quality assurance / quality control (QA/QC) samples comprised intra-laboratory duplicate samples, inter-laboratory duplicate samples and rinsate blank samples.
Soil sample preservation	During collection in the field, soil samples were placed in eskies kept cool with bagged ice prior to air transport to the laboratory. Samples were submitted with chain of custody documentation to an accredited laboratory.
Decontamination procedures	The decontamination procedures were performed before initial use of re-useable equipment and after each subsequent use. All reusable sampling equipment was decontaminated between each sample by scrubbing in a solution of Liquinox[11] and potable water before being rinsed in PFAS free distilled water. For each day of sampling, following decontamination procedures, a rinsate blank was completed by running laboratory prepared rinsate water over the reusable sampling equipment for collection directly into laboratory prepared sampling containers for analysis. At each sample location, a new set of disposable nitrile gloves was used to directly collect soil samples from the re-useable sampling equipment for placement into the laboratory prepared sampling containers.
Disposal of waste	Waste soil generated during the drilling was disposed of into 205 L drums for temporarily storage in an area nominated by QFES.

[11] Further information on PFAS-free status of Liquinox is provided at http://technotes.alconox.com/industry/laboratory/manual-lab-cleaning/pfoa-pfos-pfas-alconox-cleaners/

4.2.2 Groundwater Investigation

The groundwater investigation methodology is described in **Table 9**.

Table 9 Groundwater investigation methodology

Activity	Details
Monitoring well installation	Monitoring well construction comprised a 50 mm diameter uPVC screen and casing with screw fittings, installed in an approximately 150 mm diameter bore. Wells were installed to a depth of 8.3 mbgl with screen lengths from 5.3 mbgl to 8.3 mbgl for all wells. Screened sections were installed in a gravel filter pack to 0.5 m above the top of the screen and isolated with a 1 m thick bentonite seal. Each well was fitted with a flush mounted gatic and secured into position with concrete. A water tight enviro-cap was installed on the top of each well casing to prevent accidental blockage of the well.
Well development	Wells were developed following installation using a foot pump. The wells were purged until the extracted water was 'clearing' and field parameters were stabilised. Monitoring well construction details can be found in **Table T1, Appendix B**.
Well gauging	Monitoring wells were gauged using an oil/water interface probe. The results of groundwater level gauging are presented in **Table T2, Appendix B**. The field sheets and calibration certificates are provided in **Appendix E**.
Field Parameters	Groundwater physicochemical properties were measured in the field prior to sample collection using a calibrated YSI water quality meter. Groundwater pH, temperature, electrical conductivity, redox potential and dissolved oxygen concentrations were measured. Groundwater physicochemical parameters are presented in **Table T3, Appendix B**. Water quality meter calibration certificates are presented in **Appendix E**.
Groundwater sampling	The groundwater sampling procedure is described in detail in the SAQP (AECOM, 2019). Groundwater samples were collected from each monitoring well using a low flow peristaltic pump in accordance with Australian Standard AS5667.11 (1998) and the AECOM Standard Operating Procedure (SOP). Samples were obtained following stabilisation of field parameters and standing water level. The field QA/QC samples comprised intra-laboratory duplicate samples, inter-laboratory duplicate samples and rinsate blank samples.
Sample preservation	During collection in the field, samples were placed into the appropriate laboratory-supplied containers and placed in an esky, which was kept cool with bagged ice. Samples were transferred to a clean fridge before being delivered to the lab via air freight. Samples were submitted with chain of custody documentation to a laboratory NATA accredited for the analysis requested.
Decon-tamination procedures	The oil/water interface probe and peristaltic pump were decontaminated by scrubbing in a solution of Liquinox[12] and potable water before rinsing with PFAS-free distilled water between each groundwater well. A rinsate sample was collected from either the interface probe or peristaltic pump each day of sampling. Dedicated tubing was used for during the monitoring of each well to minimise the potential for cross-contamination and appropriate silicone and HDPE tubing was used which is PFAS-free. A new pair of nitrile gloves were used for each well sampled.
Disposal of waste	Purged groundwater was disposed of into a 205 L waste drum, which was temporarily stored in an area nominated by QFES.
Surveying	Surveying of newly installed groundwater wells was completed by Veris Australia Pty Ltd. The surveying report is presented in **Appendix F**.

[12] Further information on PFAS-free status of Liquinox is provided at http://technotes.alconox.com/industry/laboratory/manual-lab-cleaning/pfoa-pfos-pfas-alconox-cleaners/

4.2.3 Sediment Investigation

The sediment sampling methodology is summarised in **Table 10**.

Table 10 Sediment investigation methodology

Activity	Details
Sediment sampling	On-Site sediment samples were collected using a gloved hand placing samples directly into laboratory sample jars. At each location the sample jar was filled to the top to ensure no headspace and the cap was immediately applied.
Sample preservation	Samples were placed into the appropriate laboratory-supplied containers and placed in an esky, which was kept cool with bagged ice. Samples were submitted with chain-of-custody documentation to a laboratory NATA accredited for the analysis requested.
Decontamination	A new pair of disposable nitrile gloves was used to collect each sediment sample to avoid the potential for cross contamination.

4.2.4 Surface Water and Tap Water Investigation

The water sampling methodology is summarised in **Table 11**.

Table 11 Surface Water investigation methodology

Activity	Details
Surface water sampling	At the drain location, the surface water grab sample was collected using a sampling pole to retrieve water from near the water surface, and towards the centre of the drain. The water sample was placed directly in the laboratory sample jar. Care was taken to ensure the water column at the sampling location was not agitated during sampling.
Tap water sampling	The tap water sample was collected using the first flush in the laboratory sample jar.
Sample preservation	Samples were placed into the appropriate laboratory-supplied containers and placed in an esky, which was kept cool with bagged ice. Samples were submitted with chain-of-custody documentation to a laboratory NATA accredited for the analysis requested.
Decontamination	A new pair of disposable nitrile gloves was used to collect each surface water and tap water sample to avoid the potential for cross contamination.

4.3 Laboratory Analysis and Quality Assurance / Quality Control

A summary of samples analysed for this DSI is shown in **Table 12**. The laboratory analyses were conducted by Australian Laboratory Services (ALS) (primary laboratory) and National Measurement Institute (NMI) (secondary laboratory).

Table 12 Summary of laboratory analyses

Sample Media	Number of primary samples analysed for PFAS	No of duplicate samples	No of triplicate samples	No of rinsate samples
Soil samples	16	2	2	3
Water samples	6	1	1	1
Sediment samples	3	1	1	-

4.3.1 Data Quality Objectives and Analytical Data Validation

The *National Environment Protection (Assessment of Site Contamination) Measure (*as amended 2013) (ASC NEPM) Schedule B2 Guideline on-Site Characterisation specifies that the nature and quality of the data produced in an investigation should be determined by the data quality objectives (DQO). As referenced by the ASC NEPM, the DQO process is detailed in the United States Environmental Protection Agency (US EPA, 2006) *Guidance on Systematic Planning Using the Data Quality Objectives Process (EPA QA/G-4 : EPA/240/B-06/001),* February 2006. The DQOs were specified within the SAQP and are presented in **Appendix G**.

AECOM has undertaken a review of the laboratory analytical results for quality control purposes; the results of the data validation process are presented in **Appendix G** and the laboratory quality control reports are included in **Appendix H**. In summary, while some non-conformances have been identified, these are considered of minor importance and it is concluded that the dataset presented in this report is suitable for use.

5.0 Assessment Criteria

Section 3.7 identified the Haughton Basin (fresh water) has the following EVs: aquatic ecosystems, irrigation, farm supply/use, stock water, aquaculture, human consumer, primary recreation, secondary recreation, visual recreation, drinking water, industrial use and cultural and spiritual values. Guidelines values need to be suitably protection of the above EVs. The guideline values relevant for the Site that have been adopted for this investigation are identified in **Table 13**. The guideline values are considered to provide a suitable level of protection for all EVs identified (refer to **Section 3.7**).

Table 13 Adopted investigation levels for PFAS

Media	Environmental Value	PFAS	Guideline Value
Soil	Human health- industrial / commercial landuse	∑(PFHxS+PFOS)	20 mg/kg[A]
		PFOA	50 mg/kg[A]
	Ecosystems- interim soil – ecological indirect exposure (residential)	PFOS	0.01 mg/kg[A]
	Ecosystems- interim soil – ecological indirect exposure (commercial)		0.14 mg/kg[A]
Groundwater	Human health- drinking water	∑(PFHxS+PFOS)	0.07 µg/L[A]
		PFOA	0.56 µg/L[A]
Groundwater discharging to surface water / surface water	Aquatic ecosystem protection (99% species protection)	PFOS	0.00023 µg/L[A]
			0.051 µg/L[B]
		PFOA	19 µg/L[A]
	Human health- recreational contact with waters	∑(PFHxS+PFOS)	2.0 µg/L[C]
		PFOA	10 µg/L[C]
Sediment	No applicable sediment guidelines are available for PFAS.		

Notes:

A - NEMP (HEPA, 2018)

B-It is noted, that the NEMP (HEPA, 2018) 99% species protection guideline value for PFOS (0.00023 µg/L) is below the laboratory limit of reporting (LOR) and that the CSIRO has undertaken work to further review the draft freshwater criteria presented in the HEPA (2018) NEMP. The revised draft guideline values for PFOS were presented in Batley et al., 2018, Application of revised methodologies for default guideline value derivations: PFOS in freshwater at the Society of Environmental Toxicology and Chemistry (SETAC) North America scientific conference in November 2018. AECOM understands, through discussions with CSIRO, that these values are currently being further revised to consider more recent ecotoxicity testing results and the updated statistical interpretation methodology recommended in ANZG (2018). In the interim, both the draft freshwater criteria from the HEPA (2018) NEMP and the draft revised criteria proposed by Batley et al (2018) will be used to evaluate the data.

C- Australian Government National Health and Medical Research Council (2019), Guidance on Per and Polyfluoroalkyl substances in Recreational Water. Values are for recreational activities in natural waters only and not applicable for water extracted to fill swimming pools.

6.0 Results

6.1 Soil Conditions

The bore logs for the new soil bores (AY_BH01 to AY_BH04, AY_SS01 and AY_SS02) drilled in July 2019 are shown in **Appendix D**. Soil bores AY_BH01 to AY_BH04 were drilled to 8.3 mbgl, with AY_SS01 and AY_SS02 advanced to 0.5 mbgl. Underlying the concrete (where present), the soil conditions logged at these locations consisted of sand or gravel fill or disturbed natural (i.e. reworked) clay to approximately 0.4 to 0.5 mbgl, underlain by natural soil consisting of brown firm to soft sandy or silty clay and sand to the maximum depth of investigation. This was considered to be Quaternary Flood Plain Alluvium.

There was no visual or olfactory indication of contamination in the soil samples during the drilling.

6.2 Hydrogeology

6.2.1 Observations during Drilling

Groundwater was encountered within the sandy horizons in soil bores AY_BH01 to AY_BH04. The depths of the groundwater strikes were at approximately 4.5 mbgl in all soil bores as shown on the bore logs in **Appendix D** and in **Table T1**, **Appendix B**.

6.2.2 Groundwater Elevations and Groundwater Flow Direction

The four groundwater monitoring wells sampled during this investigation were gauged before groundwater samples were collected. The SWLs were between 4.48 and 4.62 metres below top of casing (mbtoc). The groundwater elevations were between 3.43 and 3.44 m AHD. The SWLs and groundwater elevations are presented in **Table T2**, **Appendix B**.

The inferred groundwater contours and local groundwater flow direction at the site is shown on **Figure 3**, **Appendix A**. Based on the available data, the groundwater is inferred to locally flow towards the southeast.

6.2.3 Water Quality Parameters

Table T3, **Appendix B** presents the field water quality parameter results for groundwater collected during the groundwater monitoring event. The raw data were recorded on the field sheets presented in **Appendix E**. A summary of the water quality results is presented in **Table 14**.

Table 14 Summary of groundwater quality parameter results

Well ID	Units	MW01 6/08/2019	MW02 6/08/2019	MW03 6/08/2019	MW04 6/08/2019
pH	pH units	6.49	6.09	5.77	5.66
Temperature	°C	27.1	27.3	26.6	27.7
Electrical Conductivity	µS/cm	498.5	1333	109.5	107.5
Total Dissolved Solids	mg/L	324.0	866.5	71.2	69.9
Dissolved Oxygen	mg/L	4.96	0.41	0.13	0.23
Field Oxidation Reduction Potential	mV	138.5	35.7	100.9	161.1
Oxidation Reduction Potential	mV	144.6	240.7	305.9	366.1

The results indicate that the groundwater is slightly acidic, fresh, poorly to well oxygenated with mildly reducing conditions.

6.2.4 Groundwater Field Observations

There was no visual or olfactory indication of contamination in the monitoring wells during the groundwater monitoring, including no identification of non-aqueous phase liquids, foaming or odours.

6.3 Analytical Results

6.3.1 Soil

The soil analytical results are presented in **Table T5, Appendix B** and on **Figure 4, Appendix A**. The laboratory analytical reports are presented in **Appendix H**. PFAS was detected in all 16 soil samples analysed.

There were no exceedances of the human health guideline values for commercial land use in the soil samples analysed. A summary of the analytical results is presented in **Table 15**Error! Reference source not found..

Table 15 Summary of PFAS soil analytical results and assessment with human health guideline values

Compound	No. of samples analysed	No. of samples >LOR*	Maximum concentration (mg/kg)	Human health guideline value (mg/kg)	No. of samples exceeding human health guideline value
∑(PFHxS+ PFOS)	16	16	0.418	20	0
PFOS	16	16	0.418	No guideline	No guideline
PFOA	16	10	0.0033	50	0
Sum of PFAS	16	16	0.423	No guideline	No guideline

*Limit of Reporting (LOR)

There were two exceedances of the ecological guideline value for PFOS for indirect exposure for commercial land use. A summary of the analytical results is presented in **Table 16**. The exceedances occurred in two out of the six soil bores, with the maximum concentration detected in the sample from AY_BH04 at 1.0 mbgl (0.418 mg/kg).

A comparison of the PFAS concentrations to the residential land use ecological guidelines for indirect exposure was also performed, as the northwestern portion of the Site contain open ground/landscaped areas where secondary consumers such as insectivorous birds and mammals may forage. This is a conservative approach, as it is considered that the wildlife would be transient in nature due to the urbanised setting of the site. There were eleven exceedances of the ecological guideline value for PFOS for indirect exposure for residential land use. The exceedances occurred in samples from five out of the six soil bores.

Table 16 Summary of PFAS soil analytical results and assessment with ecological guideline values

Compound	No. of samples analysed	No. of samples >LOR*	Maximum concen-tration (mg/kg)	Ecological guideline value Commercial / residential (mg/kg)	No. of samples exceeding ecological guideline value
∑(PFHxS+ PFOS)	16	16	0.418	No guideline	No guideline
PFOS	16	16	0.418	0.14 / 0.01	11(residential) 2 (commercial)
PFOA	16	10	0.0033	No guideline	No guideline
Sum of PFAS	16	16	0.423	No guideline	No guideline

6.3.2 Groundwater

The groundwater analytical results for samples collected from monitoring wells are presented in **Table T5, Appendix B.** The laboratory analytical reports are presented in **Appendix H**. A summary of the assessment of the results with human health guideline values is presented in **Table 17** below.

Table 17 Summary of groundwater results and assessment with human health guideline values

Compound	No. of samples analysed	No. of samples >LOR	Maximum concen-tration (µg/L)	Drinking water / recreational water guideline values (µg/L)	No. of samples exceeding drinking water guideline value	No. of samples exceeding recreational water guideline value
∑(PFHxS+PFOS)	4	4	53.7[13]	0.07 / 2.0	4	4
PFOS	4	4	59.9*	No guideline		
PFOA	4	4	0.93*	0.56 / 10.0	3	0
Sum of PFAS	4	4	68*	No guideline		

The groundwater analytical results for ∑(PFHxS+PFOS) and PFOA concentrations are presented on **Figure 5, Appendix A**. Groundwater samples from all four monitoring wells exceeded the human health guideline values for drinking water for ∑(PFHxS+PFOS), with the maximum ∑(PFHxS+PFOS) concentration detected in the primary sample from monitoring well AY_MW01 (53.7 µg/L), located adjacent east of the Case 4 Pit.

All four of these samples also exceeded the recreational water guideline value for ∑(PFHxS+PFOS).

There were three exceedances of the human health guideline value for drinking water for PFOA concentrations in the groundwater samples with the maximum PFOA concentration (0.9 µg/L) also detected in AY_MW01. There were no exceedances of the recreational water guideline value.

There were exceedances of the ecological guideline values for 99% species protection for fresh water for PFOS in all four samples. There were no exceedances of the adopted ecological guideline values for PFOA.

6.3.3 TOPA

TOPA is used to detect certain harder to analyse PFAS precursor compounds that may be present. One soil sample and one groundwater sample were analysed for TOPA with the results summarised in **Table 18**.

Table 18 Summary of TOPA analysis (soil and groundwater)

Sample	Units	Sum of 28 PFAS (standard analysis)	Sum of 28 PFAS (TOPA)	Sum of TOP C4-C14 Carboxylates and C4-C8 Sulfonates	% of Sum of 28 TOPA to 28 PFAS standard analysis
AY_BH04_1.0_190723	mg/kg	0.423	0.352	0.352	-17%
AY_MW01_190806	µg/L	57.7	58.5	58.5	+1%

Comparison of the results for the soil sample (AY_BH04 at 1.0 mbgl) indicates the sum of 28 PFAS by TOPA was 17% lower than the sum of 28 PFAS by standard analysis, which also indicates minor depletion of oxidation by compounds other than PFAS. As the sum of the 28 PFAS by TOPA is slightly higher (by 1%) than the sum of the 28 PFAS by standard analysis for the groundwater sample

[13] Quality assurance samples were analysed for monitoring well AY_MW01 with ∑(PFHxS+PFOS) in the primary sample reporting 53.7 µg/L, the intra-laboratory (duplicate) sample reporting 64.1 µg/L and the inter-laboratory (triplicate) sample reporting 49.0 µg/L. The results indicate variability in the samples.

(AY_MW01), this indicates low potential for transformation of precursor compounds in groundwater at this location. The results are indicative of a degraded PFAS product. Overall, it is considered unlikely that PFAS concentrations will significantly increase through biotransformation or oxidation processes.

6.3.4 Tap Water

The tap water analytical results for one sample collected from an on-Site outdoor tap are presented in **Table T6, Appendix B.** The laboratory analytical reports are presented in **Appendix H**. A summary of the assessment of the results with human health guideline values is presented in **Table 19** below.

Table 19 Assessment of tap water results with human health guideline values

Compound	No. of samples analysed	Maximum concen-tration (µg/L)	Human health drinking water / recreational water guideline value (µg/L)	No. of samples exceeding drinking water guideline value	No. of samples exceeding recreational water guideline value
∑(PFHxS+PFOS)	1	0.105	0.07 / 2.0	1	0
PFOS	1	0.0652	No guideline		
PFOA	1	0.0025	0.56 / 10.0	0	0
Sum of PFAS	1	0.128	No guideline		

The tap water analytical result for ∑(PFHxS+PFOS) and PFOA concentrations are presented on **Figure 6, Appendix A**. The tap water sample exceeded the human health guideline value for drinking water for ∑(PFHxS+PFOS). No exceedance was reported for PFOA and the sample did not exceed the recreational water guideline value.

There was one exceedance of the NEMP (HEPA, 2018) and Batley et al. (2018) ecological guideline values for 99% species protection for fresh water for PFOS. There was no exceedance of the adopted ecological guideline values for PFOA.

6.3.5 Surface Water

The surface water analytical result for one sample collected from the drainage pit located adjacent east of the former foam training area on the southern portion of the Site is presented in **Table T7, Appendix B.** The laboratory analytical reports are presented in **Appendix H**. A summary of the assessment of the results with human health and ecological guideline values is presented in **Table 20** below.

Table 20 Assessment of surface water results with human health and ecological guideline values

Compound	No. of samples analysed	Concen-tration (µg/L)	Human health recreational water guideline value (µg/L)	No. of samples exceeding recreational water guideline value	Ecological guideline value (µg/L)	No. of samples exceeding ecological IL
∑(PFHxS+PFOS)	1	0.142	2.0	0	No guideline	
PFOS	1	0.0737	No guideline		0.00023	1
PFOA	1	0.023	10.0	0	19.0	0
Sum of PFAS	1	0.249	No guideline		No guideline	

The surface water analytical results for ∑(PFHxS+PFOS) and PFOA concentrations are presented on **Figure 6, Appendix A**.

There were no exceedances of the human health guideline values for recreational water for ∑(PFHxS+PFOS) and PFOA.

The concentration of PFOS in the surface water sample exceeded the adopted ecological guidelines for 99% freshwater species protection as presented in the NEMP (2018) and Batley et al. (2018). No exceedances were reported for PFOA.

6.3.6 Sediment

The sediment analytical results for samples collected from three on-Site drains are presented in **Table T8, Appendix B** and on **Figure 6, Appendix A**. The laboratory analytical reports are presented in **Appendix H**. A summary of the results is presented in **Table 21** below.

Table 21 Summary of sediment analytical results

Compound	No. of samples analysed	No. of samples >LOR	Maximum concentration (mg/kg)
∑(PFHxS+PFOS)	3	3	0.005
PFOS	3	3	0.0047
PFOA	3	1	0.0002
Sum of PFAS	3	3	0.0098

No suitable criteria are available for assessing human and ecological risk from sediment. It is noted that the sediment concentrations did not exceed either human health or ecological guidelines values for commercial landuse. The moisture contents of SED01 and SED02 samples were less than 50% and SED03 had a moisture content of 58%.

7.0 Discussion

7.1 Geological and Hydrogeological Conditions

7.1.1 Soil Conditions

Based on the soil conditions recorded in the bore logs, the subsurface lithology beneath the Site generally comprises a shallow layer of fill consisting of gravelly sand and reworked natural deposits, underlain by natural sandy or silty clays and sand to the maximum depth of the investigation (8.3 mbgl).

7.1.2 Hydrogeology

Measured groundwater elevations indicate the presence of a shallow aquifer, approximately 4.5 mbgl. Based on the limited groundwater elevation data (four locations), the inferred contours indicate groundwater on the Site could potential flow locally to the southeast, towards Nelsons Lagoon, 700 m south-southeast of the Site.

Surface cover at the Site is a combination of concrete and grass. Areas formerly used for firefighting training are paved with concrete at surface. Prior to the paving, AFFF may have directly infiltrated to the subsurface following direct application during training exercises. Since the placement of concrete, the application of AFFF to surface has the potential to impregnate concrete or seep through joints and cracks in the concrete cover to the underlying fill and natural soil below. The presence of underground services beneath the concrete and presence of the Case 4 Pit may create preferential pathways through coarse backfill materials for contaminant migration in areas where clay is the main soil type present.

7.2 Soil Analytical Results

The soil bores drilled as part of this PFAS DSI (AY_BH01 to AY_BH04, AY_SS01 and AY_SS02) were located within or adjacent to potential source areas (the two areas formerly used for foam training exercises) and at locations up-gradient and down-gradient of these potential source areas (AY_BH02 and AY_BH03).

The highest PFAS concentrations detected in shallow soil sample was at soil bore AY_BH04, located within the former foam training area on the southern portion of the Site. The sample with the highest PFAS concentration (0.418 mg/kg ∑(PFHxS+PFOS)) was collected in the natural sandy clay at 1.0 mbgl. PFAS concentrations in a deeper sample at 6.0 mbgl were an order of magnitude lower (0.0426 mg/kg ∑(PFHxS+PFOS)) indicating attenuation with depth. The presence of cohesive soil (clay) below the fill (i.e. below 0.5 mbgl) may retard the vertical migration of PFAS in the unsaturated zone.

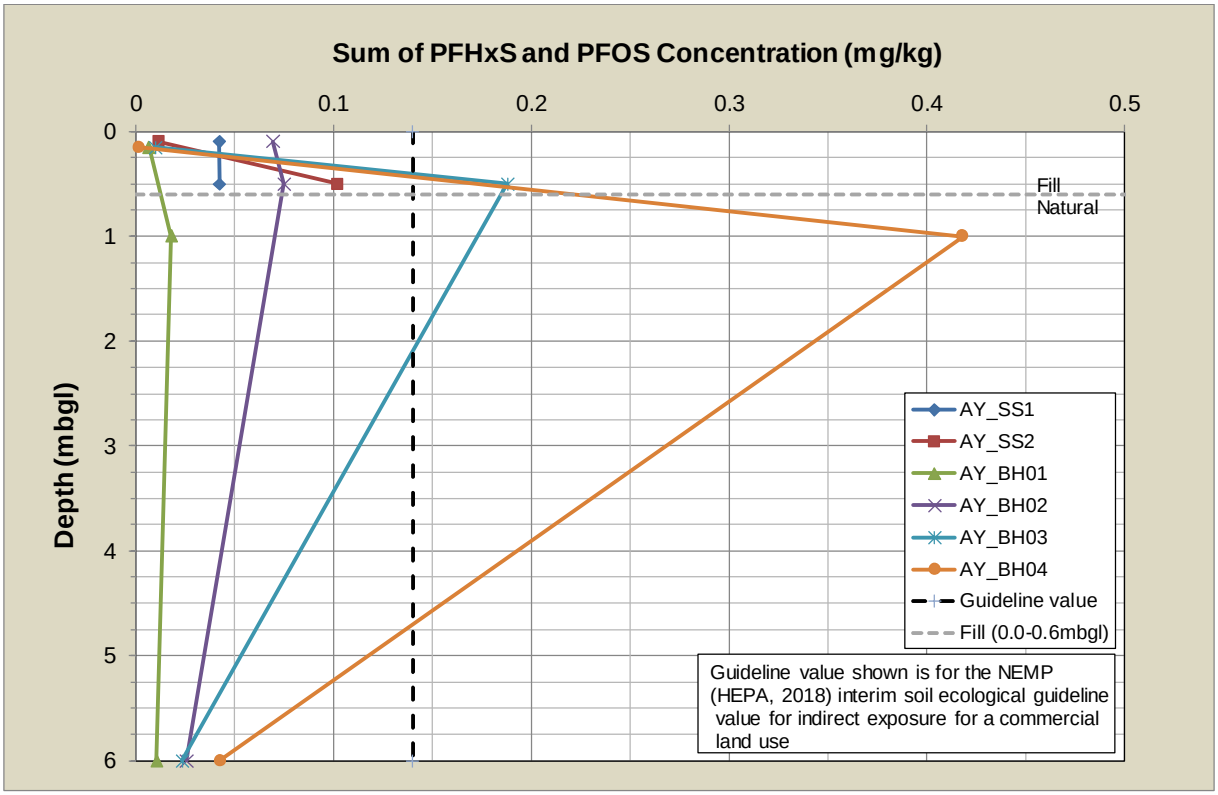
Table 22 below summarises the soil analytical results for ∑(PFHxS+PFOS) for different sample depths. This is shown graphically in **Chart 1**.

Table 22 Soil analytical results for ∑(PFHxS+PFOS)

Depth (mbgl)	∑(PFHxS+PFOS) (mg/kg)						
	AY_BH01	AY_BH02	AY_BH03	AY_BH04	AY_SS2	AY_SS1	Range
	Adjacent to Case 4 Pit	North and up-gradient of foam training areas	Within areas formerly used for firefighting training using foams			West and up-gradient of foam training areas	
0.1, 0.15	0.0066	0.069	0.01	0.001	0.012	0.042	0.001-0.069
0.5	NA	0.075	0.188	NA	0.102	0.042	0.042-0.19
1.0	0.018	NA	NA	0.418	NA	NA	0.018-0.42
6.0	0.0105	0.026	0.024	0.043	NA	NA	0.011-0.04

Notes: Samples from 6.0 mbgl are from the saturated zone. All results in mg/kg, NA - No sample analysed.

Chart 1 Concentration of ∑(PFHxS+PFOS) at depth in soil bores at Ayr Fire Station



Review of the distribution of PFAS concentrations in soil samples indicates concentrations at AY_BH03 (located adjacent west of the former foam training area on the eastern portion of the Site) and AY_BH04 (located within the former foam training area on the southern portion of the Site) were higher compared to other sampling locations, the other samples are considered to be in a similar range at the locations sampled.

The maximum soil ∑(PFHxS+PFOS) concentration detected is two orders of magnitude lower than the guideline value for human health for commercial landuse. Two soil samples from two bores (AY_BH03 and AY_BH04) had PFOS concentrations that exceeded the guideline value for ecological indirect exposure for commercial use. Eleven soil samples from five bores (SS1, SS2, AY_BH02, AY_BH03 and AY_BH04) contained PFOS concentrations that exceeded the guideline value for ecological indirect exposure for residential use. Three of the five bores were located in

landscaped/grassy areas potentially accessible to ecological receptors and the remaining two bores were located beneath concrete.

Some localised areas of excavations and infilling have been identified in the vicinity of the foam training area including underground structures such as the Case 4 Pit and underground services such as sewer lines. The presence of these filled areas, which are likely to contain coarser material such as sand, may create preferential pathways for the migration of PFAS within the unsaturated zone. The Case 4 Pit is 2.3 mbgl deep and does not extend to the groundwater table. Backfill around tanks/pits has the potential to form a preferential pathway for the vertical migration of PFAS to groundwater.

7.3 Groundwater Analytical Results

PFAS (∑(PFHxS+PFOS) and PFOA) have been detected in all four groundwater monitoring wells (AY_MW01 and AY_MW04) with the highest concentrations detected at AY_MW01 (54 µg/L ∑(PFHxS+PFOS)) located adjacent east of the Case 4 Pit and west of the area used for foam training exercises on the eastern portion of the Site. The next highest PFAS concentrations were reported at AY_MW04 (43 µg/L ∑(PFHxS+PFOS)), located the within the area used for foam training exercises on the southern portion of the Site. This suggests a secondary source of PFAS may be present in the soil in these areas. It is noted that ∑(PFHxS+PFOS) (0.12 µg/L) and PFOA (0.031 µg/L) were detected in water samples collected in 2016 from the Case 4 Pit.

The monitoring well located up-gradient of the Site (AY_MW02) reported PFAS concentrations which were an order of magnitude lower (2.1 µg/L ∑(PFHxS+PFOS)) than concentrations reported in monitoring wells in the southern portion of the Site. This indicates the primary source of PFAS in groundwater is likely to be located on the southern portion of the Site, within the vicinity of the two former foam training exercises areas and the Case 4 Pit.

The extent of PFAS in groundwater has not been established laterally in any direction. Groundwater elevation data indicate that local flow is likely to be towards the southeast towards Nelson's Lagoon. Council bores used for water supply are located in the Nelson's Lagoon area and may influence the local groundwater flow direction.

Shorter chain compounds (i.e. compounds with six or fewer perfluorinated carbons) have higher mobility relative to longer chain compounds. The groundwater sample from monitoring well MW03, which is located closest to the down-gradient southeastern site boundary reported relatively higher concentrations of shorter chain compounds including PFHxS (7.13 µg/L), PFBS (0.84 µg/L), PFPeS (1.32 µg/L), PFPeA (1.05 µg/L) and PFHxA (2.4 µg/L) compared to groundwater from up-gradient monitoring wells (e.g. MW01). This indicates shorter chain compounds have migrated from up-gradient source areas and these compounds are considered to have a higher potential to migrate in groundwater beyond the site boundary.

7.4 PFAS composition in soil and groundwater samples

Table 23 below presents a comparison of the compounds detected in soil and groundwater samples.

Table 23 PFAS composition in soil and groundwater samples

PFAS	Carbon chain length	Average soil ratios for different depth intervals				Average groundwater ratios (n=4)
		0.1-0.15 mbgl (n = 6)	0.5 mbgl (n = 4)	1.0 mbgl (n = 2)	6.0 mbgl (n = 4)	
PFBS	4	0.1%	0%	0%	0.3%	0.6%
PFBA	4	0.5%	0%	0%	0%	0%
PFPeS	5	0.1%	0%	0%	0.4%	0.9%
PFPeA	5	2.1%	0.4%	0%	0.8%	1.0%
PFHxS	6	2.6%	1.9%	31.5%	10.3%	9.9%
PFHxA	6	1.8%	0.5%	0.9%	1.6%	2.1%
6:2 FTS	6	0.9%	0%	0%	2.0%	2.1%
PFHpS	7	0.1%	0.3%	2.6%	0.8%	0.5%
PFHpA	7	2.1%	0.5%	0.7%	1.1%	1.3%
PFOS	8	63.1%	82.4%	56.8%	79.8%	79.4%
PFOA	8	1.3%	0.7%	7.1%	1.6%	1.7%
PFNA	8	2.7%	3.6%	0.4%	1.3%	0.5%
8:2 FTS	8	0.8%	1.9%	0%	0%	0%
FOSA	8	0.6%	2.9%	0%	0%	0%
PFDS	10	2.1%	1.8%	0%	0%	0%
PFDcA	10	1.8%	1.4%	0%	0%	0%
10:2 FTS	10	0.7%	0%	0%	0%	0%
PFUnDA	11	11.3%	1.7%	0%	0%	0%
PFDoDA	12	0.8%	0%	0%	0%	0%
PFTrDA	12	4.5%	0%	0%	0%	0%

7.4.1 Soil Profile

The composition of PFAS in the soil samples analysed is dominated by PFOS (between 57 and 83%). The PFAS present in soil samples ranged from short (four perfluorinated carbons) to long chain (12 perfluorinated carbons). Longer chained perfluorinated carbons (>C6) were primarily observed in the shallower soil samples (0 to 0.5 mbgl), with PFOS the dominant compound. Perfluoroalkyl carboxylic acids (PFCA) analogues for the other the major components are present in this depth interval. This may be due to the longer chain PFAS having a greater potential to sorb to soil particles compared to shorter chain PFAS. At the deeper depths (1.0 – 6.0 mbgl), PFOS and PFHxS are the main compounds present with PFHxS noted to form a larger portion of the compounds present at 1.0 mbgl (32%) and 6.0 m (10%) compared to shallower depth (e.g. at 0.1 m the average PFHxS ratio was 2.6% of the total 28 PFAS). This may be due shorter chain PFAS having higher solubilities and increased mobility than the longer chain compounds. This indicates the longer chain PFAS have less mobility compared to shorter chain compounds.

7.4.2 Groundwater Profile

The composition of PFAS in groundwater is dominated by PFOS (average composition of 79%). The compounds present in groundwater samples primarily consisted of short chained perfluorinated carbons. PFOS was the dominant PFAS in the groundwater samples, compared to the shorter chain PFHxS compound. This may be due to the slightly acidic to near neutral (pH ranging 5.66 to 6.49) and

fresh conditions (total dissolved solids ranging 69.9 to 866) of the groundwater, which may inhibit the sorption of PFOS onto organic matter, thus increasing mobility (CRC CARE 2018).

7.4.3 Summary

Based on **Table 23**, approximately 99% of the mass of PFAS in the soil (based on the sum of 28 PFAS analysed) consisted of longer chain compounds with more than six perfluorinated carbons. Approximately 97% of the mass of PFAS in groundwater consisted of longer chain length with more than six perfluorinated carbons.

7.5 Tap Water Analytical Results

The tap water sample (AY_Tap01), collected from the outside tap located on the outside wall of the workshop in the north-central portion of the Site contained PFAS concentrations (0.105 µg/L ∑(PFHxS+PFOS)) which exceeded the NEMP (HEPA, 2013) drinking water quality guideline (0.07 µg/L ∑(PFHxS+PFOS)). It is understood that the tap is used for washing purposes, and it is unknown if the water is used for drinking. The tapwater is reticulated and supplied by Burdekin Shire Council from the Ayr water supply network (sourced mainly from either Nelsons Lagoon or South Ayr Borefield).

The Council were notified of the PFAS detection by the Queensland Government in September 2019. The Queensland Government reported on 20 September 2019[14] that follow-up testing was completed with results indicating all drinking water taps at Ayr Fire Station did not exceed national drinking water guidelines. As discussed in **Section 2.4**, PFAS has previously been detected in 2018 in two bores in the Nelsons Lagoon Borefield and these were disconnected from the network. The locations of the two bores are not known. Further results in May 2019 indicated PFAS concentrations exceeded national drinking water guidelines in one of the bores, implying that one of the bores was reconnected. The Queensland Government website indicated that further water sampling of the water supply bores is currently being conducted by the Queensland Government.

The composition of PFAS in tap water from the Ayr Fire Station is summarised in **Table 24**. The composition of PFAS in tap water is dominated by PFOS (51%) and PFHxS (31%) with nine other compounds present below or at 4%. Approximately 91% of the mass of PFAS in tap water is comprised of longer chain length with more than six perfluorinated carbons. This is noted to be different from the groundwater beneath the fire station, which has a higher proportion of longer chain PFAS (97%).

Table 24 PFAS composition in the tap water sample

PFAS	Carbon Chain Length	Tap water sample (n = 1)	Hydrant water (n=1)	Groundwater on-site
PFBS	4	3.5%	4.1%	0.6%
PFPeS	5	3.4%	2.7%	0.9%
PFPeA	5	1.5%	-	1.0%
PFHxS	6	31.0%	37.7%	9.9%
PFHxA	6	2.9%	4.1%	2.1%
6:2 FTS	6	1.5%	-	2.1%
PFHpS	7	1.9%	-	0.5%
PFHpA	7	1.1%	-	1.3%
PFOS	8	50.9%	51.4%	79.4%
PFNA	8	0.4%	-	0.5%
PFOA	8	1.9%	-	1.7%

Notes: - denotes results were below LOR

[14] https://www.qld.gov.au/environment/pollution/management/disasters/investigation-pfas/sites/ayr

Analytical results for a water sample from the on-site hydrant (AY_QC300, see **Table G4** in **Appendix G**) reported 0.067 ug/L ∑(PFHxS+PFOS), which was approaching the drinking water guideline of 0.07 µg/L. The composition of the hydrant water is also shown in **Table 24** and has a similar composition to the tap water with PFOS and PFHxS being the main compounds present. This indicates a similar source for the tap and hydrant water.

7.6 Surface Water and Sediment Analytical Results

The surface water sample (SW02), collected from the concrete lined drainage pit located adjacent east of the former foam training area (see **Figure 6, Appendix A**) contained a PFOS concentration (0.0737 µg/L) which exceeded the adopted ecological guidelines (0.00023 µg/L (NEMP HEPA, 2018) and 0.051 µg/L (Batley 2018)). The stormwater drainage line traverses across the centre of the Site from the Case 4 Pit with flow directed to the north-west of the Site, before discharging off-Site at Queen Street. A second drainage line is connected to the sewerage inspection pit, located near the southwestern boundary line and traverses through two drainage pits (one within a former foam training area) located on the southern portion of the Site, and through the drainage pit adjacent to Queen Street. It is noted that there is the potential for preferential pathways associated with sewerage inspection pit backfill materials to be present.

∑(PFHxS+PFOS) concentrations in the sediment samples from drains located close to the former foam training area were between 0.0009 and 0.005 mg/kg, indicating concentrations relatively close to the limit of reporting. Although there are no guideline values for sediment, the results are noted to not exceed human health and ecological guideline values for soils. The concentrations indicate sediment in the drains is unlikely to represent a source of PFAS to surface water.

A summary of the composition of PFAS in surface water and sediment from the Ayr Fire Station is provided in **Table 25**. The composition of PFAS in sediment is generally dominated by the longer chained perfluorinated carbons (>C6), due to their greater potential to sorb to soil particles. PFOS remains the dominant compound (average of 58%) with 8:2 FTS (average of 26%) the next highest. The composition of PFAS in surface water is generally dominated by PFOS and PFHxS (30% and 27%, respectively). PFHxA, PFOA and 6:2 FTS are present at 11%, 9% and 8% respectively with eight other compounds present or below at 4%.

Table 25 PFAS composition in surface water and sediment samples

PFAS	Carbon Chain Length	Surface water (n = 1)	Sediment (n = 3)	Soil 0.1-0.5 (n=6) (for comparison)
PFBS	4	0%	0%	0.1%
PFBA	4	0%	0%	0.5%
PFPeS	5	3.5%	1.4%	0.1%
PFPeA	5	3.6%	0%	2.1%
PFHxS	6	27.4%	1.0%	2.6%
PFHxA	6	10.6%	4.5%	1.8%
6:2 FTS	6	8.4%	0%	0.9%
PFHpS	7	1.4%	0%	0.1%
PFHpA	7	3.8%	0%	2.1%
PFOS	8	29.7%	58.2%	63.1%
PFOA	8	9.2%	3.5%	1.3%
PFNA	8	0.6%	0%	2.7%
8:2 FTS	8	1.2%	26.0%	0.8%
FOSA	8	0.3%	1.0%	0.6%
MeFOSAA	8	0%	1.0%	0%
PFDS	10	0%	0%	2.1%
PFDcA	10	0.3%	0%	1.8%
10:2 FTS	10	0%	3.4%	0.7%
PFUnDA	11	0%	0%	11.3%
PFDoDA	12	0%	0%	0.8%
PFTrDA	12	0%	0%	4.5%

8.0 Conceptual Site Model - PFAS

8.1 Introduction

8.1.1 Purpose

The purpose of the CSM is to provide an understanding of the nature and extent of contamination impacts and the migration mechanisms, and the exposure pathways by which identified receptors may be exposed to contamination from the Investigation areas. The CSM also serves as a framework to assess risks to human health and ecological receptors, and assists in identifying uncertainties and data gaps. A preliminary CSM was developed as part of the PSI (AECOM, 2019). The CSM has been updated based on the findings of this PFAS DSI.

8.1.2 Definition of source-pathway-receptor linkages

In accordance with national guidance on assessment of contamination (NEPM, 2013), potential risks to receptors are evaluated based on three components:

- **Source**: A potentially hazardous substance that has been released into the environment
- **Receptors**: A person, ecosystem or ecological member potentially at risk of experiencing an adverse response following exposure to the source or derivatives of the source
- **Pathway**: A mechanism by which receptors can become exposed to the source or derivatives of the source.

If all three components are present at an exposure scenario, the source-pathway-receptor linkage is considered complete and a receptor is exposed to a hazard. The risk to the receptor will be based on the consequence of the exposure. However, if one of these three is missing there is no direct risk to receptors.

8.1.3 Definition of exposure pathways

In order for a human receptor to be exposed to a chemical contaminant derived from the Site, a complete exposure pathway must exist. An exposure pathway describes the course a chemical or physical agent takes from the source to the exposed individual and generally includes the following elements (USEPA, 1989):

- A source and mechanism of chemical release
- A retention or transport medium (or media where chemicals are transferred between media)
- A point of potential human contact with the contaminated media
- An exposure route (e.g. ingestion, inhalation) at the point of exposure.

8.2 Contaminants of Potential Concern

The main contaminants of concern are those with guideline values in the NEMP (HEPA, 2018), PFHxS, PFOS and PFOA.

8.3 Sources

The main source areas of PFAS contamination at the Site are summarised below.

8.3.1 Primary Sources

The following activities on the Site are considered to have resulted in PFAS impacts to soil, and groundwater:

- Former firefighting training activities using AFFF containing PFAS at the former foam training areas (see **Figure 2**, **Appendix A**)
- Leaks and spills of AFFF containing PFAS from storage areas, during product transfer and vehicle maintenance.

8.3.2 Secondary Sources

The following secondary sources were identified which could potentially lead to PFAS impacts:

- Surface soil where AFFF containing PFAS was historically discharged to surface
- Unsaturated zone soil beneath potential source zones
- Concrete infrastructure that has been in contact with AFFF (including Case 4 Pit)
- Sediment and surface water in stormwater drains and sewerage inspection pit
- Tap water for potable purposes if released to ground.

8.3.3 Off-Site

The following off-Site landuses have the potential to affect groundwater quality beneath the Site:

- A fuel depot (Lowes Petroleum Service) is located 1.6 km to the east of the Site
- A business/industrial park is located 2.2 km west of the Site and includes scrap metals, tank direct and agricultural business services.

8.4 Migration Mechanisms

The mechanisms which may have contributed to the migration of PFAS across and from the Site include:

- Historical discharge of AFFF containing PFAS to ground surface or leakage from storage infrastructure
- Spilling of AFFF containing PFAS to ground surface during filling and decanting operations
- Sorption of PFAS to soil in areas where AFFF was historically used, particularly in the foam training areas which were previously unpaved
- Localised dispersion of firefighting foams with wind during historical application
- Leaching of PFAS in concrete or soil to surface water run-off and off-Site migration within the drainage system
- Leaching of PFAS from soil and infiltration to groundwater in areas where AFFF was historically used
- Leaching of PFAS from concrete pavements or concrete lined drains/pits and infiltration to surface water or groundwater
- Lateral and vertical migration of PFAS in groundwater under the influence of groundwater flow and PFAS dispersion
- Migration within backfill to underground services and infrastructure which may act as preferential pathways for PFAS in the unsaturated zone
- Use of groundwater off-Site for irrigation of parks and gardens
- Use of tap water on-Site for potable purposes (i.e. irrigation, washing, drinking)
- Sorption of PFAS to soil below the groundwater table during migration with groundwater. Sorption to soil slows down the migration of PFAS, but sorbed PFAS may continue to diffuse back into groundwater and act as a secondary source, if conditions are suitable
- Excavation of soil containing PFAS and relocation to other areas on Site
- Transport of sediment and surface water along stormwater drains/pits and discharging into waterways.

8.5 Receptors and Exposure Pathways

The following potential human and ecological receptors have been identified:

- Personnel who work at the fire station (current and future QFES employees). This includes intrusive (i.e. involved in soil excavation) maintenance workers who may conduct infrequent maintenance activities at the Site and come into contact with impacted soil, sediment, stormwater and/or groundwater
- Persons exposed to groundwater extracted from off-Site bores for industrial activities, recreational activities, irrigation for parks and gardens and domestic activities
- Recreational users of surface water off-Site
- The terrestrial ecosystem (flora and fauna) on and off-site
- The aquatic ecosystems of nearby waterways (Nelsons Lagoon Park).

The following potential exposure pathways have been identified for human receptors:

- Dermal contact and/or incidental ingestion of PFAS impacted soil, including dust inhalation
- Persons drinking PFAS impacted tap water or groundwater
- Dermal contact and/or incidental ingestion of PFAS impacted tap water, groundwater, surface water, and sediment (in drains)

The following potential exposure pathways have been identified for ecological receptors:

- Ecological receptors in direct contact with PFAS impacted soil, sediment and surface water.

8.6 Assessment of Exposure Pathways

An assessment of the exposure pathways for the Site is presented in **Table 26**. A figure showing the key features of the CSM is presented as **Figure 7, Appendix A**.

Table 26 Ayr Fire Station PFAS CSM

Primary Source	Secondary Sources[15]	Transport Mechanism	Exposure Pathways	Receptor	Likelihood of complete linkage	Comments
On-Site areas where firefighting foams have been discharged or spilt to the environment. Off-Site areas where firefighting foams have been discharged or spilt to the environment	PFAS in soil	Excavation of soil during construction / maintenance activities	Human health: incidental ingestion of soil, direct contact with soil (dermal contact and dust inhalation)	Intrusive maintenance / landscaping workers	Unlikely	Considered unlikely due to use of occupational health and safety controls and non-exceedance of health guideline values for PFAS in soil for a commercial land use.
			Ecological: ingestion of plants and terrestrial biota by higher order ecological receptors	Terrestrial ecosystem	Possible	Considered possible due to exceedance of indirect ecological guideline value for commercial land use. Open space / landscaped areas exist on the northern and western portions of the Site.
		General QFES activities	Human health: incidental ingestion of soil, direct contact with soil (dermal contact and dust inhalation)	Site workers and visitors	Unlikely	Considered unlikely due to non-exceedance of health guideline values for PFAS in soil for commercial land use.
	PFAS in concrete lined pits and drains	Leaching of PFAS within concrete structures to soil, groundwater and surface water.	Human health - Incidental ingestion or contact with soil, groundwater or surface water. Ecological – uptake and bioaccumulation.	Surface soil, groundwater, and surface water	Possible	Considered possible as PFAS concentrations in groundwater and surface water may be partly sourced from concrete impregnated with PFAS.
	PFAS in groundwater	Groundwater transport in aquifer followed	Human health: direct ingestion or incidental ingestion or direct contact	Off-Site groundwater users	Possible	Considered possible as the PSI identified five registered abstraction bores surrounding the Site, which

[15] The key PFAS compounds are those with national guideline values, as identified in Section 5.0: ∑(PFHxS+PFOS), PFOS and PFOA.

Primary Source	Secondary Sources[15]	Transport Mechanism	Exposure Pathways	Receptor	Likelihood of complete linkage	Comments
		by extraction and use for domestic, recreational, industrial uses and irrigation (parks and gardens)	with groundwater (off-Site)			includes bores used for water supply. The nearest hydraulic down-gradient registered bore used for water supply is located 175 m southeast of the Site and is screened at approximately 8 mbgl. The groundwater beneath the Site is fresh. Additional unregistered bores may also be present in the surrounding area.
			Uptake and bioaccumulation in terrestrial biota	Flora and fauna	Possible	
		Groundwater transport in aquifer followed by extraction for stock watering	Livestock: direct ingestion or incidental ingestion or direct contact of groundwater (off-Site)	Livestock	Unlikely	Considered unlikely as the fire station is located in an urban area and groundwater in the vicinity of the sites is unlikely to be used for stock watering purposes
	PFAS in tap water	Groundwater transport in aquifer followed by extraction and use as town water supply for domestic and irrigation purposes.	Human health: direct ingestion or incidental ingestion or direct contact with on-Site tap water	Site workers and visitors	Possible	Considered possible as PFAS concentrations in tap water exceeded the human health guidelines for drinking water purposes. However, it is noted that the PFAS impact may be from an off-Site source. Subsequent sampling of the tap by DES indicated concentrations were below the guidelines indicating variability in the results. In 2018 the Queensland Government and the Council tested two groundwater bores that previously supplied part of Ayr's town water network[16]. PFAS concentrations in those two bores exceeded the Australian drinking water

[16] https://www.qld.gov.au/environment/pollution/management/disasters/investigation-pfas/sites/ayr

Primary Source	Secondary Sources[15]	Transport Mechanism	Exposure Pathways	Receptor	Likelihood of complete linkage	Comments
						quality guidelines. The locations of the two bores are not known.
			Uptake and bioaccumulation in terrestrial biota	Flora and fauna	Possible	Considered possible as PFAS concentrations in tap water exceeded the adopted ecological guidelines.
	PFAS in surface water	Surface water transport via overland flow into on- and off-Site drains that discharge into channels, ponds, lagoons and potentially Kalamia Creek	Human health: direct or incidental ingestion or direct contact with off-Site surface water (i.e. surface water, drainage overland flow water).	Recreational users	Unlikely	Considered unlikely as PFAS concentrations in one stormwater drain sample on-Site did not exceed the human health recreational water guideline values.
			Ecological: direct exposure as well as ingestion of biota by higher order ecological receptors	Aquatic ecosystem	Possible	Considered possible as runoff from the Site will enter surrounding stormwater channels which potentially discharge into the Kalamia Creek. PFAS concentrations in one stormwater drain sample on-Site exceeded the adopted ecological guidelines.
	Accumulation of PFAS in creek sediment	Dispersion via surface water	Human health: incidental ingestion or direct contact of sediment (off-Site). Direct ingestion of aquatic biota	Recreational users	Possible	Considered possible as runoff from the Site will enter surrounding stormwater channels which eventually drain to Kalamia Creek. Mitigated by the low concentration of PFAS compounds in sediment.
			Ecological: direct exposure, as well as ingestion of biota by higher order ecological receptors	Aquatic ecosystem	Possible	

9.0 Conclusions

The key findings of the DSI are presented below.

- Groundwater elevations in August 2019 indicated a shallow sandy aquifer is present beneath the Site. Depth to groundwater was approximately 4.5 mbgl. Groundwater was inferred to locally flow towards the southeast.
- The main PFAS compounds present in the soil samples analysed were PFHxS and PFOS. The soil samples collected were from bores in potential source areas (the two areas formerly used for foam training exercises) and at locations up-gradient and down-gradient to these potential source areas. The highest ∑(PFHxS+PFOS) concentrations detected were in the shallow soil (1 mbgl) at the soil bore located within the former foam training area on the southern portion of the Site (AY_BH04). The soil samples analysed indicated that soil PFAS (PFHxS and PFOS) concentrations decreased with increased depth, with higher PFAS concentrations in the near-surface material.
- None of the soil samples analysed exceeded the NEMP (HEPA, 2018) health guideline values for commercial land use. Two soil samples (AY_BH03 and AY_BH04) contained PFOS concentrations that exceeded the guideline level for ecological indirect exposure for commercial land use. The exceedances were reported from two soil bores located beneath concrete. Landscaped/grassy areas, potentially accessible to ecological receptors are located on the northwestern portion of the Site adjacent to Queen Street. Analytical results for eleven soil samples detected PFOS concentrations that exceeded the guideline level for ecological indirect exposure for residential land use. Three of the bores containing exceedances were located in landscaped/grassy areas. The fire station is immediately surrounded by industry / commercial premises except for Queen Street where residential properties are located across the road. Due to the urbanised setting of the Site, it is considered that the ecological receptors would be transient in nature, and comparison against the residential land use guideline is considered to be an appropriately conservative approach.
- Elevated PFAS concentrations in groundwater, i.e. exceeding NEMP (HEPA, 2018)) drinking water and recreational water quality guideline values for ∑(PFHxS+PFOS) and for PFOA, were detected in groundwater samples from all four newly installed monitoring wells. The two groundwater samples (collected from approximately 4.5 mbgl) with the highest ∑(PFHxS+PFOS) concentrations (54 µg/L[17] and 43 µg/L, respectively) were located adjacent to or within the former areas used for foam training exercises (AY_MW01 and AY_MW04). Groundwater monitoring well AY_MW01 was also located adjacent east of the Case 4 Pit. The predominant PFAS compound detected was PFOS. The groundwater sample (AY_MW02) collected from the monitoring well located up-gradient of the former foam training areas reported PFAS concentrations which were an order of magnitude lower (2.1 µg/L ∑(PFHxS+PFOS)), which indicates the primary source of PFAS in groundwater is likely to be located in the southern portion of the Site, in the vicinity of the former foam training exercise areas and the Case 4 Pit.
- The laboratory analytical technique for TOPA is used to detect certain harder to analyse PFAS precursor compounds that may be present. TOPA analysis was undertaken on one soil and one groundwater sample. The soil results did not identify the potential for PFAS precursors, while the groundwater results indicated a low potential for precursors. The results indicated a degraded PFAS product. Overall, it is considered unlikely that PFAS concentrations will significantly increase or alter through biotransformation or oxidation processes.
- Based on the inferred groundwater contour data, PFAS may migrate in groundwater in a south-easterly direction. The lateral extent of the area of groundwater impacted with PFAS is uncertain and potentially extends off-Site to the southeast within the shallow sandy aquifer at concentrations in excess of NEMP (HEPA, 2018) human health and ecological guideline values. A commercial property is present adjacent to the southeastern Site boundary and the closest water supply bore

[17] Quality assurance samples were analysed for monitoring well AY_MW01 with ∑(PFHxS+PFOS) in the primary sample reporting 54 µg/L, the intra-laboratory (duplicate) sample reporting 64 µg/L and the inter-laboratory (triplicate) sample reporting 49 µg/L. The results indicate variability in the samples.

is located approximately 175 m to the southeast. The closest surface water receptor (Nelsons Lagoon Park) is located approximately 700 m southeast of the Site.

- The on-Site tap water sample collected from the outdoor tap located on the wall of the workshop in the central portion of the Site contained a ∑(PFHxS+PFOS) concentration (0.11 µg/L) which exceeded the NEMP (HEPA, 2018) human health drinking water guideline value. PFHxS and PFOS were the main PFAS compounds present. Analytical results for a water sample from the on-site hydrant reported 0.067 ug/L ∑(PFHxS+PFOS), which was approaching the drinking water guideline of 0.07 µg/L. The PFAS composition of the hydrant water was similar to the tap water.
- The tap water is reticulated and supplied by Burdekin Shire Council from the Ayr water supply network (sourced mainly from either Nelsons Lagoon or South Ayr Borefield). Council were notified of the PFAS detection by the Queensland Government. The Queensland Government reported on 20 September 2019[18] that follow-up testing was completed with results indicating all drinking water taps at Ayr Fire Station did not exceed national drinking water guidelines. The Queensland Government website reported that two bores (locations not known) in the Nelsons Lagoon Borefield were disconnected in 2018 following PFAS detections. Further results in May 2019 indicated PFAS concentrations exceeded NEMP (HEPA, 2018) drinking water guidelines in one of the bores, implying that one of the bores was reconnected. The website reports that further water sampling of the water supply bores is being conducted by the Queensland Government.
- One surface water sample was collected from the concrete-lined drainage pit in a central location adjacent to the storage room awning. The results indicated the main PFAS compounds present in the surface water sample were PFHxS and PFOS, however the results were below the adopted human health guidelines for recreational water. PFOS was reported at a concentration (0.074 µg/L) which exceeded the adopted ecological guideline (0.051 µg/L). The stormwater drainage line traverses the centre of the Site from the Case 4 Pit with flow directed to the northwest of the Site before discharging off-Site. The sediment samples from the drainage lines had PFAS concentrations relatively close to the limit of reporting indicating sediment in the drains is unlikely to act as a source of PFAS.
- Based on information provided as part of the PSI, the source of the PFAS detected in soil, groundwater, sediment and surface water samples is considered likely to be related to the historical firefighting training practices at the fire station and/or spills from storage containers, product transfer and other maintenance activities. The PFAS detected in tap water is understood to be sourced from water supply bores in the Nelsons Lagoon Borefield or South Ayr Borefield. As the location of the off-Site water supply bore impacted with PFAS is not known, the potential source cannot be ascertained.

Based on these key findings, the PFAS CSM developed for the PSI has been updated. A number of possibly complete exposure pathways for PFAS sourced from the fire station to impact off-Site human and ecological receptors have been identified. The significance of these potentially complete source-pathway-receptor linkages is uncertain and further investigation is required to understand the potential risks to off-Site receptors.

[18] https://www.qld.gov.au/environment/pollution/management/disasters/investigation-pfas/sites/ayr

10.0 References

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11.0 Limitations

AECOM Australia Pty Ltd has prepared this report in accordance with the usual care and thoroughness of the consulting profession for the use of Queensland Fire and Emergency Services and only those third parties who have been authorised in writing by AECOM to rely on the report.

The report is based on generally accepted practices and standards at the time it was prepared. No other warranty, expressed or implied, is made as to the professional advice included in this report.

The report is prepared in accordance with the scope of work and for the purpose outlined in the Proposal dated 23 May 2019.

This report should be read in full. No responsibility is accepted for use of any part of this report in any other context or for any other purpose or by third parties.

The methodology adopted and sources of information used by AECOM are outlined in the report.

Where this report indicates that information has been provided to AECOM by third parties, AECOM has made no independent verification of this information unless required as part of the agreed scope of work. AECOM assumes no liability for any inaccuracies in or omissions to that information.

This report was prepared between 2 September and 31 October 2019. The information in this report is considered to be accurate at the date of issue and is in accordance with conditions at the Site and surrounding areas at the dates sampled. Opinions and recommendations presented herein apply to the Site and surrounding areas existing at the time of our investigation and cannot necessarily apply to changes to Site and surrounding areas of which AECOM is not aware and has not had the opportunity to evaluate. This document and the information contained herein should only be regarded as validly representing the Site and surrounding area conditions at the time of the investigation unless otherwise explicitly stated in a preceding section of this report. AECOM disclaims responsibility for any changes that may have occurred after this time.

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It is the responsibility of third parties to independently make inquiries or seek advice in relation to their particular requirements and proposed use of the relevant property.

List of Appendices

Appendix A

Figures

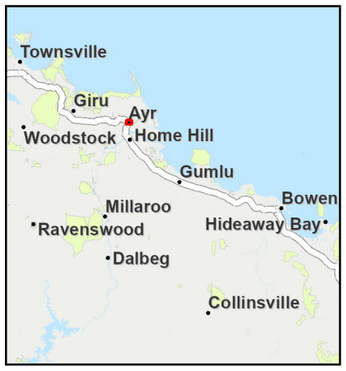
Appendix A Figures

AECOM

0 200 400
Meters

Legend

- Registered Groundwater Bores
- Streams
- Lakes
- 500m Site Radius
- 1km Site Radius
- Site Boundary
- Cadastre



Queensland Fire and Emergency Services (QFES)

FIGURE 1
Site Location

PFAS Detailed Site Investigation at Ayr Fire Station

Source: State of Queensland, 2019. World Imagery: ESRI, DigitalGlobe, GeoEye, Earthstar Geographics, CHES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

AECOM

0 5 10 15
Meters

Legend

- Montioring Well Sample Location
- Sediment Sample Location
- Sediment/ Surface Water Sample Location
- Surface Soil Sample Location
- Tap Sample Location
- Drainage Pit
- Hydrant
- Drainage Line
- Comms Line
- Hydrant Water Mains
- Sewer
- Previously grassed areas potentially used for foam training excercises
- Site Boundary
- Cadastre

Queensland Fire and Emergency Services (QFES)

FIGURE 2
Site Layout and Sampling Locations

PFAS Detailed Site Investigation at Ayr Fire Station

Source: State of Queensland, 2019. AECOM 2019
Imagery: State of Queensland. ESRI Basemaps Online 2019

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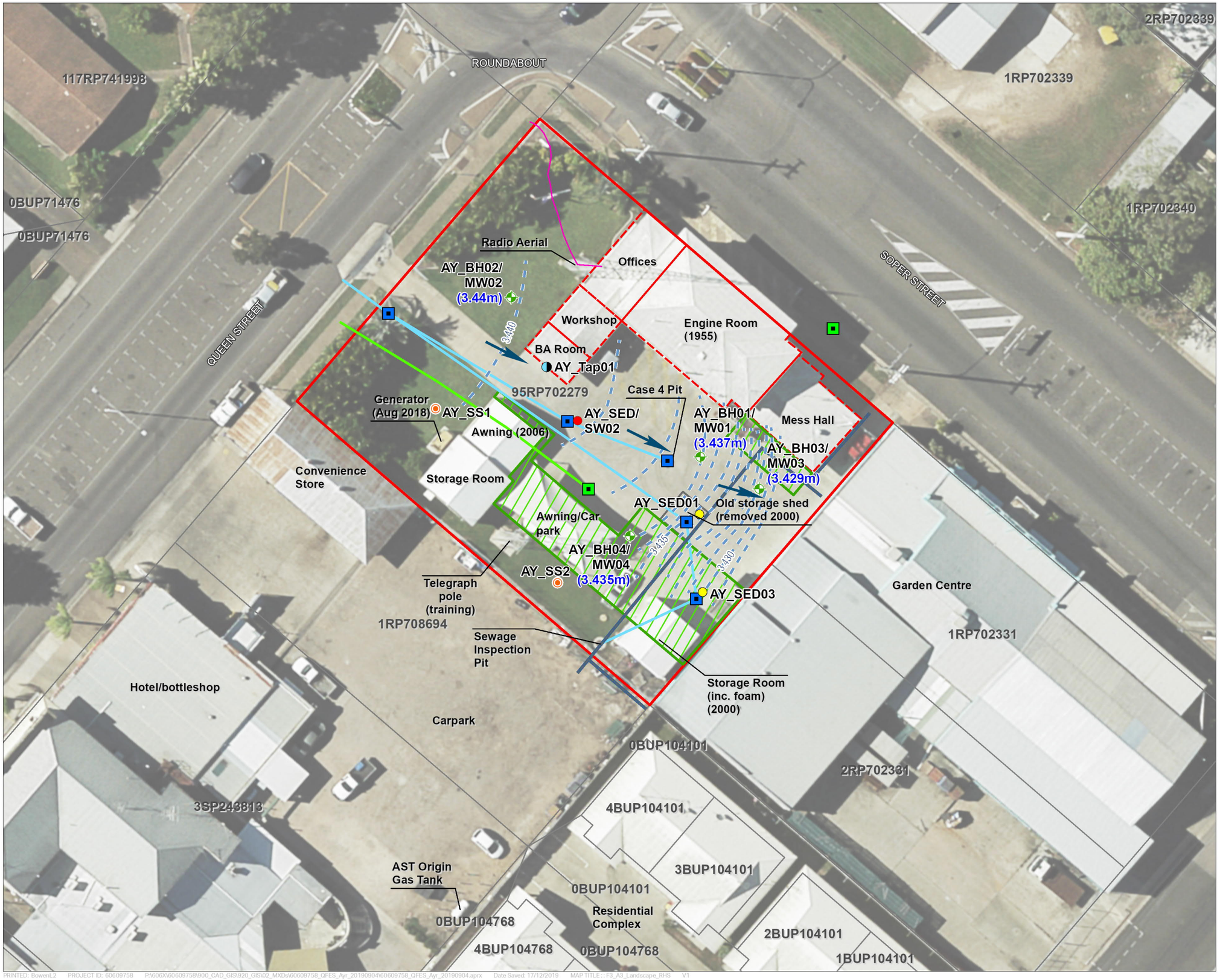

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Meters

Legend

- Montioring Well Sample Location
- Sediment Sample Location
- Sediment/ Surface Water Sample Location
- Surface Soil Sample Location
- Tap Sample Location
- Drainage Pit
- Hydrant
- Inferred groundwater contours (mAHD)*
- Drainage Line
- Comms Line
- Hydrant Water Mains
- Sewer
- Previously grassed areas potentially used for foam training excercises
- Site Boundary
- Cadastre
- Inferred Groundwater flow direction

* Groundwater elevations shown on map are in mAHD

Queensland Fire and Emergency Services (QFES)

FIGURE 3
Inferred Groundwater Contours: 6 August 2019

PFAS Detailed Site Investigation at Ayr Fire Station

Source: State of Queensland, 2019. AECOM 2019
Imagery: State of Queensland. ESRI Basemaps Online 2019

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Analyte	Unit	AY_BH02_190723		
		0.1 m	0.5 m	6.0 m
PFOS	mg/kg	0.0644	0.0719	0.0247
PFHxS	mg/kg	0.005	0.0029	0.0009
PFOA	mg/kg	0.0025	0.0012	0.0003

Analyte	Unit	AY_SS1_190723	
		0.1 m	0.5 m
PFOS	mg/kg	0.0398	0.0414
PFHxS	mg/kg	0.0023	0.0008
PFOA	mg/kg	0.0017	0.0005

Analyte	Unit	AY_SS2_190723	
		0.1 m	0.5 m
PFOS	mg/kg	0.0108	0.102
PFHxS	mg/kg	0.0009	0.0004
PFOA	mg/kg	0.0003	<0.0002

Analyte	Unit	AY_BH01_190723		
		0.15 m	1.0 m	6.0 m
PFOS	mg/kg	0.0066	0.0034	0.0072
PFHxS	mg/kg	<0.0002	0.0146	0.0033
PFOA	mg/kg	<0.0002	0.0033	0.0005

Analyte	Unit	AY_BH03_190723		
		0.15 m	0.5 m	6.0 m
PFOS	mg/kg	0.0099	0.182	0.0207
PFHxS	mg/kg	<0.0002	0.0057	0.0029
PFOA	mg/kg	<0.0002	0.0011	0.0004

Analyte	Unit	AY_BH04_190724		
		0.15 m	1.0 m	6.0 m
PFOS	mg/kg	0.0013	0.418	0.0413
PFHxS	mg/kg	<0.0002	0.0004	0.0013
PFOA	mg/kg	<0.0002	<0.0002	<0.0002

ROUNDABOUT
QUEEN STREET
SOPER STR
Radio Aerial
Offices
AY_BH02/ MW02
Workshop
Engine Room (1955)
BA Room
AY_Tap01
95RP702279
Case 4 Pit
Generator (Aug 2018)
AY_SS1
AY_SED/ SW02
Awning (2006)
AY_BH01/ MW01
Mess Hall
AY_BH03/ MW03
Convenience Store
Storage Room
AY_SED01
Old storage shed (removed 2000)
Awning/Car park
AY_BH04/ MW04
AY_SS2
AY_SED03
Telegraph pole (training)
Garden Centre
1RP708694
Sewage Inspection Pit
Storage Room (inc. foam) (2000)
Hotel/bottleshop
Carpark
0BUP104101
2RP702331
3SP243813
4BUP104101
3BUP104101
0BUP104101
AST Origin Gas Tank
Residential Complex
0BUP104768
4BUP104768
1RP702331
1RP702340
1RP702339
2RP702339
0BUP71476

Exceedance of NEMP (HEPA, 2018) guidance value for human health for commercial / industrial landuse.
Exceedance of NEMP (HEPA, 2018) guideline value for ecological indirect exposure for residential landuse.

AECOM

N

0 5 10 15
Meters

Legend

- Montioring Well Sample Location
- Sediment Sample Location
- Sediment/ Surface Water Sample Location
- Surface Soil Sample Location
- Tap Sample Location
- Drainage Pit
- Hydrant
- Drainage Line
- Comms Line
- Hydrant Water Mains
- Sewer
- Previously grassed areas potentially used for foam training excercises
- Site Boundary
- Cadastre

Queensland Fire and Emergency Services (QFES)

FIGURE 4
Soil PFAS Analytical Results

PFAS Detailed Site Investigation at Ayr Fire Station

Source: State of Queensland, 2019. AECOM 2019
Imagery: State of Queensland. ESRI Basemaps Online 2019

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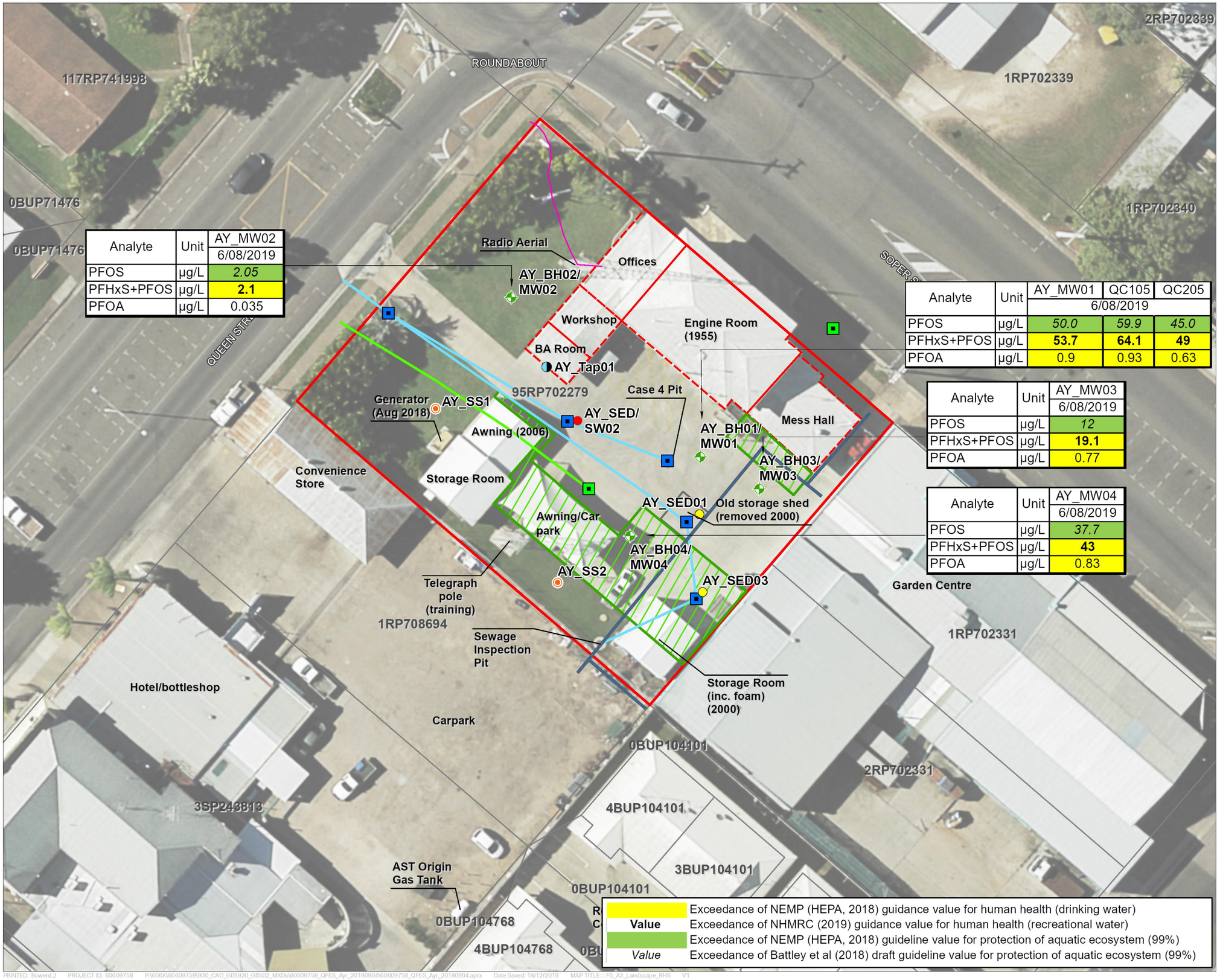

Analyte	Unit	AY_MW02
		6/08/2019
PFOS	µg/L	*2.05*
PFHxS+PFOS	µg/L	**2.1**
PFOA	µg/L	0.035

Analyte	Unit	AY_MW01	QC105	QC205
		6/08/2019		
PFOS	µg/L	*50.0*	*59.9*	*45.0*
PFHxS+PFOS	µg/L	**53.7**	**64.1**	**49**
PFOA	µg/L	0.9	0.93	0.63

Analyte	Unit	AY_MW03
		6/08/2019
PFOS	µg/L	*12*
PFHxS+PFOS	µg/L	**19.1**
PFOA	µg/L	0.77

Analyte	Unit	AY_MW04
		6/08/2019
PFOS	µg/L	*37.7*
PFHxS+PFOS	µg/L	**43**
PFOA	µg/L	0.83

AECOM

0 5 10 15
Meters

Legend

- Montioring Well Sample Location
- Sediment Sample Location
- Sediment/ Surface Water Sample Location
- Surface Soil Sample Location
- Tap Sample Location
- Drainage Pit
- Hydrant
- Drainage Line
- Comms Line
- Hydrant Water Mains
- Sewer
- Previously grassed areas potentially used for foam training excercises
- Site Boundary
- Cadastre

Queensland Fire and Emergency Services (QFES)

FIGURE 5
Groundwater PFAS Analytical Results

PFAS Detailed Site Investigation at Ayr Fire Station

Source: State of Queensland, 2019. AECOM 2019
Imagery: State of Queensland. ESRI Basemaps Online 2019

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Analyte	Unit	AY_Tap01
		6/08/2019
PFOS	µg/L	*0.0652*
PFHxS+PFOS	µg/L	0.105
PFOA	µg/L	0.0025

Analyte	Unit	AY_SED02
		6/08/2019
PFOS	mg/kg	0.0005
PFHxS	mg/kg	<0.0002
PFOA	mg/kg	0.0002

Analyte	Unit	AY_SW02
		6/08/2019
PFOS	µg/L	*0.0737*
PFHxS+PFOS	µg/L	0.142
PFOA	µg/L	0.023

Analyte	Unit	AY_SED01
		6/08/2019
PFOS	mg/kg	0.0009
PFHxS	mg/kg	<0.0002
PFOA	mg/kg	<0.0002

Analyte	Unit	AY_SED03
		6/08/2019
PFOS	mg/kg	0.0047
PFHxS	mg/kg	0.0003
PFOA	mg/kg	<0.0002

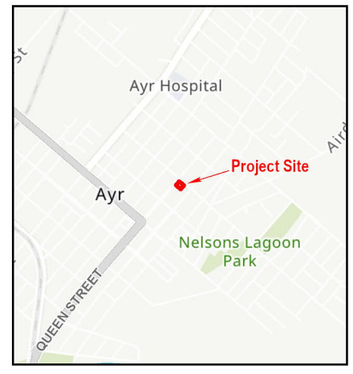
	Exceedance of NEMP (HEPA, 2018) guidance value for human health (drinking water)
Value	Exceedance of NHMRC (2019) guidance value for human health (recreational water)
	Exceedance of NEMP (HEPA, 2018) guideline value for protection of aquatic ecosystem (99%)
Value	Exceedance of Batley et al (2018) draft guideline value for protection of aquatic ecosystem (99%)
Note: No criteria for SED samples	

AECOM

0 5 10 15
Meters

Legend

- Montioring Well Sample Location
- Sediment Sample Location
- Sediment/ Surface Water Sample Location
- Surface Soil Sample Location
- Tap Sample Location
- Drainage Pit
- Hydrant
- Drainage Line
- Comms Line
- Hydrant Water Mains
- Sewer
- Previously grassed areas potentially used for foam training excercises
- Site Boundary
- Cadastre



Queensland Fire and Emergency Services (QFES)

FIGURE 6
Surface Water & Sediment PFAS Analytical Results

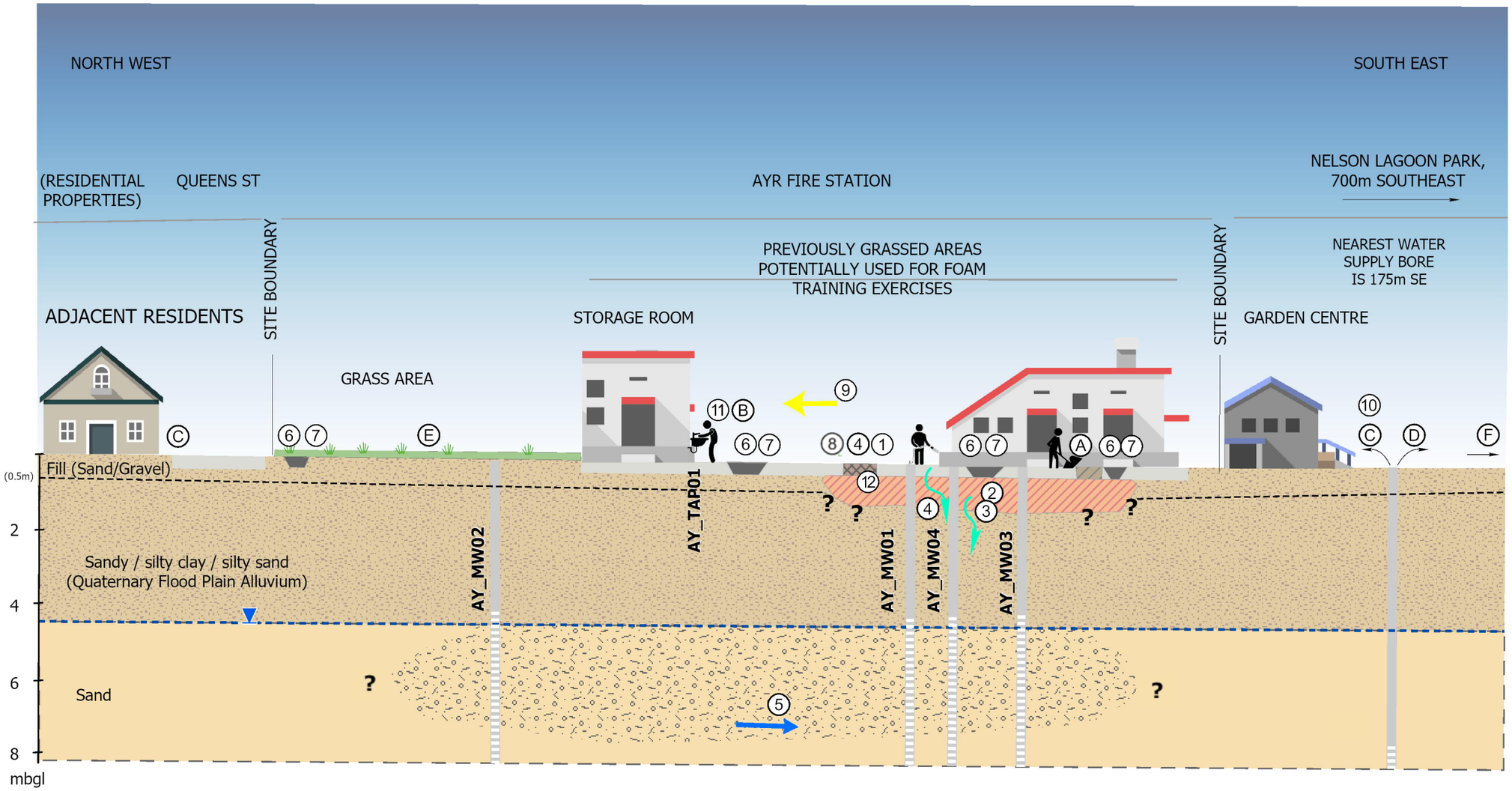
PFAS Detailed Site Investigation at Ayr Fire Station

Source: State of Queensland, 2019. AECOM 2019
Imagery: State of Queensland. ESRI Basemaps Online 2019

PRINTED: BowenL2 PROJECT ID: 60609758 P:\606X\60609758\900_CAD_GIS\920_GIS\02_MXDs\60609758_QFES_Ayr_20190904\60609758_QFES_Ayr_20190904.aprx Date Saved: 18/12/2019 MAP TITLE :: F6_A3_Landscape_RHS V1

AECOM

NOT TO SCALE



Legend

- PFAS in Soil
- Concrete
- Grassy Area
- Case 4 Pit
- Drainage Pit
- Sewerage Inspection Pit
- Groundwater table
- Inferred groundwater flow direction
- Wind dispersion of foam
- Infiltration & Leaching
- Inferred groundwater depth

Queensland Fire and Emergency Services (QFES)

FIGURE 7
PFAS Conceptual Site Model

PFAS Detailed Site Investigation at Ayr Fire Station

Source: AECOM 2019

TRANSPORT PATHWAYS

1. Historic discharge of AFFF to ground / leaks or spills of AFFF
2. Sorption of PFAS to soil
3. Infiltrating water leaching PFAS from soil to groundwater
4. Leaching of PFAS from concrete to groundwater or surface water
5. Groundwater transport followed by abstraction
6. Surface water runoff to surface water and off-site migration in the drainage system
7. Sediment transport along stormwater drains
8. Excavation of soil and relocation on site
9. Localised dispersion of foam with wind during historical application
10. Use of groundwater off-site for irrigation of parks and gardens
11. Use of tap water on-site for domestic or irrigation purposes
12. Migration in backfill around underground services and structures

RECEPTORS

- A. Intrusive construction workers
- B. QFES personnel
- C. Off-site groundwater users
- D. Off-site surface water recreational users
- E. Terrestrial ecosystems
- F. Aquatic ecosystems

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Appendix B

Tables

Appendix B Tables

Location ID	Date of Installation	Easting	Northing	Top of Casing Elevation (mAHD)	Cover	TOC Elevation (m AHD)	Drilled Depth (m)	Top of screen (mbgs)	Water Strike (mbgs)	Lithology of screened section
AY_BH01/MW01	24/07/2019	542970.2	7835855.0	7.999	Gatic	8.067	8.3	5.3	4.5	SAND
AY_BH02/MW02	23/07/2019	542949.7	7835872.3	7.924	Gatic	8.023	8.3	5.3	4.5	SAND
AY_BH03/MW03	23/07/2019	542976.5	7835851.6	8.000	Gatic	8.075	8.3	5.3	4.5	Gravelly SAND
AY_BH04/MW04	24/07/2019	542962.6	7835846.5	8.054	Gatic	8.127	8.3	5.3	4.5	SAND

m' is metres
mAHD' is metres above Australian height datum
mbgs' is metres below ground surface

Well ID	Easting	Northing	Top of Casing Elevation (mAHD)	Gauging Date	Total Depth (mbtoc)	Depth to Water (mbtoc)	Corrected Groundwater Elevation (mAHD)
AY_MW01	542970.2	7835855.0	7.999	6/08/2019	8.3	4.562	3.437
AY_MW02	542949.7	7835872.3	7.924	6/08/2019	8.3	4.484	3.440
AY_MW03	542976.5	7835851.6	8.000	6/08/2019	8.3	4.571	3.429
AY_MW04	542962.6	7835846.5	8.054	6/08/2019	8.3	4.619	3.435

m' is metres
mAHD' is metres above Australian height datum
mbtoc' is metres below top of casing

Well ID	Date	pH	Temperature (°C)	Electrical Conductivity (µS/cm)	Total Dissolved Solids (mg/L)	Dissolved Oxygen (mg/L)	Oxidation Reduction Potential (mV)
AY_MW01	6/08/2019	6.49	27.1	498.5	324.0	4.96	144.6
AY_MW02	6/08/2019	6.09	27.3	1333	866.5	0.41	240.7
AY_MW03	6/08/2019	5.77	26.6	109.5	71.2	0.13	305.9
AY_MW04	6/08/2019	5.66	27.7	107.5	69.9	0.23	366.1

°C is degrees Celsius
µS/cm is microsiemens per centimetre
mg/L is milligrams per litre
mV is millvolt

		Sum (PFHxS + PFOS)	PFOS	PFHxS	PFHxA	PFOA	PFBS	PFPeS	PFHpS	PFDS	PFBA	PFPeA	PFHpA	PFNA	PFDcA	PFUnA	PFDoA	PFTrDA	PFTeDA	4:2 FTS	6:2 FTS	8:2 FTS	10:2 FTS	MeFOSAA	EtFOSAA	FOSA	N-Et-FOSA	N-Me-FOSA	N-Et-FOSE	N-MeFOSE	Sum of PFAS	Sum of TOP C4 - C14 Carboxylates and C4 - C8 Sulfonates
	Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	ug/L	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	mg/kg
	LOR	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0020	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0005	0.0005	0.0005	0.0005	0.0005	0.0002	0.0002	0.0002	0.0005	0.0005	0.0005	0.0005	0.0002	0.0002
NEMP (HEPA 2018) Human Health Industrial/Commercial		20				50																										
NEMP (HEPA 2018) Interim Soil Ecological Residential			0.01																													
NEMP (HEPA 2018) Interim Soil Ecological Commercial			**0.14**																													
Sample ID	**Date**	**Lab Report**	**Type**																													
PFAS by Standard Analysis																																
AY_SS1_0.1_190723	23/07/2019	EB1919839	Normal	0.0421	0.0398	0.0023	0.0029	0.0017	<0.0002	<0.0002	<0.0002	0.0022	0.001	0.004	0.0033	0.0015	0.0026	0.0029	0.0008	<0.0002	<0.0005	<0.0005	0.0029	0.0019	0.0012	<0.0002	<0.0002	0.0008	<0.0005	<0.0005	<0.0005	<0.0005	0.0718	-
AY_SS1_0.5_190723	23/07/2019	EB1919839	Normal	0.0422	0.0414	0.0008	0.0003	0.0005	<0.0002	<0.0002	<0.0002	0.0022	<0.001	0.0003	0.0004	0.0008	0.0013	0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	0.004	<0.0005	<0.0002	<0.0002	0.0041	<0.0005	<0.0005	<0.0005	<0.0005	0.0566	-
AY_SS2_0.1_190723	23/07/2019	EB1919839	Normal	0.0117	0.0108	0.0009	0.0003	0.0003	<0.0002	<0.0002	<0.0002	0.0008	<0.001	<0.0002	0.0002	0.0004	<0.0002	0.0126	0.0004	0.0079	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	0.0002	<0.0005	<0.0005	<0.0005	<0.0005	0.0348	-
AY_SS2_0.5_190723	23/07/2019	EB1919839	Normal	0.102	0.102	0.0004	0.0003	<0.0002	<0.0002	<0.0002	<0.0002	0.0004	<0.001	<0.0002	<0.0002	0.0003	0.0005	0.0042	<0.0002	0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	0.1083	-
AY_BH01_0.15_190723	23/07/2019	EB1919839	Normal	0.0066	0.0066	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	0.0066	-
AY_BH01_1.0_190723	23/07/2019	EB1919839	Normal	0.018	0.0034	0.0146	0.0004	0.0033	<0.0002	<0.0002	0.0012	<0.0002	<0.001	<0.0002	0.0003	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	0.0232	-
AY_BH01_6.0_190724	24/07/2019	EB1919839	Normal	0.0105	0.0072	0.0033	0.0004	0.0005	<0.0002	<0.0002	0.0003	<0.0002	<0.001	0.0003	0.0005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	0.0011	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	0.0136	-
AY_BH02_0.1_190723	19/07/2019	EB1919839	Normal	0.0694	0.0644	0.005	0.0031	0.0025	0.0003	0.0003	0.0004	0.0039	0.001	0.0036	0.004	0.0029	0.0038	0.0046	0.0012	0.0003	<0.0005	<0.0005	0.0006	0.0012	0.0012	<0.0002	<0.0002	0.0011	<0.0005	<0.0005	<0.0005	<0.0005	0.1054	-
AY_BH02_0.5_190723	23/07/2019	EB1919839	Normal	0.0748	0.0719	0.0029	0.001	0.0012	<0.0002	<0.0002	0.0003	0.0028	<0.001	0.001	0.0011	0.0016	0.0025	0.0011	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	0.0006	<0.0005	<0.0002	<0.0002	0.004	<0.0005	<0.0005	<0.0005	<0.0005	0.092	-
AY_QC100_190723	23/07/2019	EB1919839	Duplicate	0.0511	0.049	0.0021	0.0007	0.001	<0.0002	<0.0002	0.0003	0.0023	<0.001	0.0008	0.0009	0.0012	0.002	0.0009	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	0.0006	<0.0005	<0.0002	<0.0002	0.0035	<0.0005	<0.0005	<0.0005	<0.0005	0.0653	-
AY_QC200_190723	23/07/2019	RN1242615	Triplicate	0.0646	0.062	0.0026	0.001	0.0013	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	0.0011	0.0016	0.0026	<0.002	<0.002	<0.002	<0.002	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002	0.0031	<0.002	<0.002	<0.005	<0.005	0.0753	-
AY_BH02_6.0_190723	23/07/2019	EB1919839	Normal	0.0256	0.0247	0.0009	<0.0002	0.0003	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	0.0259	-
AY_BH03_0.15_190723	23/07/2019	EB1919839	Normal	0.0099	0.0099	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	0.0011	<0.0002	0.0027	<0.0002	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	0.0142	-
AY_BH03_0.5_190723	23/07/2019	EB1919839	Normal	0.188	**0.182**	0.0057	<0.0002	0.0011	<0.0002	<0.0002	0.0018	<0.0002	<0.001	<0.0002	<0.0002	0.0233	<0.0002	0.0014	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	0.0003	<0.0005	<0.0005	<0.0005	<0.0005	0.2156	-
AY-QC101_190723	23/07/2019	EB1919839	Duplicate	0.249	**0.241**	0.0082	<0.0002	0.0014	<0.0002	<0.0002	0.0025	<0.0002	<0.001	<0.0002	<0.0002	0.0284	<0.0002	0.0017	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	0.2832	-
AY_QC201_190723	23/07/2019	RN1242615	Triplicate	0.2164	**0.21**	0.0064	<0.001	0.0012	<0.001	<0.001	0.0017	<0.001	<0.001	<0.002	<0.001	0.03	<0.001	<0.002	<0.002	<0.002	<0.002	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002	<0.001	<0.002	<0.002	<0.005	<0.005	0.2493	-
AY_BH03_6.0_190723	23/07/2019	EB1919839	Normal	0.0236	0.0207	0.0029	0.0009	0.0004	0.0003	0.0004	0.0003	<0.0002	<0.001	0.0003	0.0002	0.0011	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	0.0275	-
AY_BH04_0.15_190724	24/07/2019	EB1919839	Normal	0.0013	0.0013	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0003	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	0.0018	-
AY_BH04_1.0_190724	24/07/2019	EB1919839	Normal	0.418	**0.418**	0.0004	<0.0002	<0.0002	<0.0002	<0.0002	0.0002	<0.0002	<0.001	<0.0002	<0.0002	0.0035	<0.0002	0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	0.0004	<0.0005	<0.0005	<0.0005	<0.0005	0.4227	-
AY_BH04_6.0_190724	24/07/2019	EB1919839	Normal	0.0426	0.0413	0.0013	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	0.0006	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	0.0432	-
PFAS by TOPA																																
AY_BH04_1.0_190723	23/07/2019	EB1922766	Normal	0.338	**0.338**	0.0004	0.0077	0.0005	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	0.001	0.0011	0.0037	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	0.352	0.352

TOPA is Total Oxidisable Precursor Assay
mg/kg' is milligrams per kilogram
'<' is less than limit of reporting
'-' not analysed

		Sum (PFHxS + PFOS)	PFOS	PFHxS	PFHxA	PFOA	PFBS	PFPeS	PFHpS	PFDS	PFBA	PFPeA	PFHpA	PFNA	PFDcA	PFUnA	PFDoA	PFTrDA	PFTeDA	4:2 FTS	6:2 FTS	8:2 FTS	10:2 FTS	MeFOSAA	EtFOSAA	FOSA	N-Et-FOSA	N-Me-FOSA	N-Et-FOSE	N-MeFOSE	Sum of PFAS	Sum of TOP C4 - C14 Carboxylates and C4 - C8 Sulfonates
	Units	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
	LOR	0.0003	0.0003	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.01	0.0005	5E-04	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.001	0.001	0.001	0.001	0.0005	0.0005	0.0005	0.001	0.001	0.001	0.001	0.0003	0.01
NEMP (HEPA 2018) Human Health Drinking Water		0.07				0.56																										
NHMRC (2019) Human Health Recreational Water		**2.00**				**10.0**																										
NEMP (HEPA 2018) Ecological Freshwater 99% Species Protection			0.00023			19.0																										
Batley et al (2018) 99% Species Protection			**0.051**																													
Sample ID	**Date**	**Type**	**Lab Report**																													
PFAS by Standard Analysis																																
AY_MW01_190806	6/08/2019	Normal	EB1921176	**53.7**	**50**	3.74	0.36	0.9	<0.1	0.11	0.27	<0.1	<0.50	0.25	0.58	0.15	<0.1	<0.1	<0.1	<0.1	<0.25	<0.1	1.37	<0.1	<0.1	<0.1	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	57.73	-
AY_QC105_190806	6/08/2019	Duplicate	EB1921176	**64.1**	**59.9**	4.22	0.38	0.93	<0.1	<0.1	0.25	<0.1	<0.50	0.26	0.61	0.11	<0.1	<0.1	<0.1	<0.1	<0.25	<0.1	1.35	<0.1	<0.1	<0.1	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	68.01	-
AY_QC205_190806	6/08/2019	Triplicate	RN1244319	**49.0**	**45.0**	4.0	0.36	0.63	0.036	0.084	0.32	<0.001	0.11	0.3	0.44	0.1	0.01	0.0083	<0.001	<0.002	<0.002	<0.001	0.81	0.0069	<0.001	<0.002	<0.002	0.0087	<0.002	<0.002	<0.005	<0.005	52.22	-
AY_MW02_190806	6/08/2019	Normal	EB1921176	**2.1**	**2.05**	0.054	<0.01	0.035	0.01	<0.01	<0.01	<0.01	<0.05	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.025	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.025	<0.025	<0.025	<0.025	2.149	-
AY_MW03_190806	6/08/2019	Normal	EB1921176	**19.1**	**12**	7.13	2.42	0.77	0.84	1.32	0.24	<0.1	<0.50	1.05	0.84	<0.1	<0.1	<0.1	<0.1	<0.1	<0.25	<0.1	1.33	<0.1	<0.1	<0.1	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	27.94	-
AY_MW04_190806	6/08/2019	Normal	EB1921176	**43.0**	**37.7**	5.3	0.94	0.83	<0.1	0.2	0.36	<0.1	<0.05	0.6	0.93	1.03	<0.1	<0.1	<0.1	<0.1	<0.25	<0.1	0.95	<0.1	<0.1	<0.1	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	48.84	-
PFAS by TOPA																																
AY_MW01_190806	6/08/2019	Normal	EB1922105	**46.4**	**42.1**	4.3	6.46	1.14	0.04	0.1	0.32	<0.02	0.9	2.18	0.82	0.14	<0.02	<0.02	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.02	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	58.50	58.50

TOPA is Total Oxidisable Precursor Assay
µg/L' micrograms per litre
<' less than the limit of reporting
-' not analysed

		Sum (PFHxS + PFOS	PFOS	PFHxS	PFHxA	PFOA	PFBS	PFPeS	PFHpS	PFDS	PFBA	PFPeA	PFHpA	PFNA	PFDcA	PFUnA	PFDoA	PFTrDA	PFTeDA	4:2 FTS	6:2 FTS	8:2 FTS	10:2 FTS	MeFOSAA	EtFOSAA	FOSA	N-Et-FOSA	N-Me-FOSA	N-Et-FOSE	N-MeFOSE	Sum of PFAS
	Units	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
	LOR	0.0003	0.0003	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.002	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.001	0.001	0.001	0.001	0.0005	0.0005	0.0005	0.001	0.001	0.001	0.001	0.0003
NEMP (HEPA 2018) Human Health Drinking Water		0.07				0.56																									
NHMRC (2019) Human Health Recreational Water		**2.0**				**10.0**																									
NEMP (HEPA 2018) Ecological Freshwater 99% Species Protection			0.00023			19.0																									
Batley et al (2018) 99% Species Protection			**0.051**																												
Sample ID	**Date**	**Type**	**Lab Report**																												
AY_Tap01_190806	6/08/2019	Normal	EB1921176	**0.105**	**0.0652**	0.0398	0.0037	0.0025	0.0045	0.0044	0.0024	<0.0005	<0.002	0.002	0.0014	0.0006	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	0.002	<0.001	<0.001	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.001	0.128

µg/L' micrograms per litre
<' less than the limit of reporting
-' not analysed

		Sum (PFHxS + PFOS	PFOS	PFHxS	PFHxA	PFOA	PFBS	PFPeS	PFHpS	PFDS	PFBA	PFPeA	PFHpA	PFNA	PFDcA	PFUnA	PFDoA	PFTrDA	PFTeDA	4:2 FTS	6:2 FTS	8:2 FTS	10:2 FTS	MeFOSAA	EtFOSAA	FOSA	N-Et-FOSA	N-Me-FOSA	N-Et-FOSE	N-MeFOSE	Sum of PFAS
	Units	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
	LOR	0.0003	0.0003	0.0005	5E-04	0.0005	0.0005	0.0005	0.0005	0.0005	0.002	5E-04	0.0005	5E-04	0.0005	0.0005	0.0005	0.0005	0.0005	0.001	0.001	0.001	0.001	0.0005	0.0005	0.0005	0.001	0.001	0.001	0.001	0.0003
NHMRC (2019) Human Health Recreational Water		2.00				10.0																									
NEMP (HEPA 2018) Ecological Freshwater 99% Species Protection			0.00023			19.0																									
Batley et al (2018) 99% Species Protection			**0.051**																												
Sample ID	**Date**	**Type**	**Lab Report**																												
AY_SW02_190806	6/08/2019	Normal	EB1921176	0.142	**0.0737**	0.0679	0.0263	0.023	<0.0005	0.0086	0.0036	<0.0005	<0.002	0.009	0.0095	0.0015	0.0008	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	0.021	0.003	<0.001	<0.0005	<0.0005	0.0007	<0.001	<0.001	<0.001	<0.001	0.249

µg/L' micrograms per litre
'<' less than the limit of reporting
'-' not analysed

	Sum (PFHxS + PFOS)	PFOS	PFHxS	PFHxA	PFOA	PFBS	PFPeS	PFHpS	PFDS	PFBA	PFPeA	PFHpA	PFNA	PFDcA	PFUnA	PFDoA	PFTrDA	PFTeDA	4:2 FTS	6:2 FTS	8:2 FTS	10:2 FTS	MeFOSAA	EtFOSAA	FOSA	N-Et-FOSA	N-Me-FOSA	N-Et-FOSE	N-MeFOSE	Sum of PFAS
Units	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	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
LOR	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.001	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0005	0.0005	0.0005	0.0005	0.0005	0.0002	0.0002	0.0002	0.0005	0.0005	0.0005	0.0005	0.0002

Sample ID	Date	Lab Report	Type																												
AY_SED01_190806	6/08/2019	EB1921176	Normal	0.0009	0.0009	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	0.0009
AY_QC106_190806	6/08/2019	EB1921176	Duplicate	0.0006	0.0006	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	0.0006
AY_QC206_190806	6/08/2019	RN1244319	Triplicate	<0.002	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002	<0.001	<0.002	<0.002	<0.005	<0.005	<0.005
AY_SED02_190806	6/08/2019	EB1921176	Normal	0.0005	0.0005	<0.0002	0.0002	0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	0.001	<0.0005	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	0.0019
AY_SED03_190806	6/08/2019	EB1921176	Normal	0.005	0.0047	0.0003	0.0003	<0.0002	<0.0002	0.0004	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	0.0025	0.001	0.0003	<0.0002	0.0003	<0.0005	<0.0005	<0.0005	<0.0005	0.0098

mg/kg is milligrams per kilogram
'<' less than the limit of reporting
'-' not analysed

Appendix C

Photographs

PHOTOGRAPHIC LOG

Site Name:	Site Location:	Project No:
Ayr Fire Station	47-49 Soper Street, Ayr, Queensland	60609758

Plate No.	Date:
1	13/02/2019

Direction Photo Taken:
N/A

Description:
Class A and Class B Foams stored in storage shed in the southern corner of the site.

PHOTOGRAPHIC LOG

Site Name:	Site Location:	Project No:
Ayr Fire Station	47-49 Soper Street, Ayr, Queensland	60609758

Plate No.	Date:
2	13/02/2019

Direction Photo Taken:
N/A

Description:
Storage of 11 x 20L Class A drums and 17 x 20L Class B drums in a storage shed in the southern corner of the site.

PHOTOGRAPHIC LOG

Site Name:	Site Location:	Project No:
Ayr Fire Station	47-49 Soper Street, Ayr, Queensland	60609758

Plate No.	Date:
3	13/02/2019

Direction Photo Taken:
N/A

Description:
Storage shed located in the southern corner of site, including miscellaneous fuel, oil, cleaning chemicals and foam storage.

PHOTOGRAPHIC LOG

Site Name:	Site Location:	Project No:
Ayr Fire Station	47-49 Soper Street, Ayr, Queensland	60609758

Plate No.	Date:
4	13/02/2019

Direction Photo Taken:
North

Description:
Grassed area in the western portion of the site bisected by the driveway. A radio tower is located adjacent to the breathing apparatus and workshop rooms.

PHOTOGRAPHIC LOG

Site Name:	Site Location:	Project No:
Ayr Fire Station	47-49 Soper Street, Ayr, Queensland	60609758

Plate No.	Date:
5	13/02/2019

Direction Photo Taken: South

Description: View from inside the Engine Room across the site. The covered carpark and storage room are visible in the background

PHOTOGRAPHIC LOG

Site Name:	Site Location:	Project No:
Ayr Fire Station	47-49 Soper Street, Ayr, Queensland	60609758

Plate No.	Date:
6	13/02/2019

Direction Photo Taken: N/A

Description: Oil/water separator and pump for treatment of intercepted stormwater from the stormwater drain in front of the storage shed in the southern corner of the site.

PHOTOGRAPHIC LOG

Site Name:	Site Location:	Project No:
Ayr Fire Station	47-49 Soper Street, Ayr, Queensland	60609758

Plate No.	Date:
7	06/08/2019

Direction Photo Taken:
N/A

Description:
Location of the tap (TAP01) on the workshop room outside wall.

PHOTOGRAPHIC LOG

Site Name:	Site Location:	Project No:
Ayr Fire Station	47-49 Soper Street, Ayr, Queensland	60609758

Plate No.	Date:
8	06/08/2019

Direction Photo Taken:
N/A

Description:
Location of SED01 sample from surface water drainage pit.

PHOTOGRAPHIC LOG

Site Name: Ayr Fire Station	**Site Location:** 47-49 Soper Street, Ayr, Queensland	**Project No:** 60609758

Plate No.	**Date:**
9	06/08/2019

Direction Photo Taken: N/A

Description: Location of SW02/SED02 samples from surface water drainage pit.

Appendix D

Bore Logs

MONITORING WELL LOG AY_BH01/AY_MW01

ENSR Australia Pty Ltd
Level 5, 828 Pacific Highway
Gordon NSW 2073

PROJECT NUMBER 60609758
PROJECT NAME QFES PFAS DSIs - Ayr
LOCATION 47-49 Soper St, Ayr, 4807
DRILLING METHOD Hand Auger, Push Tube & HFAs
SAMPLING METHOD Grab & Push Tube
SURFACE ELEVATION 7.999 m AHD
WELL HEAD/TOC
LOGGED BY C. McCosker
COMMENTS

DATE 24/7/2019
BLANK 0.0 - 5.3 m bgl
SCREEN 5.3 - 8.3 m bgl
GRAVEL PACK 4.8 - 8.3 m bgl
SANITARY SEAL/BENTONITE 3.5 - 4.8 m bgl
NORTHING 7835855
EASTING 542970.2

PID (ppm)	Penetrometer (Kg/cm2)	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGL)	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
0.0			AY_BH01_0.15_190723				CONCRETE	0.15
0.0			AY_BH01_0.5_190723				FILL: Gravelly SAND, light brown, dry, loose, medium-coarse grained, fine angular gravels.	0.30
0.0			AY_BH01_1.0_190723		1.0		FILL: CLAY, brown, dry, firm, medium plasticity.	0.60
0.0			AY_BH01_1.5_190723				Sandy CLAY, brown, dry, soft, no-low plasticity.	1.05
0.0			AY_BH01_2.0_190723		2.0		SAND, light brown, dry, loose, medium-coarse grained.	
0.0			AY_BH01_3.0_190724		3.0		With fine-medium sub-rounded gravels @ 2.90m bgl.	
0.0			AY_BH01_4.0_190724		4.0		No gravels @ 4.30m bgl. Moist @ 4.50m bgl.	
0.0			AY_BH01_5.0_190724		5.0			
0.0			AY_BH01_6.0_190724		6.0		Brown @ 6.00m bg.	
0.0			AY_BH01_7.0_190724		7.0			
0.0			AY_BH01_8.0_190724		8.0			
							End of hole at target depth. Total Depth: 8.30 m	8.30

WELL DIAGRAM: Grout; Casing; Bentonite; Filter Sands; Screen

AY_BORELOGS_DRAFT.GPJ 16/12/19

MONITORING WELL LOG AY_BH02/AY_MW02

ENSR Australia Pty Ltd
Level 5, 828 Pacific Highway
Gordon NSW 2073

PROJECT NUMBER 60609758
PROJECT NAME QFES PFAS DSIs - Ayr
LOCATION 47-49 Soper St, Ayr, 4807
DRILLING METHOD Hand Auger, Push Tube & HFAs
SAMPLING METHOD Grab & Push Tube
SURFACE ELEVATION 7.924 m AHD
WELL HEAD/TOC
LOGGED BY C. McCosker
COMMENTS

DATE 23/7/2019
BLANK 0.0 - 5.3 m bgl
SCREEN 5.3 - 8.3 m bgl
GRAVEL PACK 4.8 - 8.3 m bgl
SANITARY SEAL/BENTONITE 3.5 - 4.8 m bgl
NORTHING 7835872.3
EASTING 542949.7

PID (ppm)	Penetrometer (Kg/cm2)	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGL)	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
0.0			AY_BH02_0.1_190723				FILL: Silty CLAY loam, brown, dry, soft, no plasticity.	0.35
0.0			AY_BH02_0.5_190723				Sandy CLAY, dark brown, dry, soft, no-low plasticity.	0.90
0.0			AY_BH02_1.0_190723		1.0		SAND, brown, slightly moist, medium dense, fine-medium grained.	
0.0			AY_BH02_1.5_190723				Light brown, dry @ 1.30.m bgl.	
0.0			AY_BH02_2.0_190723		2.0		SAND, light brown-orange, dry, loose, coarse grained, rounded.	1.90
0.0			AY_BH02_3.0_190723		3.0			
0.0			AY_BH02_4.0_190723		4.0		Slightly moist @ 4.20m bgl.	
							Brown, moist @ 4.60m bgl.	
0.0			AY_BH02_5.0_190723		5.0			
0.0			AY_BH02_6.0_190723		6.0			
0.0			AY_BH02_7.0_190723		7.0		Light brown @ 6.80m bgl.	
0.0			AY_BH02_8.0_190723		8.0			8.30
							End of hole at target depth. Total Depth: 8.30 m	

WELL DIAGRAM: Grout; Casing; Bentonite; Filter Sands; Screen

AY_BORELOGS_DRAFT.GPJ 16/12/19

MONITORING WELL LOG AY_BH03/AY_MW03

ENSR Australia Pty Ltd
Level 5, 828 Pacific Highway
Gordon NSW 2073

PROJECT NUMBER 60609758
PROJECT NAME QFES PFAS DSIs - Ayr
LOCATION 47-49 Soper St, Ayr, 4807
DRILLING METHOD Hand Auger, Push Tube & HFAs
SAMPLING METHOD Grab & Push Tube
SURFACE ELEVATION 8.000 m AHD
WELL HEAD/TOC
LOGGED BY C. McCosker
COMMENTS

DATE 23/7/2019
BLANK 0.0 - 5.3 m bgl
SCREEN 5.3 - 8.3 m bgl
GRAVEL PACK 4.8 - 8.3 m bgl
SANITARY SEAL/BENTONITE 3.5 - 4.8 m bgl
NORTHING 7835851.6
EASTING 542976.5

PID (ppm)	Penetrometer (Kg/cm2)	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGL)	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
0.0			AY_BH03_0.15_190723				CONCRETE	0.15
0.0			AY_BH03_0.5_190723				DISTURBED NATURAL: Sandy CLAY, brown, dry, soft, no plasticity.	0.40
0.0			AY_BH03_1.0_190723		1.0		Silty CLAY, brown, dry, soft, medium plasticity.	1.20
0.0			AY_BH03_1.5_190723				SAND, light brown, dry, loose, fine-medium grained, trace of clay. No clay @ 1.50m bgl.	1.90
0.0			AY_BH03_2.0_190723		2.0		Gravelly SAND, light brown-orange, dry, loose, coarse grained, rounded, fine grained sub-rounded gravels.	
0.0			AY_BH03_3.0_190723		3.0		Trace of medium sub-rounded gravels @ 2.90m bgl.	
0.0			AY_BH03_4.0_190723		4.0		Slightly moist @ 4.10m bgl.	
0.0			AY_BH03_5.0_190723		5.0		Brown, orange mottle, moist, dense @ 4.70m bgl.	
0.0			AY_BH03_6.0_190723		6.0			
0.0			AY_BH03_7.0_190723		7.0		Very moist @ 6.90m bgl.	
0.0			AY_BH03_8.0_190723		8.0			
							End of hole at target depth. Total Depth: 8.30 m	8.30

WELL DIAGRAM: Grout; Casing; Bentonite; Filter Sands; Screen

AY_BORELOGS_DRAFT.GPJ 16/12/19

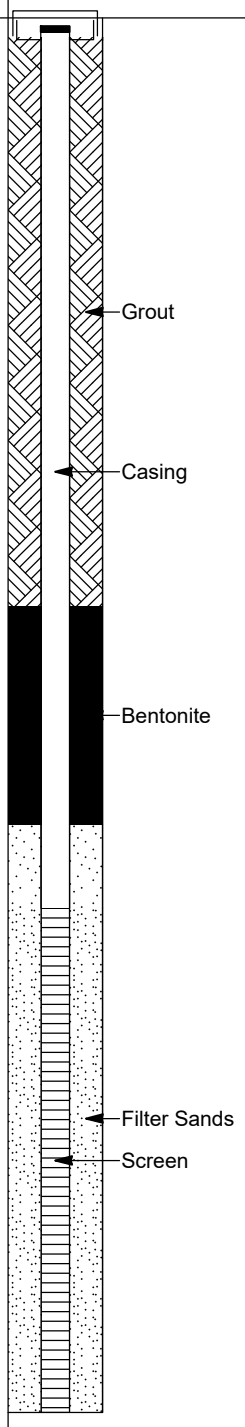
MONITORING WELL LOG AY_BH04/AY_MW04

ENSR Australia Pty Ltd
Level 5, 828 Pacific Highway
Gordon NSW 2073

PROJECT NUMBER 60609758
PROJECT NAME QFES PFAS DSIs - Ayr
LOCATION 47-49 Soper St, Ayr, 4807
DRILLING METHOD Hand Auger, Push Tube & HFAs
SAMPLING METHOD Grab & Push Tube
SURFACE ELEVATION 8.054 m AHD
WELL HEAD/TOC
LOGGED BY C. McCosker
COMMENTS

DATE 24/7/2019
BLANK 0.0 - 5.3 m bgl
SCREEN 5.3 - 8.3 m bgl
GRAVEL PACK 4.8 - 8.3 m bgl
SANITARY SEAL/BENTONITE 3.5 - 4.8 m bgl
NORTHING 7835846.5
EASTING 542962.6

PID (ppm)	Penetrometer (Kg/cm2)	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGL)	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
0.0			AY_BH04_0.15_190724	*			CONCRETE	0.15
0.0			AY_BH04_0.5_190724				FILL: Gravelly CLAY, brown, dry, soft, no plasticity, fine angular gravels.	0.40
0.0							SAND, light brown-orange, loose, fine-medium grained.	0.60
0.0			AY_BH04_1.0_190724	*	1.0		Sandy CLAY, brown, dry, soft, no-low plasticity.	
							Low plasticity @ 1.25m bgl.	
0.0			AY_BH04_1.5_190724					1.60
							SAND, light brown-orange, dry, loose, medium-coarse grained.	
0.0			AY_BH04_2.0_190724		2.0			
0.0			AY_BH04_3.0_190724		3.0		Slightly moist,m sub-rounded gravels @ 3.10m bgl.	
0.0			AY_BH04_4.0_190724		4.0			
							Moist, no gravels @ 4.70m bgl.	
0.0			AY_BH04_5.0_190724		5.0			
							Brown @ 5.80m bgl.	
0.0			AY_BH04_6.0_190724	*	6.0			
0.0			AY_BH04_7.0_190724		7.0			
0.0			AY_BH04_8.0_190724		8.0			
								8.30
							End of hole at target depth. Total Depth: 8.30 m	



AY_BORELOGS_DRAFT.GPJ 16/12/19

AECOM Australia Pty Ltd
Level 8, 540 Wickham Street
Fortitude Valley, QLD 4006

BOREHOLE LOG AY_SS1

PROJECT NUMBER 60609758 **DATE** 23/07/2019
PROJECT NAME QFES PFAS DSIs - Ayr
LOCATION 47-49 Soper St, Ayr, 4807
DRILLING METHOD Hand Auger
SAMPLING METHOD Grab

LOGGED BY C. McCosker
COMMENTS

PID (ppm)	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGS)	GRAPHIC LOG	USCS CLASS	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
0.0		AY_SS1_0.1_190723	✳			CL-ML	FILL: Silty CLAY loam, dark brown, dry, soft, no plasticity.	
0.0		AY_SS1_0.5_190723	✳			CLS	Sandy CLAY, brown, dry, soft, no plasticity, trace of silt.	0.40
							End of hole at target depth. Total Depth: 0.50 m	0.50

AY_BORELOGS_DRAFT.GPJ 16/12/19

AECOM Australia Pty Ltd
Level 8, 540 Wickham Street
Fortitude Valley, QLD 4006

BOREHOLE LOG AY_SS2

PROJECT NUMBER 60609758 **DATE** 23/07/2019
PROJECT NAME QFES PFAS DSIs - Ayr
LOCATION 47-49 Soper St, Ayr, 4807
DRILLING METHOD Hand Auger
SAMPLING METHOD Grab

LOGGED BY C. McCosker
COMMENTS

PID (ppm)	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGS)	GRAPHIC LOG	USCS CLASS	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
0.0		AY_SS2_0.1_190723	✳			CL-ML	FILL: Silty CLAY, dark brown, dry, firm, medium plasticity.	
						SP-SC	Clayey SAND, brown, dry, loose, medium grained.	0.35
0.0		AY_SS2_0.5_190723	✳					
							End of hole at target depth. Total Depth: 0.50 m	0.50

AY_BORELOGS_DRAFT.GPJ 16/12/19

Appendix E

Fieldsheets and Calibration Certificates

ANZ

FQM - Groundwater Sampling and Purging Record

AECOM

Q4AN(EV)-405-FM1

Project Name:	QFES GW Monitoring	**Project Number:**	60609758	**PM Name:**	James Peachey	**Bore ID:**	MW01
Client:	QFES	**Project Location:**	Ayr	**Fieldwork Staff:**	NK	**Sample Date:**	6/8/19
						Well Development or Well Sampling Event? (circle)	

General Bore Information		Parameter Info.	Decontamination	Sampling Method	Hydrasleeve info.	
Date of GW Level: 6/8/19 ~0900	Bore Radius (mm): 100	Chem Kit Serial No.: 19C101112	☑ Decontaminated	☑ Low Flow Pump rate: 3/4	Hydrasleeve Size:	Monitoring sequence followed (number in order):
Depth to GW (m-pvc): 4.562	Screen Interval (m): –	Chem Kit Model: YSI proplus	☐ Dedicated	Intake depth: 7.75	Hydrasleeve Type:	
Bore Depth (m-pvc): 8.257	Casing Radius (mm): 50	**Corrected Redox:** Y / N	☐ Disposable	☐ Bailer ☐ Hydrasleeve	Sampling Depth (m-pvc):	Gauging
Depth to Product (m-pvc): –	Cover Type (gatic/stick up):	(The correction to apply is probe dependent)	☐ Other (specify)	☑ Peristaltic Pump ☐ Waterra	Hydrasleeve Install time:	Hydrasleeve in
Product Thickness (m): –	Bore Locked (YES/NO):	**Parameter method:** ☐ Downhole		☐ Other (specify)	Sampling Start Time:	Hydrasleeve out
	Key Type (if applicable): –	☐ Retrieved				Parameters
Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:		Total purged volume (L):		

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
0900	0	4.562	–	–	–	–	–	–	
0903	0.5	4.566	Peri	4.96	494.9	6.57	134.1	26.8	Clear – no odour – no sheen. yellowish (pale)
0906	1.0	"	"	4.78	495.7	6.52	138.3	26.9	"
0909	1.5	"	"	4.80	496.6	6.51	141.5	27.0	pale yellow
0912	2	"	"	5.01	498.0	6.49	143.4	27.0	
0915	2.5	"	"	4.96	498.5	6.49	144.6	27.1	
				*	✓	✓	✓	✓	DO & fluctuating, but steady
		sampled @		0920	@ 2.5	L.			
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Analytes Sampled for:		Bottles Collected						QA/QC Information	Field Commets
Field Filtered:	**Unfiltered:**		x 40 mL Vial (HCl)		x 60 mL Ferrous		x 60 mL metals (HNO_3)	AY_QC103-190806	Bore volume calculation, bore condition, fate of tubing, redox correction etc.
/	/		x 40 mL Vial (H_2SO_4)		x 100 mL Amber	3	x 250 mL Plastic	AY_QC203-190806	
									/

Approval and Distribution

Fieldwork Staff Signature	**Date**	**Checker Name and Signature**	**Date**
Project Manager Signature	**Date**	**Distribution:** Project Central File	

ANZ

FQM - Groundwater Sampling and Purging Record

Q4AN(EV)-405-FM1

						Bore ID:	MW02
Project Name:	QFES GW Monitoring	**Project Number:**	60609758	**PM Name:**	James Peachey	**Sample Date:**	6/8/19
Client:	QFES	**Project Location:**	Ayr	**Fieldwork Staff:**	NK	**Well Development or Well Sampling Event? (circle)**	

General Bore Information		Parameter Info.	Decontamination	Sampling Method	Hydrasleeve info.	
Date of GW Level: 6/8/19 ~1030	Bore Radius (mm): 100	Chem Kit Serial No.: 19C101112	☑ Decontaminated	☐ **Low Flow** Pump rate: 3/4	Hydrasleeve Size:	**Monitoring sequence followed (number in order):**
Depth to GW (m-pvc): 4.484	Screen Interval (m): –	Chem Kit Model: YSI Pro Plus	☐ Dedicated	Intake depth: 7.5m	Hydrasleeve Type:	
Bore Depth (m-pvc): 8.298	Casing Radius (mm): 50	**Corrected Redox:** Y / N	☐ Disposable	☐ Bailer ☐ Hydrasleeve	Sampling Depth (m-pvc):	Gauging
Depth to Product (m-pvc): –	Cover Type (gatic/stick up):	(The correction to apply is probe dependent)	☐ Other (specify)	☑ Peristaltic Pump ☐ Waterra	Hydrasleeve Install time:	Hydrasleeve in
Product Thickness (m): –	Bore Locked (YES/NO):	**Parameter method:** ☐ Downhole		☐ Other (specify)	Sampling Start Time:	Hydrasleeve out
	Key Type (if applicable): –	☐ Retrieved				Parameters
Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:		Total purged volume (L):		

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
1038	0	4.484	–	–	–	–	–	–	
1041	0.5	"	Peri	4.41	528	6.36	150.1	28.7	low turb, yellowish/brown, no odour, no sheen.
1044	1.5	"	"	3.98	531	6.33	151.4	29.0	"
1047	2.25	"	"	4.00	535	6.33	151.6	29.0	"
1050	3.025	"	"	4.03	538	6.31	152.2	29.0	"
		–	Sampled @		1100	@ 3.25L.			
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Analytes Sampled for:		Bottles Collected						QA/QC Information	Field Commets
Field Filtered:	**Unfiltered:**		x 40 mL Vial (HCl)		x 60 mL Ferrous		x 60 mL metals (HNO_3)		Bore volume calculation, bore condition, fate of tubing, redox correction etc.
//	//		x 40 mL Vial (H_2SO_4)		x 100 mL Amber	1	x 250 mL Plastic		//

Approval and Distribution

Fieldwork Staff Signature	**Date**	**Checker Name and Signature**	**Date**
Project Manager Signature	**Date**	**Distribution:** Project Central File	

ANZ

FQM - Groundwater Sampling and Purging Record

Q4AN(EV)-405-FM1

						Bore ID:	MW03
Project Name:	QFES GW Monitoring	**Project Number:**	60609758	**PM Name:**	James Peachey	**Sample Date:**	6/9/18
Client:	QFES	**Project Location:**	Ayr	**Fieldwork Staff:**	NK	**Well Development or Well Sampling Event? (circle)**	

General Bore Information		Parameter Info.	Decontamination	Sampling Method	Hydrasleeve info.	
Date of GW Level: 6/8/18 ~ 9:45	Bore Radius (mm): 100	Chem Kit Serial No.: 19C101112	☑ Decontaminated	☑ **Low Flow** Pump rate:	Hydrasleeve Size:	**Monitoring sequence followed (number in order):**
Depth to GW (m-pvc): 4.571	Screen Interval (m):	Chem Kit Model: YSI ProPlus	☐ Dedicated	Intake depth: 7.75	Hydrasleeve Type:	
Bore Depth (m-pvc): 8.333	Casing Radius (mm): 50	**Corrected Redox:** Y / N	☐ Disposable	☐ Bailer ☐ Hydrasleeve	Sampling Depth (m-pvc):	Gauging
Depth to Product (m-pvc): –	Cover Type (gatic/stick up):	(The correction to apply is probe dependent)	☐ Other (specify)	☐ Peristaltic Pump ☐ Waterra	Hydrasleeve Install time:	Hydrasleeve in
Product Thickness (m): –	Bore Locked (YES/NO):	**Parameter method:** ☐ Downhole		☐ Other (specify)	Sampling Start Time:	Hydrasleeve out
	Key Type (if applicable): –	☐ Retrieved				Parameters

Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:	Total purged volume (L):

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
1000	0	4.571	–	–	–	–	–	–	No - odour, clear, pale yellow/Brown.
1003	~1.0	"	Per:	4.13	557	6.46	146.7	28.5	"
1006	2.0	"	"	4.23	567	6.45	147.0	28.6	"
1009	~3.0	"	"	4.22	580	6.44	147	28.7	"
1012	3.5	"	"	4.05	582	6.43	146.7	28.9	"
1015	4.5	"	"	4.33	583	6.43	146.4	28.9	"
				~ Steady.					
				Sampled @	1020	@ 4.5	L.		
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Analytes Sampled for:		Bottles Collected						QA/QC Information	Field Commets
Field Filtered:	**Unfiltered:**		x 40 mL Vial (HCl)		x 60 mL Ferrous		x 60 mL metals (HNO_3)		Bore volume calculation, bore condition, fate of tubing, redox correction etc.
//	//		x 40 mL Vial (H_2SO_4)		x 100 mL Amber	1	x 250 mL Plastic	//	//

Approval and Distribution

Fieldwork Staff Signature	Date	Checker Name and Signature	Date
Project Manager Signature	**Date**	**Distribution:** Project Central File	

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FQM - Groundwater Sampling and Purging Record

A OM

Q4AN(EV)-405-FM1

Project Name:	QFES GW Monitoring	**Project Number:**	60609758	**PM Name:**	James Peachey	**Bore ID:**	mw04
Client:	QFES	**Project Location:**	Ayr	**Fieldwork Staff:**	NK	**Sample Date:**	6/8/19

Well Development or Well Sampling Event? (circle)

General Bore Information		Parameter Info.	Decontamination	Sampling Method	Hydrasleeve info.	
Date of GW Level: 6/8/19	Bore Radius (mm): 100	Chem Kit Serial No.: 19C101112	☑ Decontaminated	☐ Low Flow Pump rate: ~3/4	Hydrasleeve Size:	**Monitoring sequence followed (number in order):**
Depth to GW (m-pvc): 4.619	Screen Interval (m):	Chem Kit Model: YSI Proplus	☐ Dedicated	Intake depth: 8m	Hydrasleeve Type:	
Bore Depth (m-pvc): 8.349	Casing Radius (mm): 50	**Corrected Redox:** Y / N	☐ Disposable	☐ Bailer ☐ Hydrasleeve	Sampling Depth (m-pvc):	Gauging
Depth to Product (m-pvc): –	Cover Type (gatic/stick up):	(The correction to apply is probe dependent)	☐ Other (specify)	☑ Peristaltic Pump ☐ Waterra	Hydrasleeve Install time:	Hydrasleeve in
Product Thickness (m): –	Bore Locked (YES/NO):	**Parameter method:** ☐ Downhole		☐ Other (specify)	Sampling Start Time:	Hydrasleeve out
	Key Type (if applicable): –	☐ Retrieved				Parameters
Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:		Total purged volume (L):		

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
8:20	0	4.620	Peri	–	–	–	–	–	
8:23	0.5	"	"	3.71	565	6.30	165.6	29.3	No odour - colour - sheen
8:26	1.5	"	"	3.39	564	6.33	155.1	29.4	"
8:29	2.5	"	"	3.45	568	6.34	152.0	29.4	"
8:32	3.0	"	"	3.26	567	6.35	150.1	29.5	"
8:35	3.75	"	"	3.26	567	6.35	148.3	29.6	
			—	Sampled @	0840	@	3.75L		
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Analytes Sampled for:		Bottles Collected						QA/QC Information
Field Filtered:	**Unfiltered:**		x 40 mL Vial (HCl)		x 60 mL Ferrous		x 60 mL metals (HNO_3)	//
//	//		x 40 mL Vial (H_2SO_4)		x 100 mL Amber	1	x 250 mL Plastic	

Field Commets

Bore volume calculation, bore condition, fate of tubing, redox correction etc.

//

Approval and Distribution

Fieldwork Staff Signature _____ Date _____ Checker Name and Signature _____ Date _____

Project Manager Signature _____ Date _____ **Distribution:** Project Central File

Oil / Water Interface Meter

Instrument Interface Meter (30M)
Serial No. 224606

airmet
Air-Met Scientific Pty Ltd
1300 137 067

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

Certificate of Calibration

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

Calibrated by: Nikhil Mruthyunjayappa

Calibration date: 15/07/2019

Next calibration due: 13/09/2019

Gas Detection Air Sampling & Monitoring Environmental & Water Quality Monitoring

airmet

Air-Met Scientific Pty Ltd

ABN 73 006 849 949

Ph 1300 137 067

Multi Parameter Water Meter

Instrument YSI Quatro Pro Plus
Serial No. 11K100831

Item	Test	Pass	Comments
Battery	Charge Condition	✓	
	Capacity	✓	
Switch/keypad	Operation	✓	
Display	Intensity	✓	
	Operation (segments)	✓	
	Seal	✓	
Connectors	Condition	✓	
Sensor	1. pH	✓	
	2. mV	✓	
	3. EC/Temp.	✓	
	4. D.O	✓	
Alarms	Beeper	✓	
	Settings	✓	
Software	Version	✓	
Data logger	Operation	✓	
Download	Operation	✓	
Other tests:			

Certificate of Calibration

This is to certify that the above instrument has been calibrated to the following specifications:

Sensor	Serial no	Standard Solutions	Certified	Solution Bottle Number	Instrument Reading
1. pH 7.00		pH 7.00	NIST	320613	pH 7.00
2. pH 4.00		pH 4.00	NIST	320612	pH 4.00
3. mV		240mV	NIST	325420/325421	240mV
4. EC		2.76mS	NIST	304153	2.76mS
6. D.O		0 ppm	NIST	5928	0 ppm
7. Temp		22.6oC	NIST	MultiTherm 09000528	22.6oC

Calibrated by: Nikhil Mruthyunjayappa

Calibration date: 15-Jul-19

Next calibration due: 11-Jan-20

PID Calibration Certificate

Instrument PhoCheck Tiger
Serial No. T-114169

airmet

Air-Met Scientific Pty Ltd
1300 137 067

Item	Test	Pass	Comments
Battery	Charge Condition	✓	
	Fuses	✓	
	Capacity	✓	
	Recharge OK?	✓	
Switch/keypad	Operation	✓	
Display	Intensity	✓	
	Operation (segments)	✓	
Grill Filter	Condition	✓	
	Seal	✓	
Pump	Operation	✓	
	Filter	✓	
	Flow	✓	
	Valves, Diaphragm	✓	
PCB	Condition	✓	
Connectors	Condition	✓	
Sensor	PID	✓	10.6 ev
Alarms	Beeper	✓	
	Settings	✓	
Software	Version	✓	
Data logger	Operation	✓	
Download	Operation	✓	
Other tests:			

Low	High	TWA	STEL
50ppm	100ppm		

Certificate of Calibration

This is to certify that the above instrument has been calibrated to the following specifications:

Diffusion mode Aspirated mode

Sensor	Serial no	Calibration gas and concentration	Certified	Gas bottle No		Instrument Reading
PID Lamp		93ppm Isobutylene	NIST	BR100		93.0ppm

Calibrated by: Nikhil Mruthyunjayappa

Calibration date: 15/07/2019

Next calibration due: 14/08/2019

Gas Calibration Certificate

airmet

Air-Met Scientific Pty Ltd
1300 137 067

Instrument MX4
Serial No. 13054CJ-002
Sensors CO, H2S, O2, LEL

Item	Test	Pass	Comments			
Battery	Charge Condition	✓				
	Fuses	✓				
	Capacity	✓				
	Recharge OK?	✓				
Switch/keypad	Operation	✓				
Display	Intensity	✓				
	Operation (segments)	✓				
Grill Filter	Condition	✓				
	Seal	✓				
PCB	Condition	✓				
Connectors	Condition	✓				
			Low	**High**	**TWA**	**STEL**
Sensor	Oxygen	✓	19.50%	23.50%	N/A	N/A
	Pentane	✓	5% LEL	10% LEL	N/A	N/A
	CO	✓	30 ppm	60 ppm	30ppm	60ppm
	H2S	✓	10 ppm	15 ppm	10ppm	15ppm
Alarms	Beeper	✓				
	Settings	✓				
Software	Version					
Datalogger	Operation					
Download	Operation					
Other tests:						

Certificate of Calibration

This is to certify that the above instrument has been calibrated to the following specifications:

Diffusion mode Aspirated mode

Sensor	Serial no	Calibration gas and concentration	Certified	Gas bottle No	Instrument Reading
O2		Fresh Air		Fresh Air	20.90%
LEL		25% LEL Pentane	NIST	BR133	25% LEL Pentane
CO		100ppm	NIST	BR133	100ppm
H2S		25ppm	NIST	BR133	25ppm

Calibrated by: **Braeden Curtis**

Calibration date: **16/07/19**

Next calibration due: **15/01/2020 0:00**

Multi Parameter Water Meter

Instrument YSI Quatro Pro Plus
Serial No. 11K100830

airmet
Air-Met Scientific Pty Ltd
1300 137 067

Item	Test	Pass	Comments
Battery	Charge Condition	✓	
	Fuses	✓	
	Capacity	✓	
Switch/keypad	Operation	✓	
Display	Intensity	✓	
	Operation (segments)	✓	
Grill Filter	Condition	✓	
	Seal	✓	
PCB	Condition	✓	
Connectors	Condition	✓	
Sensor	1. pH	✓	
	2. mV	✓	
	3. EC	✓	
	4. D.O	✓	
	5. Temp	✓	
Alarms	Beeper		
	Settings		
Software	Version		
Data logger	Operation		
Download	Operation		
Other tests:			

Certificate of Calibration

This is to certify that the above instrument has been calibrated to the following specifications:

Sensor	Serial no	Standard Solutions	Certified	Solution Bottle Number	Instrument Reading
1. pH 7.00		pH 7.00	NIST	320613	pH 7.00
2. pH 4.00		pH 4.00	NIST	307927	pH 4.00
3. mV		240mV	NIST	325420/325421	240mV
4. EC		2.76mS	NIST	304153	2.76mS
6. D.O		0 ppm	NIST	5928	0 ppm
7. Temp		24.oC	NIST	MultiTherm 09000528	24.oC

Calibrated by: **Nikhil Mruthyunjayappa**

Calibration date: **15/07/2019**

Next calibration due: **11/01/2020**

Appendix F

Surveying Report

Our Ref: 400571
Surveyed - Veris
Date of Survey 6/8/19
Site Address: 47 Soper St, Ayr

Origin of Coordinates

Projection	MGA Zone 55	
Coordinate Datum	GDA94	
Height Datum	AHD	
Coordinate Origin	PM 78088	E 542 831.779m, N 7 835 386.955m, Z 9.321m

Point ID	**Easting (m)**	**Northing(m)**	**Elevation (m)**
MW01 Natural Surface Level	542970.068	7835855.130	8.067
MW01 CASING	542970.169	7835855.036	7.999
MW02 Natural Surface Level	542949.681	7835872.140	8.023
MW02 CASING	542949.728	7835872.255	7.924
MW03 Natural Surface Level	542976.633	7835851.436	8.075
MW03 CASING	542976.515	7835851.559	8.000
MW04 CASING	542962.569	7835846.485	8.054
MW04 Natural Surface Level	542962.488	7835846.504	8.127

Appendix G

Analytical Data Validation

Appendix G - Analytical Data Validation

G1.0 Introduction

The amended NEPM, Schedule B [2]) Guideline on Site Characterisation (2013) specifies that the nature and quality of the data produced in an investigation should be determined by the data quality objectives (DQOs). As referenced by the NEPM, the DQO process is detailed in the United States Environmental Protection Agency (US EPA) *Guidance on Systematic Planning Using the Data Quality Objectives Process (EPA QA/G-4 : EPA/240/B-06/001), February 2006.*

The US EPA defines the process as *'a strategic planning approach based on the Scientific Method that is used to prepare for a data collection activity. It provides a systematic procedure for defining the criteria that a data collection design should satisfy, including when to collect samples, where to collect samples, the tolerable level of decision errors for the study, and how many samples to collect'.*

The process of establishing appropriate DQOs is defined by the US EPA (2006) according to the following seven steps:

The seven steps in defining DQOs

Step	Data Quality Objective Step
1	***State the problem*** – Define the problem that necessitates the study; identify the planning team, examine budget, schedule.
2	***Identify the goal of the study –*** State how environmental data will be used in meeting objectives and solving the problem, identify study questions, define alternative outcomes.
3	***Identify information inputs*** – Identify data & information needed to answer study questions.
4	***Define the boundaries of the study*** – Specify the target population & characteristics of interest, define spatial & temporal limits, scale of inference.
5	***Develop the analytic approach*** – Define the parameter of interest, specify the type of inference, and develop the logic for drawing conclusions from findings.
6	***Specify performance or acceptance criteria*** – Develop performance criteria for new data being collected or acceptable criteria for existing data being considered for use.
7	***Develop the plan for obtaining data*** – Select the resource-effective sampling and analysis plan that meets the performance criteria.

The approach adopted relative to the seven steps presented above is discussed below.

G1.1 Step 1 – State the Problem

A report prepared by QFES in November 2018 indicated that PFAS was detected in water held within the Case 4 Pit at the fire station.

The findings of a review of the historical use of firefighting foams containing PFAS at the site have been documented in the PSI report (AECOM, 2019) and it was identified that there was the potential for PFAS to have been released to ground. The extent of the potential presence of PFAS in the different environmental media (soil, groundwater, surface water and sediment) was not known and characterisation of potential source areas, boundary locations and downstream (for surface water) and down-gradient (for groundwater) was required to inform the potential presence of complete source-pathway-receptor linkages at the site.

G1.2 Step 2 – Identify the Goal of the Study

The overarching purpose of the works is to characterise the potential for PFAS impacts, including concentration and distribution in environmental media (soil, groundwater, surface water and sediment), within and at the boundary of the site.

G1.3 Step 3 – Identify Information Inputs

To allow assessment of the data against the study goal listed in step 2 above, the following inputs have been considered:

- Anecdotal information on historical operations provided from interviews with personnel familiar with the fire stations
- Observations made during the site inspections completed in February 2019 and during the fieldwork in July and August 2019
- The data review information (site and environmental setting) presented in the PSI report (AECOM, 2019) including:
    - Quantitative site characterisation data including visual observations, laboratory analytical data from field samples (samples of water from the Case 4 pit, comparison of analytical data with screening criteria appropriate for the land use
    - Hydrogeological and hydrological data including inferred groundwater and surface water flow direction
    - The potential for preferential pathways e.g. stormwater drains.
- Tier 1 health and ecological investigation and screening levels of each protected beneficial use applicable within the boundary of the study area
- Soil, groundwater and sediment analytical results collected between July and August 2019 as presented in this DSI report.

G1.4 Step 4 – Define the Boundaries of the Study

The lateral extent of the study area defined for decision making is the physical area of the fire station (Lot on Plan boundaries) is outlined in figures in **Appendix A**. The vertical extent of the investigation is the depth to the shallow aquifer system beneath each site. This is considered to be less than 20 mbgl.

The temporal boundary of the study is the current conditions at the time of the fieldwork in July – August 2019.

G1.5 Step 5 – Develop the Analytical Approach

The decision rules can be defined as:

- If the laboratory quality assurance/quality control data are within the acceptable ranges, the data should be considered suitable for use.
- If the PFAS concentrations are reported above the laboratory LOR or risk-based screening levels in one or more samples, then it should be considered whether further assessment is required.

The decision on the acceptance of the analytical data should be made on the basis of the Data Quality Indicators (DQIs) as follows:

- **Precision:** A quantitative measure of the variability (or reproducibility) of data.
- **Accuracy**: A quantitative measure of the closeness of reported data to the “true” value.
- **Representativeness**: The confidence (expressed qualitatively) that data are representative of each media present at each fire station.
- **Completeness**: A measure of the amount of useable data from a data collection activity.
- **Comparability**: The confidence (expressed qualitatively) that data may be considered to be equivalent for each sampling and analytical event.

G1.5.1 Precision

Suitable criteria and/or performance indicators for assessment of precision include:

- Performance of intra-laboratory duplicate sample sets through calculation of relative percentage differences (RPDs).
- Performance of inter-laboratory duplicate sample sets through calculation of RPDs.
- The RPDs should be assessed as acceptable if less than or equal to 30% as per the NEPM Schedule B3. Where the results shows greater than 30% difference a review of the cause should be conducted (NEPC, 2013). It is noted that RPDs that exceed this range may be considered acceptable where:
  - results are less than 10 times the LOR (no limit)
  - results are less than 20 times the LOR and the RPD is less than 50%
  - heterogeneous materials are encountered.

G1.5.2 Accuracy (Bias)

The closeness of the reported data to the “true” value is assessed through review of performance of:

- method blanks, which are analysed for the analytes targeted in the primary samples
- Matrix spikes and surrogate recoveries
- Laboratory control samples.

G1.5.3 Representativeness

To ensure the data produced by the laboratory is representative of conditions encountered in the field, the following steps are taken by the laboratory and subsequently reviewed by the Consultant:

- Blank samples should be run in parallel with field samples to confirm there are no unacceptable instances of laboratory cross contamination.
- Review of RPD values for field and laboratory duplicates to provide an indication that the samples are generally homogeneous, with no unacceptable instances of significant sample matrix heterogeneities.
- The appropriateness of collection methodologies, handling, storage and preservation techniques should be assessed to ensure/confirm there was minimal opportunity for sample interference or degradation (i.e. volatile loss during transport due to incorrect preservation / transport methods).

G1.5.4 Completeness

In validating the degree of completeness of the analytical data sets acquired during the program the following is considered:

- Whether standard operating procedures (SOPs) for sampling protocols have been adhered to.
- Copies of all chain of custody (CoC) documentation are reviewed and presented.

It can therefore be considered whether the proportion of “useable data” generated in the data collection activities is sufficient for the purposes of assessing the problem as stated in Step 1 above.

G1.5.5 Comparability

Given that assessment data can comprise several data sets from separate sampling episodes, issues of comparability between data sets are reduced through adherence to SOPs and regulator endorsed or made guidelines and standards on each data gathering activity.

In addition, the data should be collected by experienced field staff familiar with PFAS contamination investigations and National Association of Testing Authorities (NATA) accredited laboratories should be employed in all laboratory programs for soil, sediment and water analysis.

G1.5.6 Step 6 – Specify Performance or Acceptance Criteria

Specific limits for this project are in accordance with the appropriate guidance made or endorsed by state and national regulations, appropriate indicators of data quality, and standard procedures for field sampling and handling.

This step also examines the certainty of conclusive statements based on the available new site data collected. This should include the following points to quantify tolerable limits:

- A decision can be made based on a certainty assumption of 95% confidence in any given data set. A limit on the decision error should be 5% that a conclusive statement may be a false positive or false negative.
- A decision error in the context of the decision rule presented above would lead to either underestimation or overestimation of the risk level associated with a particular sampling area.

Sampling errors may occur when the sampling program does not adequately detect the variability of a contaminant from point to point across the site. To address this, the SAQP outlines minimum numbers of samples proposed to be collected from each media.

- As such, there may be limitations in the data if aspects of the SAQP cannot be implemented. Some examples of this scenario include but are not limited to:
    - Proposed surface water sample locations may be dry at the time of sampling; and
    - Proposed samples are not collected due to access being restricted to a given location.
- Limitations in ability to acquire useful and representative information from the data collected. The data are proposed to be collected from multiple locations and sample media. Some examples of this scenario include:
    - Measurement errors can occur during sample collection, handling, preparation, analysis and data reduction. To address this the following measures are proposed:
        - Collection of sufficient sample mass to facilitate analysis reported to standard laboratory detections limits. Collection of insufficient sample mass may result in raised detection limits.
        - Field staff to follow a standard procedure when collecting samples, including decontamination of tools, removal of adhered soil to avoid false positives in results, and use of appropriate sample containers and preservation methods.
        - Laboratories to follow a standard procedure when preparing samples for analysis and undertaking analysis.
- Laboratories to report quality assurance/ quality control data for comparison with the DQIs established for the project.

G1.5.7 Step 7 – Optimise the Design for Obtaining Data

The methodology presented in this SAQP is designed to meet the objectives described in **Section 1.3** of the main body of the report and to achieve the nominated DQOs. Optimisation of the data collection process should be achieved by:

- Working closely with the analytical laboratories and sampling equipment suppliers to ensure that appropriate procedures and processes are developed and implemented prior to and during the fieldwork, to ensure that sample handling, and transport to and processing by the analytical laboratories is as smooth as possible; and
- Conducting sampling according to the environmental consultant's SOPs for the type of sampling being conducted.

The scope of works should be carried out to a level of accuracy and confidence presented in the NEPM (NEPC, 2013).

G2.0 Assessment of Data Quality

The quality of the data collected as part of the investigations was assessed on a range of factors including:

- Documentation and data completeness
- Data quality – comparability, representativeness, and precision and accuracy for sampling. Assessment criteria for data quality indicators for samples are listed below in the table below.

Acceptance Criteria for Data Quality Indicators in Laboratory Analysis

Data Quality Indicator	Acceptance Criteria
Rinsate Blanks	Less than the laboratory LOR
Intra laboratory field duplicates (1) (3)	RPD less than ± 30-50% (where results > 10 x LOR) (2)
Laboratory Duplicates (1) (2) (3)	RPDs in conformance with criteria in the laboratory QC report
Matrix Spikes (3) (4)	Recoveries between 70-130% of the theoretical recovery or as nominated in the laboratory's QC report
Method Blanks	Less than the laboratory LOR
Laboratory Control Samples (5)	Recoveries between laboratory specified range for each particular analyte / analytical suite.
Surrogate Spikes	Recoveries for surrogates are test dependent and are based on USEPA Method SW846. Control limits are dynamic and vary for individual tests but are within the criteria described in USEPA Method SW846.

Notes:

1. Potential exceptions to this criterion may occur where sample variation or heterogeneity, rather than poor laboratory performance, is accountable for the poor reproducibility, or where the results are close to the LOR. This typical RPD range is obtained from AS 4482.1-2005 Guide to the investigation and sampling of sites with potentially contaminated soil.
2. If the results are close to the LOR, then higher results will be accepted.
3. Criteria for sample duplicate and matrix spike results assume no sample heterogeneity. If samples are found to be heterogeneous with respect to a particular analyte the above criteria does not apply.
4. Assumes that samples are homogeneous and the background analyte level is less than 20% of the spike level (refer to USEPA Method 8000B). Note that there is no requirement for matrix spikes to pass as certain matrices may preclude recovery of spiked compounds. In this case, data will be accepted if LCS data meets the acceptance criteria.

   5.80% of the compounds tested must fall within the control limits. Control limits are dynamic and vary for individual tests as per USEPA Method 8000B.

5. Decision errors may include collecting samples that are not representative of the contamination status of the material and/or analytical errors.

G3.0 Field QA/QC Data Assessment

G3.1 General

All work completed as part of the project was conducted in accordance with standard AECOM environmental sampling protocols. The essential elements of the QA/QC program are presented in the table below.

Essential Elements of the Field QA/QC Program

Action	Description
Use of Experienced Personnel	Fieldwork was undertaken by trained AECOM engineers/scientists with previous experience in contaminated site assessment, field sampling techniques and health and safety issues.
Record Keeping	Full records of all field activities including sample collection and photo log are maintained on standard field activity sheets.
Sample Collection	New nitrile gloves were worn during soil, groundwater and sediment sampling, and were replaced between each sample collection.
Sample Labelling	A unique sample number was used for each sample to specify the sample origin (soil bore/monitoring well number and date), preservation standards and analytical requirements.
Chain of Custody	Chain of Custody procedures are required for all sample transfers. Custody sheets list sample numbers; date of collection and analyses required and are signed by each individual transferring and accepting custody.
Sample Storage	The collected samples were transferred to laboratory supplied sampling containers with appropriate preservation as required and then placed in cool storage prior to transfer to a NATA accredited laboratory (ALS and NMI).
Decontamination	All non-dedicated field equipment used in the sampling process was decontaminated using de-ionised water prior to mobilisation and between sampling locations to reduce the risks of cross contamination.

In addition to the primary samples, quality control field duplicate samples were collected to assess aspects of field protocols and laboratory performance and to classify the validity of the laboratory data. Field duplicates were collected in general accordance with AS 4482.1-2005 *Guide to the investigation and sampling of sites with potentially contaminated soil* (Standards Australia 2005).

G3.2 Handling and Sample Preservation

The laboratories reported that all samples were received in appropriately pre-treated and preserved containers

Samples were received preserved and chilled at the laboratory. The sample temperature readings recorded on the Sample Receipt Notification (SRN) ranged from 1.2°C to 6.1°C with ice present.

G3.3 Frequency of Field Quality Control Samples

Field duplicate samples (intra-laboratory duplicates) and field triplicate samples (inter-laboratory duplicates) were collected and labelled so that they could not be linked to their respective primary samples.

Field duplicate and triplicate samples were collected as 1 duplicate and triplicate sample per 10 primary samples (10%) prepared in the field by equally splitting the primary field samples. A summary of the actual duplicate and triplicate analysis frequency undertaken during this investigation is presented in the table below. The table shows that the sufficient number of field QC samples were collected.

Summary of Duplicate and Triplicate Samples

Media	No of Primary Samples	No of Duplicate Samples	% Duplicate Samples	No of Triplicate Samples	% Triplicate Samples
Soil samples	16	2	12.5%	2	12.5%
Water samples	6	1	16%	1	16%
Sediment samples	3	1	33%	1	33%

Relative Percentage Difference (RPD) Calculations

A RPD analysis of primary and duplicate/triplicate samples is used to measure the representativeness and/or precision of duplicate samples. The RPD is calculated from the absolute difference between results of the duplicate pair divided by the mean value of the duplicate pair.

RPD (%) = 100 x (D1-D2) / ((D1+D2) / 2)

Where: D1 = primary sample analysis, D2 = duplicate sample analysis

AS 4482.1-2005 states that the typical RPD which can be expected from acceptable field duplicates is < ± 30- 50% of the mean concentration of the analyte, where the results are greater than ten times the limit of reporting (LOR).

The acceptable ranges adopted are:

- 81% for laboratory duplicates between 0-10 x LOR.
- 50% for laboratory duplicates between 10-30 x LOR.
- 30% for laboratory duplicates greater than 30 x LOR.
- All other RPD calculations were either not calculable, due to the primary or duplicate sample reporting concentrations of COPC less than the LOR or within the expected range of 0- 30% for all other analytes reported.

Evaluation of the soil dataset is presented in **Table G1,** for and the RPD non-conformances for key PFAS compounds are summarised in the table below.

Summary of key PFAS RPD non-conformances

Primary Sample ID	QC sample ID	Type	RPD PFOS (%)	RPD PFOA (%)	RPD PFHxS (%)	RPD PFHxA (%)
AY_BH02_0.5_190723	AY_QC100_190723	Soil	38	-	-	-
AY_BH03_0.5_190723	AY_QC101_190723	Soil	-	-	36	-
AY_MW01_190806	AY_QC205_190806	Water	-	35	-	-

For completeness, the other RPD exceedances included:

- PFDS in the triplicate sample (QC200) to BH02_0.5 (95%)
- PFNA in the duplicate sample (QC105) and triplicate sample (QC205) to MW01 (31% and 40% respectively)

The RPD non-conformances for soil samples may be attributed to the sample heterogeneity within shallow fill type soils. The RPD non-conformance for the water sample was within an order of magnitude and confirm the presence of the analyte. Duplicate and triplicate samples were included within the analytical tables attached within Appendix B and conservatively, where significant differences between the primary and duplicate samples have been recorded, the highest concentration has been considered in the assessment of soil and groundwater contamination.

It is noted that no RPD non-conformances were reported for sediment samples.

The RPD results are not considered to impact on data interpretation for this investigation but do demonstrate that difference in soil heterogeneity, laboratory analysis and extraction methods in soil and sediment samples should be considered in assessing the contamination status of the site.

G3.4 Rinsate Blank Samples

To assess the effectiveness of sampling procedures, four rinsate blank samples were collected, on days when sampling equipment was used. Rinsate blanks were collected from sampling equipment which was decontaminated and re-used by passing laboratory supplied deionised water over the sampling equipment following decontamination procedures. The rinsate samples were analysed for PFAS.

The analytical results for PFAS compounds recorded for the rinsate blank samples are presented in **Table G3**, attached. All results for the rinsate samples collected from equipment were below the LOR. QC300 was collected from the on-site hydrant used to source water for the high-pressure cleaner used for cleaning the augers and other drill rig equipment (base plate etc.). Five detections of PFAS compounds were reported in this sample including concentrations of PFOS and PFHxS at an order of magnitude above the respective LORs.

A representative rinstate sample was also collected from the hollow flight augers (QC301) after cleaning and as no detections of PFAS above LOR were reported the data is deemed acceptable for interpretative use and not considered to impact on data interpretation for this investigation.

G4.0 Laboratory QA/QC

The analytical data was received from the laboratories as the following laboratory batches:

ALS – EB1919839, EB1921176, EB1922766, EB1922105.

NMI – RN1242615, RN1244319.

G4.1 Extraction and Analysis Holding Time

All samples were received and analysed within the specified holding times with the exception of moisture content within BH04_1.0 (TOPA) however it is noted that moisture content was analysed within the holding time for the standard analysis and that this exceedance was due to the re-batching of this sample for TOPA analysis.

G4.2 Laboratory QA/QC

The laboratories used in the investigation (ALS for primary and duplicate samples and NMI for triplicate samples) are National Association of Testing Authorities (NATA) approved for the analyses required. Quality assurance procedures adopted by both primary and secondary analytical laboratories included analysis of blanks, duplicates, laboratory control samples, matrix spikes and surrogate spikes (for organics).

For this investigation, 33 primary and field quality control samples were analysed across six laboratory batches. The additional two laboratory batches identified in **Section G4.0** (EB1921187 and EB1922105) contained samples re-run for TOPA analysis.

G4.2.1 Laboratory/Method Blanks

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 type is to monitor potential laboratory contamination.

All the laboratory blanks were within the DQO limits for this investigation. Method blank concentrations were not detected above the LOR for all analytes.

G4.2.2 Laboratory Control Sample (LCS)

The quality control term Laboratory Control Sample (LCS) refers to a known, interference free matrix spiked with target analytes or certified reference material. The purpose of this QC type is to monitor method precision and accuracy independent of sample matrix. Accepted frequency of LCS samples is 1 in 20.

LCS recovery non-conformances were reported for one analyte in EB1919839 and five analytes in EB1921176. As advised by ALS a batch is accepted if at least 80% of the analytes return conforming LCS recoveries. As this criteria has been met for these two batches and as the analytes that reported non-conformances are not key analytes, these non-conformances are not considered to affect the data analysis and interpretation for this investigation.

G4.2.3 Laboratory Duplicates

The quality control term laboratory duplicate refers to an intra-laboratory split sample randomly selected from the sample batch. Laboratory duplicates provide information on method precision and sample heterogeneity. Relative percentage differences (RPDs) are used to assess precision. Frequency of laboratory duplicate samples 1 in 10.

The RPDs for laboratory duplicate samples were within the limits for all analytes for all batches except for:

- EB1919839 where the RPD exceeded the DQO limit for PFTrDA in SS2_0.1 indicative of sample heterogeneity within shallow soils.
- EB1921176 (soil) where the RPD exceeded the DQO limit for PFOS in an anonymous sample. As this non-conformance is noted for a sample outside the investigation it is not considered in the data analysis for this investigation.
- EB1921176 (water) where the RPD exceeded the DQO limit for PFOS in QC105 (MW01). The primary to duplicate / triplicate sample RPDs for PFOS was within the acceptable range therefore this non-conformance is not considered to affect data analysis and interpretation for this investigation.

G4.2.4 Matrix Spikes

The quality control term Matrix Spike (MS) refers to an intra-laboratory split sample spiked with a representative set of target analytes. The purpose of this QC type is to monitor potential matrix effects on analyte recoveries. The samples undergo the same extraction and analysis procedures and the results are used to assess the method precision and bias. Spike recoveries are reported as a percent recovery. Frequency of MS samples is 1 in 20.

A summary of batches with MS recovery non-conformances for select analytes, are presented in the table below.

Summary of Matrix Spike Recovery non-conformances

Analyte	Batches	Comments
PFAS	EB1921176 (SED02)	Recovery was less than the lower data quality objective. Likely due to sample heterogeneity identified within shallow soils and sediment samples.
	EB1919839 (QC100)	MSR was outside the DQO and/or MS were not determined due to the higher background level greater than or equal to 4x spike level. This is potentially due to the matrix of the particular sample rather than the spike recovery and as such does not affect the quality of the data for interpretative use.
	EB1921176 (AS)	As the non-conformance was noted for a sample outside the investigation, it is not considered in the data analysis for this investigation. This non-conformance is considered insignificant and data are deemed acceptable.

AS- Anonymous Sample

G4.2.5 Surrogate Spikes

The quality control term Surrogate Spike (SS) refers to a compound added to a sample aliquot in known amounts before extraction and analysis. The compound should be similar in composition and behaviour to the target analyte but not naturally occurring in the sample. A surrogate is used to monitor the method performance for analysis of organic compounds. Spike recoveries are reported as a percent recovery.

A summary of batches with surrogate spike recovery non-conformances are presented in the table below.

Summary of Surrogate Spike Recovery non-conformances

Analyte	Batches	Comments
PFAS	EB1921176 (SED03, AS)	Recovery less than lower data quality objective.

AS- Anonymous Sample

Surrogate spike recovery non-conformance is potentially due to the matrix of the particular samples rather than the surrogate recovery and as such does not affect the quality of the data for interpretative use.

G4.2.6 Frequency of Laboratory QC samples

The laboratory reported a sufficient frequency of quality control samples to assess whether the results have been reported to an acceptable accuracy and precision for all the batches.

G5.0 Conclusions

While non-conformances with the laboratory QA/QC have been identified, these non-conformances are not considered to adversely impact the purpose of the investigation with respect to comparison against the adopted assessment criteria. It is concluded that, for the purposes of this investigation, the data are suitable for interpretation and acceptable for use in this assessment.

Table G1 Soil Duplicate and Triplicate Analytical Results
PFAS DSI
QFES - Ayr Fire Station

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	Lab Report Number	EB1919839	EB1919839		EB1919839	RN1242615		EB1919839	EB1919839		EB1919839	RN1242615		
	Field ID	AY_BH02_0.5_190723	AY_QC100_190723	**RPD**	AY_BH02_0.5_190723	AY_QC200_190723	**RPD**	AY_BH03_0.5_190723	AY-QC101_190723	**RPD**	AY_BH03_0.5_190723	AY_QC201_190723	**RPD**	
	Sampled Date	23/07/2019	23/07/2019		23/07/2019	23/07/2019		23/07/2019	23/07/2019		23/07/2019	23/07/2019		
	Units	**LOR**												
PFBS	mg/kg	0.0002 : 0.001 (Interlab)	<0.0002	<0.0002	0	<0.0002	<0.001	0	<0.0002	<0.0002	0	<0.0002	<0.001	0
PFPeS	mg/kg	0.0002 : 0.001 (Interlab)	<0.0002	<0.0002	0	<0.0002	<0.001	0	<0.0002	<0.0002	0	<0.0002	<0.001	0
PFHxS	mg/kg	0.0002 : 0.001 (Interlab)	0.0029	0.0021	32	0.0029	0.0026	11	**0.0057**	**0.0082**	36	0.0057	0.0064	12
PFHpS	mg/kg	0.0002 : 0.001 (Interlab)	0.0003	0.0003	0	0.0003	<0.001	0	0.0018	0.0025	33	0.0018	0.0017	6
PFOS	mg/kg	0.0002 : 0.002 (Interlab)	**0.0719**	**0.049**	38	0.0719	0.062	15	0.182	0.241	28	0.182	0.21	14
PFDS	mg/kg	0.0002	0.0028	0.0023	20	**0.0028**	**<0.001**	95	<0.0002	<0.0002	0	<0.0002	<0.001	0
PFBA	mg/kg	0.001	<0.001	<0.001	0	<0.001	<0.002	0	<0.001	<0.001	0	<0.001	<0.002	0
PFPeA	mg/kg	0.0002 : 0.002 (Interlab)	0.001	0.0008	22	0.001	<0.002	0	<0.0002	<0.0002	0	<0.0002	<0.002	0
PFHxA	mg/kg	0.0002 : 0.001 (Interlab)	0.001	0.0007	35	0.001	0.001	0	<0.0002	<0.0002	0	<0.0002	<0.001	0
PFHpA	mg/kg	0.0002 : 0.001 (Interlab)	0.0011	0.0009	20	0.0011	0.0011	0	<0.0002	<0.0002	0	<0.0002	<0.001	0
PFOA	mg/kg	0.0002 : 0.001 (Interlab)	0.0012	0.001	18	0.0012	0.0013	8	0.0011	0.0014	24	0.0011	0.0012	9
PFNA	mg/kg	0.0002 : 0.001 (Interlab)	0.0016	0.0012	29	0.0016	0.0016	0	0.0233	0.0284	20	0.0233	0.03	25
PFDA	mg/kg	0.0002 : 0.001 (Interlab)	0.0025	0.002	22	0.0025	0.0026	4	<0.0002	<0.0002	0	<0.0002	<0.001	0
PFUnDA	mg/kg	0.0002 : 0.002 (Interlab)	0.0011	0.0009	20	0.0011	<0.002	0	0.0014	0.0017	19	0.0014	<0.002	0
PFDoDA	mg/kg	0.0002 : 0.002 (Interlab)	<0.0002	<0.0002	0	<0.0002	<0.002	0	<0.0002	<0.0002	0	<0.0002	<0.002	0
PFTrDA	mg/kg	0.0002 : 0.002 (Interlab)	<0.0002	<0.0002	0	<0.0002	<0.002	0	<0.0002	<0.0002	0	<0.0002	<0.002	0
PFTeDA	mg/kg	0.0005 : 0.002 (Interlab)	<0.0005	<0.0005	0	<0.0005	<0.002	0	<0.0005	<0.0005	0	<0.0005	<0.002	0
4:2 FTS	mg/kg	0.0005 : 0.001 (Interlab)	<0.0005	<0.0005	0	<0.0005	<0.001	0	<0.0005	<0.0005	0	<0.0005	<0.001	0
6:2 FTS	mg/kg	0.0005 : 0.001 (Interlab)	<0.0005	<0.0005	0	<0.0005	<0.001	0	<0.0005	<0.0005	0	<0.0005	<0.001	0
8:2 FTS	mg/kg	0.0005 : 0.001 (Interlab)	0.0006	0.0006	0	0.0006	<0.001	0	<0.0005	<0.0005	0	<0.0005	<0.001	0
10:2 FTS	mg/kg	0.0005 : 0.002 (Interlab)	<0.0005	<0.0005	0	<0.0005	<0.002	0	<0.0005	<0.0005	0	<0.0005	<0.002	0
MeFOSAA	mg/kg	0.0002 : 0.002 (Interlab)	<0.0002	<0.0002	0	<0.0002	<0.002	0	<0.0002	<0.0002	0	<0.0002	<0.002	0
EtFOSAA	mg/kg	0.0002 : 0.002 (Interlab)	<0.0002	<0.0002	0	<0.0002	<0.002	0	<0.0002	<0.0002	0	<0.0002	<0.002	0
FOSA	mg/kg	0.0002 : 0.001 (Interlab)	0.004	0.0035	13	0.004	0.0031	25	0.0003	<0.0002	40	0.0003	<0.001	0
EtFOSA	mg/kg	0.0005 : 0.002 (Interlab)	<0.0005	<0.0005	0	<0.0005	<0.002	0	<0.0005	<0.0005	0	<0.0005	<0.002	0
MeFOSA	mg/kg	0.0005 : 0.002 (Interlab)	<0.0005	<0.0005	0	<0.0005	<0.002	0	<0.0005	<0.0005	0	<0.0005	<0.002	0
EtFOSE	mg/kg	0.0005 : 0.005 (Interlab)	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0
MeFOSE	mg/kg	0.0005 : 0.005 (Interlab)	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0

*RPDs have only been considered where a concentration is greater than 1 times the EQL.
**High RPDs are in bold (Acceptable RPDs for each EQL multiplier range are: 81 (1-10 x EQL); 50 (10-30 x EQL); 30 (> 30 x EQL))
***Interlab Duplicates are matched on a per compound basis as methods vary between laboratories. Any methods in the row header relate to those used in the primary laboratory

Lab Report Number			EB1921176-AK	EB1921176-AK		EB1921176-AK	RN1244319	
Field ID			AY_SED01_190806	AY_QC106_190806	**RPD**	AY_SED01_190806	AY_QC206_190806	**RPD**
Sampled Date			6/08/2019	6/08/2019		6/08/2019	6/08/2019	
	Units	**LOR**						
PFBS	mg/kg	0.0002 : 0.001 (Interlab)	<0.0002	<0.0002	0	<0.0002	<0.001	0
PFPeS	mg/kg	0.0002 : 0.001 (Interlab)	<0.0002	<0.0002	0	<0.0002	<0.001	0
PFHxS	mg/kg	0.0002 : 0.001 (Interlab)	<0.0002	<0.0002	0	<0.0002	<0.001	0
PFHpS	mg/kg	0.0002 : 0.001 (Interlab)	<0.0002	<0.0002	0	<0.0002	<0.001	0
PFOS	mg/kg	0.0002 : 0.002 (Interlab)	0.0009	0.0006	40	0.0009	<0.002	0
PFDS	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.001	0
PFBA	mg/kg	0.001	<0.001	<0.001	0	<0.001	<0.002	0
PFPeA	mg/kg	0.0002 : 0.002 (Interlab)	<0.0002	<0.0002	0	<0.0002	<0.002	0
PFHxA	mg/kg	0.0002 : 0.001 (Interlab)	<0.0002	<0.0002	0	<0.0002	<0.001	0
PFHpA	mg/kg	0.0002 : 0.001 (Interlab)	<0.0002	<0.0002	0	<0.0002	<0.001	0
PFOA	mg/kg	0.0002 : 0.001 (Interlab)	<0.0002	<0.0002	0	<0.0002	<0.001	0
PFNA	mg/kg	0.0002 : 0.001 (Interlab)	<0.0002	<0.0002	0	<0.0002	<0.001	0
PFDA	mg/kg	0.0002 : 0.001 (Interlab)	<0.0002	<0.0002	0	<0.0002	<0.001	0
PFUnDA	mg/kg	0.0002 : 0.002 (Interlab)	<0.0002	<0.0002	0	<0.0002	<0.002	0
PFDoDA	mg/kg	0.0002 : 0.002 (Interlab)	<0.0002	<0.0002	0	<0.0002	<0.002	0
PFTrDA	mg/kg	0.0002 : 0.002 (Interlab)	<0.0002	<0.0002	0	<0.0002	<0.002	0
PFTeDA	mg/kg	0.0005 : 0.002 (Interlab)	<0.0005	<0.0005	0	<0.0005	<0.002	0
4:2 FTS	mg/kg	0.0005 : 0.001 (Interlab)	<0.0005	<0.0005	0	<0.0005	<0.001	0
6:2 FTS	mg/kg	0.0005 : 0.001 (Interlab)	<0.0005	<0.0005	0	<0.0005	<0.001	0
8:2 FTS	mg/kg	0.0005 : 0.001 (Interlab)	<0.0005	<0.0005	0	<0.0005	<0.001	0
10:2 FTS	mg/kg	0.0005 : 0.002 (Interlab)	<0.0005	<0.0005	0	<0.0005	<0.002	0
MeFOSAA	mg/kg	0.0002 : 0.002 (Interlab)	<0.0002	<0.0002	0	<0.0002	<0.002	0
EtFOSAA	mg/kg	0.0002 : 0.002 (Interlab)	<0.0002	<0.0002	0	<0.0002	<0.002	0
FOSA	mg/kg	0.0002 : 0.001 (Interlab)	<0.0002	<0.0002	0	<0.0002	<0.001	0
EtFOSA	mg/kg	0.0005 : 0.002 (Interlab)	<0.0005	<0.0005	0	<0.0005	<0.002	0
MeFOSA	mg/kg	0.0005 : 0.002 (Interlab)	<0.0005	<0.0005	0	<0.0005	<0.002	0
EtFOSE	mg/kg	0.0005 : 0.005 (Interlab)	<0.0005	<0.0005	0	<0.0005	<0.005	0
MeFOSE	mg/kg	0.0005 : 0.005 (Interlab)	<0.0005	<0.0005	0	<0.0005	<0.005	0

*RPDs have only been considered where a concentration is greater than 1 times the EQL.

**High RPDs are in bold (Acceptable RPDs for each EQL multiplier range are: 81 (1-10 x EQL); 50 (10-30 x EQL); 30 (> 30 x EQL))

***Interlab Duplicates are matched on a per compound basis as methods vary between laboratories. Any methods in the row header relate to those used in the primary laboratory

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Lab Report Number	EB1921176-AK	EB1921176-AK		EB1921176-AK	RN1244319	
Field ID	AY_MW01_190806	AY_QC105_190806	RPD	AY_MW01_190806	AY_QC205_190806	RPD
Sampled Date	6/08/2019	6/08/2019		6/08/2019	6/08/2019	
	Units	LOR						
PFBS	mg/kg	0.0002 : 0.001 (Interlab)	<0.1	<0.1	0	<0.1	0.036	0
PFPeS	mg/kg	0.0002 : 0.001 (Interlab)	0.11	<0.1	10	0.11	0.084	27
PFHxS	mg/kg	0.0002 : 0.001 (Interlab)	3.74	4.22	12	3.74	4	7
PFHpS	mg/kg	0.0002 : 0.001 (Interlab)	0.27	0.25	8	0.27	0.32	17
PFOS	mg/kg	0.0002 : 0.002 (Interlab)	50	59.9	18	50	45	11
PFDS	mg/kg	0.0002	<0.1	<0.1	0	<0.1	<0.001	0
PFBA	mg/kg	0.001	<0.5	<0.5	0	<0.5	0.11	0
PFPeA	mg/kg	0.0002 : 0.002 (Interlab)	0.25	0.26	4	0.25	0.3	18
PFHxA	mg/kg	0.0002 : 0.001 (Interlab)	0.36	0.38	5	0.36	0.36	0
PFHpA	mg/kg	0.0002 : 0.001 (Interlab)	0.58	0.61	5	0.58	0.44	27
PFOA	mg/kg	0.0002 : 0.001 (Interlab)	0.9	0.93	3	**0.9**	**0.63**	**35**
PFNA	mg/kg	0.0002 : 0.001 (Interlab)	**0.15**	**0.11**	**31**	**0.15**	**0.1**	**40**
PFDA	mg/kg	0.0002 : 0.001 (Interlab)	<0.1	<0.1	0	<0.1	0.01	0
PFUnDA	mg/kg	0.0002 : 0.002 (Interlab)	<0.1	<0.1	0	<0.1	0.0083	0
PFDoDA	mg/kg	0.0002 : 0.002 (Interlab)	<0.1	<0.1	0	<0.1	<0.001	0
PFTrDA	mg/kg	0.0002 : 0.002 (Interlab)	<0.1	<0.1	0	<0.1	<0.002	0
PFTeDA	mg/kg	0.0005 : 0.002 (Interlab)	<0.25	<0.25	0	<0.25	<0.002	0
4:2 FTS	mg/kg	0.0005 : 0.001 (Interlab)	<0.1	<0.1	0	<0.1	<0.001	0
6:2 FTS	mg/kg	0.0005 : 0.001 (Interlab)	1.37	1.35	1	**1.37**	**0.81**	**51**
8:2 FTS	mg/kg	0.0005 : 0.001 (Interlab)	<0.1	<0.1	0	<0.1	0.0069	0
10:2 FTS	mg/kg	0.0005 : 0.002 (Interlab)	<0.1	<0.1	0	<0.1	<0.001	0
MeFOSAA	mg/kg	0.0002 : 0.002 (Interlab)	<0.1	<0.1	0	<0.1	<0.002	0
EtFOSAA	mg/kg	0.0002 : 0.002 (Interlab)	<0.1	<0.1	0	<0.1	<0.002	0
FOSA	mg/kg	0.0002 : 0.001 (Interlab)	<0.1	<0.1	0	<0.1	0.0087	0
EtFOSA	mg/kg	0.0005 : 0.002 (Interlab)	<0.25	<0.25	0	<0.25	<0.002	0
MeFOSA	mg/kg	0.0005 : 0.002 (Interlab)	<0.25	<0.25	0	<0.25	<0.002	0
EtFOSE	mg/kg	0.0005 : 0.005 (Interlab)	<0.25	<0.25	0	<0.25	<0.005	0
MeFOSE	mg/kg	0.0005 : 0.005 (Interlab)	<0.25	<0.25	0	<0.25	<0.005	0

*RPDs have only been considered where a concentration is greater than 1 times the EQL.
**High RPDs are in bold (Acceptable RPDs for each EQL multiplier range are: 81 (1-10 x EQL); 50 (10-30 x EQL); 30 (> 30 x EQL))
***Interlab Duplicates are matched on a per compound basis as methods vary between laboratories. Any methods in the row header relate to those used in the primary laboratory

AECOM Imagine it. Delivered.

Lab Report Number		EB1919839	EB1919839	EB1919839	EB1921176-AK
Field ID		AY-QC300_190723	AY-QC301_190723	AY_QC302_190724	AY_QC303_190806
Sampled Date		23/07/2019	23/07/2019	24/07/2019	6/08/2019
	Units	**LOR**				
PFBS	mg/kg	0.002	**0.003**	<0.002	<0.002	<0.002
PFPeS	mg/kg	0.002	**0.002**	<0.002	<0.002	<0.002
PFHxS	mg/kg	0.002	**0.028**	<0.002	<0.002	<0.002
PFHpS	mg/kg	0.002	<0.002	<0.002	<0.002	<0.002
PFOS	mg/kg	0.002	**0.038**	<0.002	<0.002	<0.002
PFDS	mg/kg	0.002	<0.002	<0.002	<0.002	<0.002
PFBA	mg/kg	0.01	<0.01	<0.01	<0.01	<0.01
PFPeA	mg/kg	0.002	<0.002	<0.002	<0.002	<0.002
PFHxA	mg/kg	0.002	**0.003**	<0.002	<0.002	<0.002
PFHpA	mg/kg	0.002	<0.002	<0.002	<0.002	<0.002
PFOA	mg/kg	0.002	<0.002	<0.002	<0.002	<0.002
PFNA	mg/kg	0.002	<0.002	<0.002	<0.002	<0.002
PFDA	mg/kg	0.002	<0.002	<0.002	<0.002	<0.002
PFUnDA	mg/kg	0.002	<0.002	<0.002	<0.002	<0.002
PFDoDA	mg/kg	0.002	<0.002	<0.002	<0.002	<0.002
PFTrDA	mg/kg	0.002	<0.002	<0.002	<0.002	<0.002
PFTeDA	mg/kg	0.005	<0.005	<0.005	<0.005	<0.005
4:2 FTS	mg/kg	0.005	<0.005	<0.005	<0.005	<0.005
6:2 FTS	mg/kg	0.005	<0.005	<0.005	<0.005	<0.005
8:2 FTS	mg/kg	0.005	<0.005	<0.005	<0.005	<0.005
10:2 FTS	mg/kg	0.005	<0.005	<0.005	<0.005	<0.005
MeFOSAA	mg/kg	0.002	<0.002	<0.002	<0.002	<0.002
EtFOSAA	mg/kg	0.002	<0.002	<0.002	<0.002	<0.002
FOSA	mg/kg	0.002	<0.002	<0.002	<0.002	<0.002
EtFOSA	mg/kg	0.005	<0.005	<0.005	<0.005	<0.005
MeFOSA	mg/kg	0.005	<0.005	<0.005	<0.005	<0.005
EtFOSE	mg/kg	0.005	<0.005	<0.005	<0.005	<0.005
MeFOSE	mg/kg	0.005	<0.005	<0.005	<0.005	<0.005

Appendix H

Analytical Laboratory Reports

ALSCompass
SAMPLING *Intelligence*

ALS

Environmental Division
Brisbane
Work Order Reference
EB1919839

Telephone : +61-7-3243 7222

Custody Document for Submissions via ALS Compass App

Project: 606909758 2.0 → AT **Client:** AECOM Pty Ltd **Project Manager:** James Peachey

Phone: (0425 206 362

ALS Compass COC Reference: 7655 **# Samples:** **Sampler:** Camden McCosker

Phone: (0499 990 214

Turnaround Requirements: Standard 5 Day Urgent

Special Instructions:

2 Esky's

Please report samples with _ YYMMDD end of Sample ID

Custody:

Relinquished by:	Received by:	Relinquished by:	Received by:
Camden	KSchafer	KSchafer	M.BIRCH
Date / Time:	Date / Time: 31.7.19 09:45	Date / Time: 31-7-19 1600	Date / Time: 1/8/19 9.40

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **EB1919839**
Amendment : **1**

Client	: **AECOM Australia Pty Ltd**	Laboratory	: Environmental Division Brisbane
Contact	: CAMDEN McCOSKER	Contact	: Carsten Emrich
Address	: Brisbane	Address	: 2 Byth Street Stafford QLD Australia 4053
E-mail	: camden.mccosker@aecom.com	E-mail	: carsten.emrich@alsglobal.com
Telephone	: ----	Telephone	: +61 7 3552 8616
Facsimile	: ----	Facsimile	: +61-7-3243 7218
Project	: 60609758_AY	Page	: 1 of 4
Order number	: 60609758 2.0	Quote number	: EB2019AECOMAU0002 (BN/112/19)
C-O-C number	: 2655	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	: CAMDEN McCOSKER		

Dates

Date Samples Received	: 01-Aug-2019 09:40	Issue Date	: 12-Aug-2019
Client Requested Due Date	: 08-Aug-2019	Scheduled Reporting Date	: **08-Aug-2019**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Intact.
No. of coolers/boxes	: 2	Temperature	: 2.2°C; 6.1°C - Ice present
Receipt Detail	: MEDIUM ESKY	No. of samples received / analysed	: 56 / 21

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- **Please be advised, samples have been fowarded to NMI as requested on the Chain of Custody. This will incur a freight fowarding fee.**
- Discounted Package Prices apply only when specific ALS Group Codes ('W', 'S', 'NT' suites) are referenced on COCs.
- Please direct any turn around / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months ± 1 week) from receipt of samples.
- 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.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.

Sample Container(s)/Preservation Non-Compliances

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

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **SOIL**

Laboratory sample ID	Client sampling date / time	Client sample ID	(On Hold) SOIL No analysis requested	SOIL - EA055-103 Moisture Content	SOIL - EP231X (solids) PFAS - Full Suite (28 analytes)
EB1919839-001	19-Jul-2019 15:55	AY_BH02_0.1_190719		✓	✓
EB1919839-002	23-Jul-2019 07:36	AY_BH02_0.5_190723		✓	✓
EB1919839-003	23-Jul-2019 07:37	AY_BH02_1.0_190723	✓		
EB1919839-004	23-Jul-2019 07:38	AY_BH02_1.5_190723	✓		
EB1919839-005	23-Jul-2019 08:45	AY_BH02_2.0_190723	✓		
EB1919839-006	23-Jul-2019 08:46	AY_BH02_3.0_190723	✓		
EB1919839-007	23-Jul-2019 08:46	AY_BH02_4.0_190723	✓		
EB1919839-008	23-Jul-2019 08:47	AY_BH02_5.0_190723	✓		
EB1919839-009	23-Jul-2019 08:48	AY_BH02_6.0_190723		✓	✓
EB1919839-010	23-Jul-2019 08:48	AY_BH02_7.0_190723	✓		
EB1919839-011	23-Jul-2019 08:49	AY_BH02_8.0_190723	✓		
EB1919839-012	23-Jul-2019 10:44	AY_SS1_0.1_190723		✓	✓
EB1919839-013	23-Jul-2019 10:45	AY_SS1_0.5_190723		✓	✓
EB1919839-014	23-Jul-2019 10:46	AY_SS2_0.1_190723		✓	✓
EB1919839-015	23-Jul-2019 10:46	AY_SS2_0.5_190723		✓	✓
EB1919839-016	23-Jul-2019 14:46	AY_BH03_0.15_190723		✓	✓
EB1919839-017	23-Jul-2019 14:46	AY_BH03_0.5_190723		✓	✓
EB1919839-018	23-Jul-2019 14:47	AY_BH03_1.0_190723	✓		
EB1919839-019	23-Jul-2019 14:47	AY_BH03_1.5_190723	✓		
EB1919839-020	23-Jul-2019 14:48	AY_BH03_2.0_190723	✓		
EB1919839-021	23-Jul-2019 14:48	AY_BH03_3.0_190723	✓		
EB1919839-022	23-Jul-2019 14:49	AY_BH03_4.0_190723	✓		
EB1919839-023	23-Jul-2019 14:49	AY_BH03_5.0_190723	✓		
EB1919839-024	23-Jul-2019 14:50	AY_BH03_6.0_190723		✓	✓
EB1919839-025	23-Jul-2019 14:50	AY_BH07_7.0_190723	✓		
EB1919839-026	23-Jul-2019 15:06	AY_BH03_8.0_190723	✓		
EB1919839-027	23-Jul-2019 15:45	AY_BH01_0.15_190723		✓	✓
EB1919839-028	23-Jul-2019 15:46	AY_BH01_0.5_190723	✓		
EB1919839-029	23-Jul-2019 15:46	AY_BH01_1.0_190723		✓	✓
EB1919839-030	23-Jul-2019 15:47	AY_BH01_1.5_190723	✓		
EB1919839-031	23-Jul-2019 15:47	AY_BH01_2.0_190723	✓		
EB1919839-032	24-Jul-2019 07:27	AY_BH01_3.0_190724	✓		
EB1919839-033	24-Jul-2019 07:28	AY_BH01_4.0_190724	✓		
EB1919839-034	24-Jul-2019 07:28	AY_BH01_5.0_190724	✓		
EB1919839-035	24-Jul-2019 07:28	AY_BH01_6.0_190724		✓	✓

			(On Hold) SOIL No analysis requested	SOIL - EA055-103 Moisture Content	SOIL - EP231X (solids) PFAS - Full Suite (28 analytes)
EB1919839-036	24-Jul-2019 07:29	AY_BH01_7.0_190724	✓		
EB1919839-037	24-Jul-2019 07:29	AY_BH01_8.0_190724	✓		
EB1919839-038	24-Jul-2019 08:02	AY_BH04_0.15_190724		✓	✓
EB1919839-039	24-Jul-2019 08:03	AY_BH04_0.5_190724	✓		
EB1919839-040	24-Jul-2019 08:04	AY_BH04_1.0_190724		✓	✓
EB1919839-041	24-Jul-2019 08:04	AY_BH04_1.5_190724	✓		
EB1919839-042	24-Jul-2019 09:02	AY_BH04_2.0_190724	✓		
EB1919839-043	24-Jul-2019 09:03	AY_BH04_3.0_190724	✓		
EB1919839-044	24-Jul-2019 09:03	AY_BH04_4.0_190724	✓		
EB1919839-045	24-Jul-2019 09:03	AY_BH04_5.0_190724	✓		
EB1919839-046	24-Jul-2019 09:04	AY_BH04_6.0_190724		✓	✓
EB1919839-047	24-Jul-2019 09:04	AY_BH04_7.0_190724	✓		
EB1919839-048	24-Jul-2019 09:21	AY_BH04_8.0_190724	✓		
EB1919839-050	23-Jul-2019 07:36	AY_QC100_190723		✓	✓
EB1919839-052	23-Jul-2019 14:40	AY-QC101_190723		✓	✓
EB1919839-053	23-Jul-2019 14:41	AY-QC102_190723	✓		
EB1919839-054	24-Jul-2019 07:25	AY-QC103_190724	✓		
EB1919839-055	24-Jul-2019 08:05	AY_QC104_190724	✓		

Matrix: **WATER**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	WATER - EP231X-LL (EB) PFAS - Full Suite Low Level (28 analytes)
EB1919839-049	23-Jul-2019 07:01	AY-QC300_190723	✓
EB1919839-051	23-Jul-2019 14:39	AY-QC301_190723	✓
EB1919839-056	24-Jul-2019 08:06	AY_QC302_190724	✓

Proactive Holding Time Report

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

Requested Deliverables

ACCOUNTS PAYABLE

- A4 - AU Tax Invoice (INV)	Email	AP_CustomerService.ANZ@aecom.com

CAMDEN McCOSKER

- *AU Certificate of Analysis - NATA (COA)	Email	camden.mccosker@aecom.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	camden.mccosker@aecom.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	camden.mccosker@aecom.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	camden.mccosker@aecom.com
- A4 - AU Tax Invoice (INV)	Email	camden.mccosker@aecom.com
- Chain of Custody (CoC) (COC)	Email	camden.mccosker@aecom.com
- EDI Format - ESDAT (ESDAT)	Email	camden.mccosker@aecom.com
- EDI Format - XTab (XTAB)	Email	camden.mccosker@aecom.com

JAMES PEACHEY

- *AU Certificate of Analysis - NATA (COA)	Email	james.peachey@aecom.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	james.peachey@aecom.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	james.peachey@aecom.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	james.peachey@aecom.com
- A4 - AU Tax Invoice (INV)	Email	james.peachey@aecom.com
- Chain of Custody (CoC) (COC)	Email	james.peachey@aecom.com
- EDI Format - ESDAT (ESDAT)	Email	james.peachey@aecom.com
- EDI Format - XTab (XTAB)	Email	james.peachey@aecom.com

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB1919839**	Page	: 1 of 13
Amendment	: **1**		
Client	: **AECOM Australia Pty Ltd**	Laboratory	: Environmental Division Brisbane
Contact	: CAMDEN McCOSKER	Contact	: Carsten Emrich
Address	: Brisbane	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: ----	Telephone	: +61 7 3552 8616
Project	: 60609758_AY	Date Samples Received	: 01-Aug-2019 09:40
Order number	: 60609758 2.0	Date Analysis Commenced	: 01-Aug-2019
C-O-C number	: 2655	Issue Date	: 12-Aug-2019 10:44
Sampler	: CAMDEN McCOSKER		
Site	: ----		
Quote number	: BN/112/19		
No. of samples received	: 56		
No. of samples analysed	: 21		

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*
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD
Minh Wills	2IC Organic Chemist	Brisbane Organics, 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 sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

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

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

- Amendment (12/08/19): This report has been amended following minor ID formatting corrections. The date has been added to the end of the sample ID. All analysis results are as per the previous report
- EP231X: Sample shows poor duplicate results due to sample heterogeneity. Confirmed by re-extraction and re-analysis.

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	AY_BH02_0.1_190719	AY_BH02_0.5_190723	AY_BH02_6.0_190723	AY_SS1_0.1_190723	AY_SS1_0.5_190723
				Client sampling date / time	19-Jul-2019 15:55	23-Jul-2019 07:36	23-Jul-2019 08:48	23-Jul-2019 10:44	23-Jul-2019 10:45
Compound	CAS Number	LOR	Unit		EB1919839-001	EB1919839-002	EB1919839-009	EB1919839-012	EB1919839-013
					Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	0.1	%		**13.8**	**10.0**	**6.1**	**15.5**	**10.2**
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg		**0.0003**	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg		**0.0003**	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg		**0.0050**	**0.0029**	**0.0009**	**0.0023**	**0.0008**
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg		**0.0004**	**0.0003**	<0.0002	<0.0002	<0.0002
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg		**0.0644**	**0.0719**	**0.0247**	**0.0398**	**0.0414**
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg		**0.0039**	**0.0028**	<0.0002	**0.0022**	**0.0022**
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg		**0.001**	<0.001	<0.001	**0.001**	<0.001
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg		**0.0036**	**0.0010**	<0.0002	**0.0040**	**0.0003**
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg		**0.0031**	**0.0010**	<0.0002	**0.0029**	**0.0003**
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg		**0.0040**	**0.0011**	<0.0002	**0.0033**	**0.0004**
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg		**0.0025**	**0.0012**	**0.0003**	**0.0017**	**0.0005**
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg		**0.0029**	**0.0016**	<0.0002	**0.0015**	**0.0008**
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg		**0.0038**	**0.0025**	<0.0002	**0.0026**	**0.0013**
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg		**0.0046**	**0.0011**	<0.0002	**0.0029**	**0.0005**
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg		**0.0012**	<0.0002	<0.0002	**0.0008**	<0.0002
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg		**0.0003**	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg		**0.0011**	**0.0040**	<0.0002	**0.0008**	**0.0041**
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	AY_BH02_0.1_190719	AY_BH02_0.5_190723	AY_BH02_6.0_190723	AY_SS1_0.1_190723	AY_SS1_0.5_190723
				Client sampling date / time	19-Jul-2019 15:55	23-Jul-2019 07:36	23-Jul-2019 08:48	23-Jul-2019 10:44	23-Jul-2019 10:45
Compound	CAS Number	LOR	Unit		EB1919839-001	EB1919839-002	EB1919839-009	EB1919839-012	EB1919839-013
					Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg		**0.0006**	<0.0005	<0.0005	**0.0029**	<0.0005
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg		**0.0012**	**0.0006**	<0.0005	**0.0019**	**0.0040**
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg		**0.0012**	<0.0005	<0.0005	**0.0012**	<0.0005
EP231P: PFAS Sums									
Sum of PFAS	----	0.0002	mg/kg		**0.105**	**0.0920**	**0.0259**	**0.0718**	**0.0566**
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg		**0.0694**	**0.0748**	**0.0256**	**0.0421**	**0.0422**
Sum of PFAS (WA DER List)	----	0.0002	mg/kg		**0.0857**	**0.0797**	**0.0259**	**0.0598**	**0.0477**
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.0002	%		**75.5**	**92.5**	**112**	**70.0**	**87.5**
13C8-PFOA	----	0.0002	%		**91.0**	**95.5**	**110**	**86.5**	**96.5**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	AY_SS2_0.1_190723	AY_SS2_0.5_190723	AY_BH03_0.15_190723	AY_BH03_0.5_190723	AY_BH03_6.0_190723
			Client sampling date / time	23-Jul-2019 10:46	23-Jul-2019 10:46	23-Jul-2019 14:46	23-Jul-2019 14:46	23-Jul-2019 14:50
Compound	CAS Number	LOR	Unit	EB1919839-014	EB1919839-015	EB1919839-016	EB1919839-017	EB1919839-024
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	**18.5**	**6.2**	**10.5**	**8.0**	**12.5**
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	**0.0003**
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	**0.0004**
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	**0.0009**	**0.0004**	<0.0002	**0.0057**	**0.0029**
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	**0.0018**	**0.0003**
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	**0.0108**	**0.102**	**0.0099**	**0.182**	**0.0207**
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	**0.0008**	**0.0004**	<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	<0.001
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	**0.0003**
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	**0.0003**	**0.0003**	<0.0002	<0.0002	**0.0009**
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	**0.0002**	<0.0002	<0.0002	<0.0002	**0.0002**
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	**0.0003**	<0.0002	<0.0002	**0.0011**	**0.0004**
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	**0.0004**	**0.0003**	**0.0011**	**0.0233**	**0.0011**
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	**0.0005**	<0.0002	<0.0002	<0.0002
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	**0.0126**	**0.0042**	**0.0027**	**0.0014**	<0.0002
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	**0.0004**	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	**0.0079**	**0.0002**	**0.0005**	<0.0002	<0.0002
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	**0.0002**	<0.0002	<0.0002	**0.0003**	<0.0002
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	AY_SS2_0.1_190723	AY_SS2_0.5_190723	AY_BH03_0.15_190723	AY_BH03_0.5_190723	AY_BH03_6.0_190723
				Client sampling date / time	23-Jul-2019 10:46	23-Jul-2019 10:46	23-Jul-2019 14:46	23-Jul-2019 14:46	23-Jul-2019 14:50
Compound	CAS Number	LOR	Unit		EB1919839-014	EB1919839-015	EB1919839-016	EB1919839-017	EB1919839-024
					Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231P: PFAS Sums									
Sum of PFAS	----	0.0002	mg/kg		**0.0348**	**0.108**	**0.0142**	**0.216**	**0.0275**
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg		**0.0117**	**0.102**	**0.0099**	**0.188**	**0.0236**
Sum of PFAS (WA DER List)	----	0.0002	mg/kg		**0.0125**	**0.103**	**0.0099**	**0.189**	**0.0257**
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.0002	%		**89.5**	**82.5**	**78.0**	**77.5**	**89.0**
13C8-PFOA	----	0.0002	%		**95.0**	**93.0**	**94.0**	**91.5**	**96.5**

Analytical Results

Sub-Matrix: SOIL
(Matrix: SOIL)

Compound	CAS Number	LOR	Unit	Client sample ID	AY_BH01_0.15_190723	AY_BH01_1.0_190723	AY_BH01_6.0_190724	AY_BH04_0.15_190724	AY_BH04_1.0_190724
				Client sampling date / time	23-Jul-2019 15:45	23-Jul-2019 15:46	24-Jul-2019 07:28	24-Jul-2019 08:02	24-Jul-2019 08:04
					EB1919839-027	EB1919839-029	EB1919839-035	EB1919839-038	EB1919839-040
					Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	0.1	%		**5.7**	**10.2**	**12.4**	**4.8**	**15.6**
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg		<0.0002	**0.0146**	**0.0033**	<0.0002	**0.0004**
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg		<0.0002	**0.0012**	**0.0003**	<0.0002	**0.0002**
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg		**0.0066**	**0.0034**	**0.0072**	**0.0013**	**0.418**
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	**0.0003**	<0.0002
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg		<0.001	<0.001	<0.001	<0.001	<0.001
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg		<0.0002	<0.0002	**0.0003**	<0.0002	<0.0002
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg		<0.0002	**0.0004**	**0.0004**	<0.0002	<0.0002
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg		<0.0002	**0.0003**	**0.0005**	<0.0002	<0.0002
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg		<0.0002	**0.0033**	**0.0005**	<0.0002	<0.0002
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	**0.0035**
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	**0.0002**	**0.0002**
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	**0.0004**
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	AY_BH01_0.15_190723	AY_BH01_1.0_190723	AY_BH01_6.0_190724	AY_BH04_0.15_190724	AY_BH04_1.0_190724
				Client sampling date / time	23-Jul-2019 15:45	23-Jul-2019 15:46	24-Jul-2019 07:28	24-Jul-2019 08:02	24-Jul-2019 08:04
Compound	CAS Number	LOR	Unit		EB1919839-027	EB1919839-029	EB1919839-035	EB1919839-038	EB1919839-040
					Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg		<0.0005	<0.0005	**0.0011**	<0.0005	<0.0005
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231P: PFAS Sums									
Sum of PFAS	----	0.0002	mg/kg		**0.0066**	**0.0232**	**0.0136**	**0.0018**	**0.423**
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg		**0.0066**	**0.0180**	**0.0105**	**0.0013**	**0.418**
Sum of PFAS (WA DER List)	----	0.0002	mg/kg		**0.0066**	**0.0220**	**0.0133**	**0.0013**	**0.418**
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.0002	%		**87.0**	**89.5**	**87.5**	**81.5**	**85.5**
13C8-PFOA	----	0.0002	%		**95.0**	**90.0**	**91.5**	**82.5**	**91.5**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	AY_BH04_6.0_190724	AY_QC100_190723	AY-QC101_190723	----	----
				Client sampling date / time	24-Jul-2019 09:04	23-Jul-2019 07:36	23-Jul-2019 14:40	----	----
Compound	CAS Number	LOR	Unit		EB1919839-046	EB1919839-050	EB1919839-052	--------	--------
					Result	Result	Result	----	----
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	0.1	%		**6.1**	**9.5**	**7.0**	----	----
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		**0.0013**	**0.0021**	**0.0082**	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg		<0.0002	**0.0003**	**0.0025**	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg		**0.0413**	**0.0490**	**0.241**	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg		<0.0002	**0.0023**	<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	**0.0008**	<0.0002	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg		<0.0002	**0.0007**	<0.0002	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg		<0.0002	**0.0009**	<0.0002	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg		<0.0002	**0.0010**	**0.0014**	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg		**0.0006**	**0.0012**	**0.0284**	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg		<0.0002	**0.0020**	<0.0002	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg		<0.0002	**0.0009**	**0.0017**	----	----
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	**0.0035**	<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	AY_BH04_6.0_190724	AY_QC100_190723	AY-QC101_190723	----	----
				Client sampling date / time	24-Jul-2019 09:04	23-Jul-2019 07:36	23-Jul-2019 14:40	----	----
Compound	CAS Number	LOR	Unit		EB1919839-046	EB1919839-050	EB1919839-052	--------	--------
					Result	Result	Result	----	----
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg		<0.0005	**0.0006**	<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		**0.0432**	**0.0653**	**0.283**	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg		**0.0426**	**0.0511**	**0.249**	----	----
Sum of PFAS (WA DER List)	----	0.0002	mg/kg		**0.0426**	**0.0551**	**0.251**	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.0002	%		**94.0**	**81.5**	**94.0**	----	----
13C8-PFOA	----	0.0002	%		**97.5**	**92.0**	**107**	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	AY-QC300_190723	AY-QC301_190723	AY_QC302_190724	----	----
				Client sampling date / time	23-Jul-2019 07:01	23-Jul-2019 14:39	24-Jul-2019 08:06	----	----
Compound	CAS Number	LOR	Unit		EB1919839-049	EB1919839-051	EB1919839-056	--------	--------
					Result	Result	Result	----	----
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.002	µg/L		**0.003**	<0.002	<0.002	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.002	µg/L		**0.002**	<0.002	<0.002	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.002	µg/L		**0.028**	<0.002	<0.002	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.002	µg/L		<0.002	<0.002	<0.002	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.002	µg/L		**0.038**	<0.002	<0.002	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.002	µg/L		<0.002	<0.002	<0.002	----	----
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.01	µg/L		<0.01	<0.01	<0.01	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.002	µg/L		<0.002	<0.002	<0.002	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.002	µg/L		**0.003**	<0.002	<0.002	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.002	µg/L		<0.002	<0.002	<0.002	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.002	µg/L		<0.002	<0.002	<0.002	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.002	µg/L		<0.002	<0.002	<0.002	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.002	µg/L		<0.002	<0.002	<0.002	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.002	µg/L		<0.002	<0.002	<0.002	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.002	µg/L		<0.002	<0.002	<0.002	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.002	µg/L		<0.002	<0.002	<0.002	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.005	µg/L		<0.005	<0.005	<0.005	----	----
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.002	µg/L		<0.002	<0.002	<0.002	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.005	µg/L		<0.005	<0.005	<0.005	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.005	µg/L		<0.005	<0.005	<0.005	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	AY-QC300_190723	AY-QC301_190723	AY_QC302_190724	----	----
				Client sampling date / time	23-Jul-2019 07:01	23-Jul-2019 14:39	24-Jul-2019 08:06	----	----
Compound	CAS Number	LOR	Unit		EB1919839-049	EB1919839-051	EB1919839-056	--------	--------
					Result	Result	Result	----	----
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.005	µg/L		<0.005	<0.005	<0.005	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.005	µg/L		<0.005	<0.005	<0.005	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.002	µg/L		<0.002	<0.002	<0.002	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.002	µg/L		<0.002	<0.002	<0.002	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.005	µg/L		<0.005	<0.005	<0.005	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.005	µg/L		<0.005	<0.005	<0.005	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.005	µg/L		<0.005	<0.005	<0.005	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.005	µg/L		<0.005	<0.005	<0.005	----	----
EP231P: PFAS Sums									
Sum of PFAS	----	0.002	µg/L		**0.074**	<0.002	<0.002	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.002	µg/L		**0.066**	<0.002	<0.002	----	----
Sum of PFAS (WA DER List)	----	0.002	µg/L		**0.072**	<0.002	<0.002	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.002	%		**89.3**	**85.5**	**86.7**	----	----
13C8-PFOA	----	0.002	%		**107**	**104**	**106**	----	----

Surrogate Control Limits

Sub-Matrix: SOIL		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP231S: PFAS Surrogate			
13C4-PFOS	----	70	130
13C8-PFOA	----	70	130

Sub-Matrix: WATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP231S: PFAS Surrogate			
13C4-PFOS	----	70	130
13C8-PFOA	----	70	130

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EB1919839**	Page	: 1 of 15
Amendment	: **1**		
Client	: **AECOM Australia Pty Ltd**	Laboratory	: Environmental Division Brisbane
Contact	: CAMDEN McCOSKER	Contact	: Carsten Emrich
Address	: Brisbane	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: ----	Telephone	: +61 7 3552 8616
Project	: 60609758_AY	Date Samples Received	: 01-Aug-2019
Order number	: 60609758 2.0	Date Analysis Commenced	: 01-Aug-2019
C-O-C number	: 2655	Issue Date	: 12-Aug-2019
Sampler	: CAMDEN McCOSKER		
Site	: ----		
Quote number	: BN/112/19		
No. of samples received	: 56		
No. of samples analysed	: 21		

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*
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD
Minh Wills	2IC Organic Chemist	Brisbane Organics, 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 (%)*
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 2501989)									
EB1919839-001	AY_BH02_0.1_190719	EA055: Moisture Content	----	0.1	%	13.8	14.1	2.41	0% - 20%
EB1919839-027	AY_BH01_0.15_190723	EA055: Moisture Content	----	0.1	%	5.7	5.5	4.13	0% - 20%
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 2501992)									
EB1919838-035	Anonymous	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	0.0018	0.0017	9.52	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	0.0004	0.0004	0.00	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	0.0088	0.0078	11.5	0% - 20%
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
EB1919839-014	AY_SS2_0.1_190723	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	0.0009	0.0009	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	0.0108	0.0098	10.3	0% - 20%
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	0.0008	0.0007	15.2	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 2501993)									
EB1919839-046	AY_BH04_6.0_190724	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	0.0013	0.0014	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	0.0413	0.0451	8.75	0% - 20%
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
EB1919840-019	Anonymous	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

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: 2501993) - continued									
EB1919840-019	Anonymous	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	0.0016	0.0015	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: 2501992)									
EB1919838-035	Anonymous	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	0.0006	0.0006	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	0.0005	0.0004	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
EB1919839-014	AY_SS2_0.1_190723	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	0.0003	0.0004	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	0.0003	0.0003	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	0.0004	0.0005	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	0.0126	0.0110	14.4	0% - 20%
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	0.0004	0.0004	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	0.0079	# 0.0062	23.9	0% - 20%
		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
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 2501993)									
EB1919839-046	AY_BH04_6.0_190724	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	0.0006	0.0006	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
EB1919840-019	Anonymous	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	0.0002	<0.0002	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 (%)*
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 2501993) - continued									
EB1919840-019	Anonymous	EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	0.0003	0.0003	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	0.0009	0.0008	0.00	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	0.0009	0.0008	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	0.0012	0.0011	9.84	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	0.0048	0.0044	8.26	0% - 20%
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	0.0037	0.0035	5.04	0% - 50%
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	0.0006	0.0006	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: 2501992)									
EB1919838-035	Anonymous	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)	24448-09-7	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
EB1919839-014	AY_SS2_0.1_190723	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)	24448-09-7	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
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 2501993)									
EB1919839-046	AY_BH04_6.0_190724	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

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 (%)*
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 2501993) - continued									
EB1919839-046	AY_BH04_6.0_190724	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)	24448-09-7	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
EB1919840-019	Anonymous	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)	24448-09-7	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: 2501992)									
EB1919838-035	Anonymous	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
EB1919839-014	AY_SS2_0.1_190723	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
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 2501993)									

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 (%)
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 2501993) - continued									
EB1919839-046	AY_BH04_6.0_190724	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
EB1919840-019	Anonymous	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	0.0029	0.0027	7.53	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: 2501826)									
EB1919838-042	Anonymous	EP231X-LL: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.002	µg/L	<0.002	<0.002	0.00	No Limit
		EP231X-LL: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.002	µg/L	<0.002	<0.002	0.00	No Limit
		EP231X-LL: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.002	µg/L	<0.002	<0.002	0.00	No Limit
		EP231X-LL: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.002	µg/L	<0.002	<0.002	0.00	No Limit
		EP231X-LL: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.002	µg/L	<0.002	<0.002	0.00	No Limit
		EP231X-LL: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.002	µg/L	<0.002	<0.002	0.00	No Limit
EB1919842-038	Anonymous	EP231X-LL: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.002	µg/L	<0.002	<0.002	0.00	No Limit
		EP231X-LL: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.002	µg/L	<0.002	<0.002	0.00	No Limit
		EP231X-LL: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.002	µg/L	<0.002	<0.002	0.00	No Limit
		EP231X-LL: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.002	µg/L	<0.002	<0.002	0.00	No Limit
		EP231X-LL: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.002	µg/L	<0.002	<0.002	0.00	No Limit
		EP231X-LL: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.002	µg/L	<0.002	<0.002	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 (%)*
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 2501826)									
EB1919838-042	Anonymous	EP231X-LL: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.002	µg/L	<0.002	<0.002	0.00	No Limit
		EP231X-LL: Perfluorohexanoic acid (PFHxA)	307-24-4	0.002	µg/L	<0.002	<0.002	0.00	No Limit
		EP231X-LL: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.002	µg/L	<0.002	<0.002	0.00	No Limit
		EP231X-LL: Perfluorooctanoic acid (PFOA)	335-67-1	0.002	µg/L	<0.002	<0.002	0.00	No Limit
		EP231X-LL: Perfluorononanoic acid (PFNA)	375-95-1	0.002	µg/L	<0.002	<0.002	0.00	No Limit
		EP231X-LL: Perfluorodecanoic acid (PFDA)	335-76-2	0.002	µg/L	<0.002	<0.002	0.00	No Limit
		EP231X-LL: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.002	µg/L	<0.002	<0.002	0.00	No Limit
		EP231X-LL: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.002	µg/L	<0.002	<0.002	0.00	No Limit
		EP231X-LL: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.002	µg/L	<0.002	<0.002	0.00	No Limit
		EP231X-LL: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.005	µg/L	<0.005	<0.005	0.00	No Limit
		EP231X-LL: Perfluorobutanoic acid (PFBA)	375-22-4	0.01	µg/L	<0.01	<0.01	0.00	No Limit
EB1919842-038	Anonymous	EP231X-LL: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.002	µg/L	<0.002	<0.002	0.00	No Limit
		EP231X-LL: Perfluorohexanoic acid (PFHxA)	307-24-4	0.002	µg/L	<0.002	<0.002	0.00	No Limit
		EP231X-LL: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.002	µg/L	<0.002	<0.002	0.00	No Limit
		EP231X-LL: Perfluorooctanoic acid (PFOA)	335-67-1	0.002	µg/L	<0.002	<0.002	0.00	No Limit
		EP231X-LL: Perfluorononanoic acid (PFNA)	375-95-1	0.002	µg/L	<0.002	<0.002	0.00	No Limit
		EP231X-LL: Perfluorodecanoic acid (PFDA)	335-76-2	0.002	µg/L	<0.002	<0.002	0.00	No Limit
		EP231X-LL: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.002	µg/L	<0.002	<0.002	0.00	No Limit
		EP231X-LL: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.002	µg/L	<0.002	<0.002	0.00	No Limit
		EP231X-LL: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.002	µg/L	<0.002	<0.002	0.00	No Limit
		EP231X-LL: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.005	µg/L	<0.005	<0.005	0.00	No Limit
		EP231X-LL: Perfluorobutanoic acid (PFBA)	375-22-4	0.01	µg/L	<0.01	<0.01	0.00	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 2501826)									
EB1919838-042	Anonymous	EP231X-LL: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.002	µg/L	<0.002	<0.002	0.00	No Limit
		EP231X-LL: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.002	µg/L	<0.002	<0.002	0.00	No Limit
		EP231X-LL: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.002	µg/L	<0.002	<0.002	0.00	No Limit
		EP231X-LL: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.005	µg/L	<0.005	<0.005	0.00	No Limit
		EP231X-LL: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.005	µg/L	<0.005	<0.005	0.00	No Limit
		EP231X-LL: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.005	µg/L	<0.005	<0.005	0.00	No Limit
		EP231X-LL: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.005	µg/L	<0.005	<0.005	0.00	No Limit
EB1919842-038	Anonymous	EP231X-LL: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.002	µg/L	<0.002	<0.002	0.00	No Limit
		EP231X-LL: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.002	µg/L	<0.002	<0.002	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: 2501826) - continued									
EB1919842-038	Anonymous	EP231X-LL: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.002	µg/L	<0.002	<0.002	0.00	No Limit
		EP231X-LL: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.005	µg/L	<0.005	<0.005	0.00	No Limit
		EP231X-LL: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.005	µg/L	<0.005	<0.005	0.00	No Limit
		EP231X-LL: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.005	µg/L	<0.005	<0.005	0.00	No Limit
		EP231X-LL: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.005	µg/L	<0.005	<0.005	0.00	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 2501826)									
EB1919838-042	Anonymous	EP231X-LL: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.005	µg/L	<0.005	<0.005	0.00	No Limit
		EP231X-LL: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.005	µg/L	<0.005	<0.005	0.00	No Limit
		EP231X-LL: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.005	µg/L	<0.005	<0.005	0.00	No Limit
		EP231X-LL: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.005	µg/L	<0.005	<0.005	0.00	No Limit
EB1919842-038	Anonymous	EP231X-LL: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.005	µg/L	<0.005	<0.005	0.00	No Limit
		EP231X-LL: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.005	µg/L	<0.005	<0.005	0.00	No Limit
		EP231X-LL: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.005	µg/L	<0.005	<0.005	0.00	No Limit
		EP231X-LL: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.005	µg/L	<0.005	<0.005	0.00	No Limit
EP231P: PFAS Sums (QC Lot: 2501826)									
EB1919838-042	Anonymous	EP231X-LL: Sum of PFAS	----	0.002	µg/L	<0.002	<0.002	0.00	No Limit
		EP231X-LL: Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.002	µg/L	<0.002	<0.002	0.00	No Limit
		EP231X-LL: Sum of PFAS (WA DER List)	----	0.002	µg/L	<0.002	<0.002	0.00	No Limit
EB1919842-038	Anonymous	EP231X-LL: Sum of PFAS	----	0.002	µg/L	<0.002	<0.002	0.00	No Limit
		EP231X-LL: Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.002	µg/L	<0.002	<0.002	0.00	No Limit
		EP231X-LL: Sum of PFAS (WA DER List)	----	0.002	µg/L	<0.002	<0.002	0.00	No Limit

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

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

Sub-Matrix: **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
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 2501992)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	0.0011 mg/kg	95.0	57	121
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	0.00117 mg/kg	86.3	55	125
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	0.00118 mg/kg	95.3	52	126
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	0.00119 mg/kg	95.4	54	123
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	0.00116 mg/kg	90.5	55	127
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	0.0012 mg/kg	92.9	54	125
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 2501993)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	0.0011 mg/kg	96.8	57	121
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	0.00117 mg/kg	99.1	55	125
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	0.00118 mg/kg	99.2	52	126
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	0.00119 mg/kg	92.8	54	123
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	0.00116 mg/kg	87.9	55	127
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	0.0012 mg/kg	100	54	125
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 2501992)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	0.00625 mg/kg	68.6	52	128
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	89.2	54	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	100	58	127
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	85.6	57	128
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	88.0	60	134
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	82.8	63	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	0.00125 mg/kg	83.6	55	130
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	84.4	62	130
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	82.8	53	134
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	73.2	49	129
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	80.1	59	129
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 2501993)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	0.00625 mg/kg	67.0	52	128
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	85.2	54	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	91.2	58	127
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	88.0	57	128
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	91.6	60	134
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	81.2	63	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	0.00125 mg/kg	83.6	55	130
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	87.2	62	130

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
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 2501993) - continued								
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	84.8	53	134
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	72.4	49	129
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	81.4	59	129
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 2501992)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	96.8	52	132
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	0.00312 mg/kg	88.0	65	126
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	83.5	64	126
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	# 60.7	63	124
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	85.2	58	125
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	87.6	61	130
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	87.6	55	130
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 2501993)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	85.6	52	132
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	0.00312 mg/kg	86.5	65	126
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	84.1	64	126
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	70.4	63	124
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	80.9	58	125
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	86.0	61	130
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	82.4	55	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 2501992)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	0.00116 mg/kg	95.7	54	130
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	0.00118 mg/kg	87.3	61	130
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	0.00119 mg/kg	88.6	62	130
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	0.0012 mg/kg	129	60	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 2501993)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	0.00116 mg/kg	95.7	54	130
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	0.00118 mg/kg	92.8	61	130
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	0.00119 mg/kg	100	62	130
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	0.0012 mg/kg	118	60	130

Sub-Matrix: **WATER**

	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report		
		Spike	Spike Recovery (%)	Recovery Limits (%)

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: 2501826)								
EP231X-LL: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.002	µg/L	<0.002	0.0442 µg/L	91.2	50	130
EP231X-LL: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.002	µg/L	<0.002	0.0469 µg/L	79.7	50	130
EP231X-LL: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.002	µg/L	<0.002	0.0473 µg/L	82.9	50	130
EP231X-LL: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.002	µg/L	<0.002	0.0476 µg/L	82.1	50	130
EP231X-LL: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.002	µg/L	<0.002	0.0464 µg/L	58.2	50	130
EP231X-LL: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.002	µg/L	<0.002	0.0482 µg/L	61.8	40	130
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 2501826)								
EP231X-LL: Perfluorobutanoic acid (PFBA)	375-22-4	0.01	µg/L	<0.01	0.25 µg/L	76.3	50	130
EP231X-LL: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.002	µg/L	<0.002	0.05 µg/L	81.0	50	130
EP231X-LL: Perfluorohexanoic acid (PFHxA)	307-24-4	0.002	µg/L	<0.002	0.05 µg/L	87.0	50	130
EP231X-LL: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.002	µg/L	<0.002	0.05 µg/L	84.6	50	130
EP231X-LL: Perfluorooctanoic acid (PFOA)	335-67-1	0.002	µg/L	<0.002	0.05 µg/L	82.2	50	130
EP231X-LL: Perfluorononanoic acid (PFNA)	375-95-1	0.002	µg/L	<0.002	0.05 µg/L	74.6	50	130
EP231X-LL: Perfluorodecanoic acid (PFDA)	335-76-2	0.002	µg/L	<0.002	0.05 µg/L	70.0	50	130
EP231X-LL: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.002	µg/L	<0.002	0.05 µg/L	60.6	40	130
EP231X-LL: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.002	µg/L	<0.002	0.05 µg/L	60.6	40	130
EP231X-LL: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.002	µg/L	<0.002	0.05 µg/L	68.4	40	130
EP231X-LL: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.005	µg/L	<0.005	0.125 µg/L	74.6	40	130
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 2501826)								
EP231X-LL: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.002	µg/L	<0.002	0.05 µg/L	76.2	40	130
EP231X-LL: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.005	µg/L	<0.005	0.125 µg/L	68.6	40	130
EP231X-LL: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.005	µg/L	<0.005	0.125 µg/L	61.5	40	130
EP231X-LL: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.005	µg/L	<0.005	0.125 µg/L	51.8	50	130
EP231X-LL: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.005	µg/L	<0.005	0.125 µg/L	62.4	40	130
EP231X-LL: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.002	µg/L	<0.002	0.05 µg/L	62.6	50	130
EP231X-LL: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.002	µg/L	<0.002	0.05 µg/L	57.0	40	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 2501826)								
EP231X-LL: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.005	µg/L	<0.005	0.0467 µg/L	91.6	50	130
EP231X-LL: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.005	µg/L	<0.005	0.0474 µg/L	85.2	50	130
EP231X-LL: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.005	µg/L	<0.005	0.0479 µg/L	72.2	50	130
EP231X-LL: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.005	µg/L	<0.005	0.0482 µg/L	54.1	50	130
EP231P: PFAS Sums (QCLot: 2501826)								
EP231X-LL: Sum of PFAS	----	0.002	µg/L	<0.002	----	----	----	----

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
EP231P: PFAS Sums (QCLot: 2501826) - continued								
EP231X-LL: Sum of PFHxS and PFOS	355-46-4/17 63-23-1	0.002	µg/L	<0.002	----	----	----	----
EP231X-LL: Sum of PFAS (WA DER List)	----	0.002	µg/L	<0.002	----	----	----	----

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
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 2501992)							
EB1919838-040	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.00125 mg/kg	81.2	57	121
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.00125 mg/kg	77.6	55	125
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.00125 mg/kg	84.4	52	126
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.00125 mg/kg	88.4	54	123
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.00125 mg/kg	74.4	55	127
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.00125 mg/kg	93.6	54	125
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 2501993)							
EB1919839-050	AY_QC100_190723	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.00125 mg/kg	83.6	57	121
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.00125 mg/kg	88.8	55	125
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.00125 mg/kg	95.2	52	126
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.00125 mg/kg	91.2	54	123
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.00125 mg/kg	# Not Determined	55	127
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.00125 mg/kg	92.8	54	125
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 2501992)							
EB1919838-040	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.00625 mg/kg	60.0	52	128
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.00125 mg/kg	81.6	54	129
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.00125 mg/kg	92.4	58	127
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.00125 mg/kg	82.4	57	128
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.00125 mg/kg	90.4	60	134
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.00125 mg/kg	82.0	63	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.00125 mg/kg	86.8	55	130
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.00125 mg/kg	84.0	62	130
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.00125 mg/kg	80.0	53	134
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.00125 mg/kg	74.4	49	129
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.00312 mg/kg	82.7	59	129

Sub-Matrix: **SOIL**

				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: 2501993)							
EB1919839-050	AY_QC100_190723	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.00625 mg/kg	72.3	52	128
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.00125 mg/kg	103	54	129
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.00125 mg/kg	103	58	127
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.00125 mg/kg	97.6	57	128
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.00125 mg/kg	100	60	134
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.00125 mg/kg	86.8	63	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.00125 mg/kg	96.8	55	130
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.00125 mg/kg	91.2	62	130
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.00125 mg/kg	87.2	53	134
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.00125 mg/kg	73.6	49	129
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.00312 mg/kg	80.9	59	129
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 2501992)							
EB1919838-040	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.00125 mg/kg	95.2	52	132
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.00312 mg/kg	82.7	65	126
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.00312 mg/kg	81.9	64	126
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.00312 mg/kg	68.4	63	124
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.00312 mg/kg	86.8	58	125
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.00125 mg/kg	86.8	61	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.00125 mg/kg	82.4	55	130
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 2501993)							
EB1919839-050	AY_QC100_190723	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.00125 mg/kg	107	52	132
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.00312 mg/kg	87.8	65	126
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.00312 mg/kg	85.7	64	126
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.00312 mg/kg	76.9	63	124
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.00312 mg/kg	86.5	58	125
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.00125 mg/kg	88.0	61	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.00125 mg/kg	86.0	55	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 2501992)							
EB1919838-040	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.00125 mg/kg	86.4	54	130

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 2501992) - continued							
EB1919838-040	Anonymous	EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.00125 mg/kg	79.6	61	130
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.00125 mg/kg	84.0	62	130
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.00125 mg/kg	124	60	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 2501993)							
EB1919839-050	AY_QC100_190723	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.00125 mg/kg	90.4	54	130
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.00125 mg/kg	92.8	61	130
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.00125 mg/kg	94.0	62	130
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.00125 mg/kg	94.8	60	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: 2501826)							
EB1919838-043	Anonymous	EP231X-LL: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.05 µg/L	73.8	50	130
		EP231X-LL: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.05 µg/L	73.0	50	130
		EP231X-LL: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.05 µg/L	76.4	50	130
		EP231X-LL: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.05 µg/L	75.0	50	130
		EP231X-LL: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.05 µg/L	68.6	50	130
		EP231X-LL: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.05 µg/L	57.6	40	130
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 2501826)							
EB1919838-043	Anonymous	EP231X-LL: Perfluorobutanoic acid (PFBA)	375-22-4	0.25 µg/L	71.8	50	130
		EP231X-LL: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.05 µg/L	75.4	50	130
		EP231X-LL: Perfluorohexanoic acid (PFHxA)	307-24-4	0.05 µg/L	81.6	50	130
		EP231X-LL: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.05 µg/L	79.8	50	130
		EP231X-LL: Perfluorooctanoic acid (PFOA)	335-67-1	0.05 µg/L	78.2	50	130
		EP231X-LL: Perfluorononanoic acid (PFNA)	375-95-1	0.05 µg/L	71.0	50	130
		EP231X-LL: Perfluorodecanoic acid (PFDA)	335-76-2	0.05 µg/L	66.4	50	130
		EP231X-LL: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.05 µg/L	53.6	40	130
		EP231X-LL: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.05 µg/L	55.0	40	130
		EP231X-LL: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.05 µg/L	74.8	40	130
		EP231X-LL: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.125 µg/L	61.8	40	130
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 2501826)							
EB1919838-043	Anonymous	EP231X-LL: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.05 µg/L	63.6	40	130
		EP231X-LL: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.125 µg/L	59.9	40	130
		EP231X-LL: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.125 µg/L	52.2	40	130
		EP231X-LL: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.125 µg/L	51.0	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: 2501826) - continued							
EB1919838-043	Anonymous	EP231X-LL: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.125 µg/L	57.1	40	130
		EP231X-LL: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.05 µg/L	52.8	50	130
		EP231X-LL: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.05 µg/L	51.0	40	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 2501826)							
EB1919838-043	Anonymous	EP231X-LL: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05 µg/L	81.4	50	130
		EP231X-LL: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05 µg/L	78.0	50	130
		EP231X-LL: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05 µg/L	69.0	50	130
		EP231X-LL: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05 µg/L	52.4	50	130

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EB1919839**	Page	: 1 of 7
Amendment	: **1**		
Client	: **AECOM Australia Pty Ltd**	Laboratory	: Environmental Division Brisbane
Contact	: CAMDEN McCOSKER	Telephone	: +61 7 3552 8616
Project	: 60609758_AY	Date Samples Received	: 01-Aug-2019
Site	: ----	Issue Date	: 12-Aug-2019
Sampler	: CAMDEN McCOSKER	No. of samples received	: 56
Order number	: 60609758 2.0	No. of samples analysed	: 21

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.**
- **Duplicate outliers exist - please see following pages for full details.**
- **Laboratory Control outliers exist - please see following pages for full details.**
- **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
Duplicate (DUP) RPDs							
EP231B: Perfluoroalkyl Carboxylic Acids	EB1919839--014	AY_SS2_0.1_190723	**Perfluorotridecanoic acid (PFTrDA)**	72629-94-8	23.9 %	0% - 20%	**RPD exceeds LOR based limits**
Laboratory Control Spike (LCS) Recoveries							
EP231C: Perfluoroalkyl Sulfonamides	QC-2501992-002	----	**N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)**	24448-09-7	60.7 %	63-124%	**Recovery less than lower control limit**
Matrix Spike (MS) Recoveries							
EP231A: Perfluoroalkyl Sulfonic Acids	EB1919839--050	AY_QC100_190723	**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
EA055: Moisture Content (Dried @ 105-110°C)							
HDPE Soil Jar (EA055) AY_BH02_0.1_190719	**19-Jul-2019**	**----**	----	----	**01-Aug-2019**	02-Aug-2019	✓
HDPE Soil Jar (EA055) AY_BH02_0.5_190723, AY_BH02_6.0_190723, AY_SS1_0.1_190723, AY_SS1_0.5_190723, AY_SS2_0.1_190723, AY_SS2_0.5_190723, AY_BH03_0.15_190723, AY_BH03_0.5_190723, AY_BH03_6.0_190723, AY_BH01_0.15_190723, AY_BH01_1.0_190723, AY_QC100_190723, AY-QC101_190723	**23-Jul-2019**	**----**	----	----	**01-Aug-2019**	06-Aug-2019	✓
HDPE Soil Jar (EA055) AY_BH01_6.0_190724, AY_BH04_0.15_190724, AY_BH04_1.0_190724, AY_BH04_6.0_190724	**24-Jul-2019**	**----**	----	----	**01-Aug-2019**	07-Aug-2019	✓

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
EP231A: Perfluoroalkyl Sulfonic Acids							
HDPE Soil Jar (EP231X)							
AY_BH02_0.1_190719	**19-Jul-2019**	**02-Aug-2019**	15-Jan-2020	✓	**05-Aug-2019**	11-Sep-2019	✓
HDPE Soil Jar (EP231X)							
AY_BH02_0.5_190723, AY_BH02_6.0_190723, AY_SS1_0.1_190723, AY_SS1_0.5_190723, AY_SS2_0.1_190723, AY_SS2_0.5_190723, AY_BH03_0.15_190723, AY_BH03_0.5_190723, AY_BH03_6.0_190723, AY_BH01_0.15_190723, AY_BH01_1.0_190723, AY_QC100_190723, AY-QC101_190723	**23-Jul-2019**	**02-Aug-2019**	19-Jan-2020	✓	**05-Aug-2019**	11-Sep-2019	✓
HDPE Soil Jar (EP231X)							
AY_BH01_6.0_190724, AY_BH04_0.15_190724, AY_BH04_1.0_190724, AY_BH04_6.0_190724	**24-Jul-2019**	**02-Aug-2019**	20-Jan-2020	✓	**05-Aug-2019**	11-Sep-2019	✓
EP231B: Perfluoroalkyl Carboxylic Acids							
HDPE Soil Jar (EP231X)							
AY_BH02_0.1_190719	**19-Jul-2019**	**02-Aug-2019**	15-Jan-2020	✓	**05-Aug-2019**	11-Sep-2019	✓
HDPE Soil Jar (EP231X)							
AY_BH02_0.5_190723, AY_BH02_6.0_190723, AY_SS1_0.1_190723, AY_SS1_0.5_190723, AY_SS2_0.1_190723, AY_SS2_0.5_190723, AY_BH03_0.15_190723, AY_BH03_0.5_190723, AY_BH03_6.0_190723, AY_BH01_0.15_190723, AY_BH01_1.0_190723, AY_QC100_190723, AY-QC101_190723	**23-Jul-2019**	**02-Aug-2019**	19-Jan-2020	✓	**05-Aug-2019**	11-Sep-2019	✓
HDPE Soil Jar (EP231X)							
AY_BH01_6.0_190724, AY_BH04_0.15_190724, AY_BH04_1.0_190724, AY_BH04_6.0_190724	**24-Jul-2019**	**02-Aug-2019**	20-Jan-2020	✓	**05-Aug-2019**	11-Sep-2019	✓
EP231C: Perfluoroalkyl Sulfonamides							
HDPE Soil Jar (EP231X)							
AY_BH02_0.1_190719	**19-Jul-2019**	**02-Aug-2019**	15-Jan-2020	✓	**05-Aug-2019**	11-Sep-2019	✓
HDPE Soil Jar (EP231X)							
AY_BH02_0.5_190723, AY_BH02_6.0_190723, AY_SS1_0.1_190723, AY_SS1_0.5_190723, AY_SS2_0.1_190723, AY_SS2_0.5_190723, AY_BH03_0.15_190723, AY_BH03_0.5_190723, AY_BH03_6.0_190723, AY_BH01_0.15_190723, AY_BH01_1.0_190723, AY_QC100_190723, AY-QC101_190723	**23-Jul-2019**	**02-Aug-2019**	19-Jan-2020	✓	**05-Aug-2019**	11-Sep-2019	✓
HDPE Soil Jar (EP231X)							
AY_BH01_6.0_190724, AY_BH04_0.15_190724, AY_BH04_1.0_190724, AY_BH04_6.0_190724	**24-Jul-2019**	**02-Aug-2019**	20-Jan-2020	✓	**05-Aug-2019**	11-Sep-2019	✓

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) AY_BH02_0.1_190719	**19-Jul-2019**	**02-Aug-2019**	15-Jan-2020	✓	**05-Aug-2019**	11-Sep-2019	✓
HDPE Soil Jar (EP231X) AY_BH02_0.5_190723, AY_BH02_6.0_190723, AY_SS1_0.1_190723, AY_SS1_0.5_190723, AY_SS2_0.1_190723, AY_SS2_0.5_190723, AY_BH03_0.15_190723, AY_BH03_0.5_190723, AY_BH03_6.0_190723, AY_BH01_0.15_190723, AY_BH01_1.0_190723, AY_QC100_190723, AY-QC101_190723	**23-Jul-2019**	**02-Aug-2019**	19-Jan-2020	✓	**05-Aug-2019**	11-Sep-2019	✓
HDPE Soil Jar (EP231X) AY_BH01_6.0_190724, AY_BH04_0.15_190724, AY_BH04_1.0_190724, AY_BH04_6.0_190724	**24-Jul-2019**	**02-Aug-2019**	20-Jan-2020	✓	**05-Aug-2019**	11-Sep-2019	✓
EP231P: PFAS Sums							
HDPE Soil Jar (EP231X) AY_BH02_0.1_190719	**19-Jul-2019**	**02-Aug-2019**	15-Jan-2020	✓	**05-Aug-2019**	11-Sep-2019	✓
HDPE Soil Jar (EP231X) AY_BH02_0.5_190723, AY_BH02_6.0_190723, AY_SS1_0.1_190723, AY_SS1_0.5_190723, AY_SS2_0.1_190723, AY_SS2_0.5_190723, AY_BH03_0.15_190723, AY_BH03_0.5_190723, AY_BH03_6.0_190723, AY_BH01_0.15_190723, AY_BH01_1.0_190723, AY_QC100_190723, AY-QC101_190723	**23-Jul-2019**	**02-Aug-2019**	19-Jan-2020	✓	**05-Aug-2019**	11-Sep-2019	✓
HDPE Soil Jar (EP231X) AY_BH01_6.0_190724, AY_BH04_0.15_190724, AY_BH04_1.0_190724, AY_BH04_6.0_190724	**24-Jul-2019**	**02-Aug-2019**	20-Jan-2020	✓	**05-Aug-2019**	11-Sep-2019	✓

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-LL) AY-QC300_190723, AY-QC301_190723	**23-Jul-2019**	**01-Aug-2019**	19-Jan-2020	✓	**01-Aug-2019**	19-Jan-2020	✓
HDPE (no PTFE) (EP231X-LL) AY_QC302_190724	**24-Jul-2019**	**01-Aug-2019**	20-Jan-2020	✓	**01-Aug-2019**	20-Jan-2020	✓
EP231B: Perfluoroalkyl Carboxylic Acids							
HDPE (no PTFE) (EP231X-LL) AY-QC300_190723, AY-QC301_190723	**23-Jul-2019**	**01-Aug-2019**	19-Jan-2020	✓	**01-Aug-2019**	19-Jan-2020	✓
HDPE (no PTFE) (EP231X-LL) AY_QC302_190724	**24-Jul-2019**	**01-Aug-2019**	20-Jan-2020	✓	**01-Aug-2019**	20-Jan-2020	✓

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
EP231C: Perfluoroalkyl Sulfonamides							
HDPE (no PTFE) (EP231X-LL) AY-QC300_190723, AY-QC301_190723	**23-Jul-2019**	**01-Aug-2019**	19-Jan-2020	✓	**01-Aug-2019**	19-Jan-2020	✓
HDPE (no PTFE) (EP231X-LL) AY_QC302_190724	**24-Jul-2019**	**01-Aug-2019**	20-Jan-2020	✓	**01-Aug-2019**	20-Jan-2020	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE (no PTFE) (EP231X-LL) AY-QC300_190723, AY-QC301_190723	**23-Jul-2019**	**01-Aug-2019**	19-Jan-2020	✓	**01-Aug-2019**	19-Jan-2020	✓
HDPE (no PTFE) (EP231X-LL) AY_QC302_190724	**24-Jul-2019**	**01-Aug-2019**	20-Jan-2020	✓	**01-Aug-2019**	20-Jan-2020	✓
EP231P: PFAS Sums							
HDPE (no PTFE) (EP231X-LL) AY-QC300_190723, AY-QC301_190723	**23-Jul-2019**	**01-Aug-2019**	19-Jan-2020	✓	**01-Aug-2019**	19-Jan-2020	✓
HDPE (no PTFE) (EP231X-LL) AY_QC302_190724	**24-Jul-2019**	**01-Aug-2019**	20-Jan-2020	✓	**01-Aug-2019**	20-Jan-2020	✓

Quality Control Parameter Frequency Compliance

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

Matrix: **SOIL**

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

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Moisture Content	EA055	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	4	40	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Matrix: **WATER**

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

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Per- and Polyfluoroalkyl Substances (PFAS by LCMSMS	EP231X-LL	2	14	**14.29**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Per- and Polyfluoroalkyl Substances (PFAS by LCMSMS	EP231X-LL	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Per- and Polyfluoroalkyl Substances (PFAS by LCMSMS	EP231X-LL	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Per- and Polyfluoroalkyl Substances (PFAS by LCMSMS	EP231X-LL	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

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

Analytical Methods	Method	Matrix	Method Descriptions
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM (2013) Schedule B(3) Section 7.1 and Table 1 (14 day holding time).
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. Where commercially available, isotopically labelled analogues of the target analytes are used as internal standards for quantification. Where a labelled analogue is not commercially available, the internal standard with similar chemistry and the closest retention time to the target is used for quantification. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. This method complies with the quality control definitions as stated in QSM 5.1. Data is reviewed in line with the DQOs as stated in QSM5.1
Per- and Polyfluoroalkyl Substances (PFAS by LCMSMS	EP231X-LL	WATER	In-house: Analysis of fresh and saline waters by solid phase extraction followed by LC-Electrospray-MS-MS, Negative Mode using MRM. Where commercially available, isotopically labelled analogues of the target analytes are used as internal standards for quantification. Where a labelled analogue is not commercially available, the internal standard with similar chemistry and the closest retention time to the target is used for quantification. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. This method complies with the quality control definitions as stated in QSM 5.1. Data is reviewed in line with the DQOs as stated in QSM5.1

Preparation Methods	Method	Matrix	Method Descriptions
Sample Extraction for PFAS	EP231-PR	SOIL	In house
SPE preparation for LL and saline PFCs	EP231-SPE	WATER	In house

AE0006 / 190802 Am
Due: 09/08/19

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 5/585 Maitland Rd Mayfield West NSW 2304 Ph: 02 4014 2500 E: samples.newcastle@alsglobal.com
☐ NOWRA 4/13 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
☐ 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: townsville.environmental@alsglobal.com
☐ WOLLONGONG 99 Kenny Street Wollongong NSW 2500 Ph: 02 4225 3125 E: portkembla@alsglobal.com

CLIENT: AECOM Pty Ltd	TURNAROUND REQUIREMENTS: ☑ Standard TAT (List due date): 5 Day
OFFICE: Brisbane	(Standard TAT may be longer for some tests e.g. Ultra Trace Organics) ☐ Non Standard or urgent TAT (List due date):
PROJECT: 60609758 2.0	ALS QUOTE NO.: BN/112/19
ORDER NUMBER:	COC SEQUENCE NUMBER (Circle) COC: 1 2 3 4 5 6 7 OF: 1 2 3 4 5 6 7
PROJECT MANAGER: James Peachey	CONTACT PH: 0426 206 362
SAMPLER: Camden McCosker	SAMPLER MOBILE: 0499 990 214
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):	

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:	RELINQUISHED BY:	RECEIVED BY:
Camden			
DATE/TIME: 31/7/19 0940	DATE/TIME:	DATE/TIME: 1/8/19	DATE/TIME:

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL: Please Forward to NMI with the COC

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	EP231X (PFAS 28)		EP231X-ST (PFAS 28 super trace)	EP231X-LL (low level)			HOLD	Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
	AY-QC200-190723	23/7/19	S	IP	1	✓				N19/019408			Forward to NMI
	AY-QC201-190723	"	"	"	1	✓				N19/019409			"
	AY-QC202-190723	"	"	"	1					N19/019410		✓	"
	AY-QC203-190724	24/07/19	"	"	1			# 23/7/19 Am		N19/019411		✓	"
	AY-QC204-190724	"	"	"	1					N19/019412		✓	"
				TOTAL									

RECEIVED 02 AUG 2019

BY: Am 13:58 C

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.

Australian Government
Department of Industry, Innovation and Science

National Measurement Institute

SAMPLE RECEIPT NOTIFICATION

CUSTOMER DETAILS

Attention: JAMES PEACHEY

Customer: AECOM AUSTRALIA PTY LTD

Address: LEVEL 8
FORTITUDE VALLEY QLD 4006

Email: james.peachey@aecom.com

Telephone:

Fax:

LABORATORY DETAILS

Lab: National Measurement Institute

Contact: Susanne Neuman

Address: 105 Delhi Road, North Ryde, NSW
NSW 2113

Email: Susanne.Neuman@measurement.gov.au

Telephone: 02 9449 0181

Fax:

SAMPLE DETAILS

NMI Job Name: **AECO06/190802**

Total No. of Samples: **5**

LRNs	Customer Sample ID	Lab Sample Description
N19/019408	AY_QC200_190723	SOIL 23/07/2019
N19/019409	AY_QC201_190723	SOIL 23/07/2019
N19/019410	AY_QC202_190723	SOIL 23/07/2019
N19/019411	AY_QC203_190724	SOIL 24/07/2019
N19/019412	AY_QC204_190724	SOIL 24/07/2019

SAMPLE RECEIVED CONDITION

Date samples received:	2-AUG-2019
Sample received in good order:	Yes
NMI Quotation no. provided:	
Client purchase order number:	60609758_2_0
Temperature of samples:	Chilled
Comments:	SAMPLE ON HOLD QC203_190724 WAS LABELED ON THE JAR QC203_19
Estimated report date:	9-AUG-2019
Mode of Delivery:	Courier

Additional Terms and Conditions

Incomplete / unclear information about samples or required testing will delay the start of the analysis work

If you require your Purchase Order (PO) number to be included on our invoice, please provide the number during sample submission and before the completion of work to avoid unnecessary delays and/or additional processing/handling fees.

The lodgement of an order or receipt of samples for NMI services referenced in this Sample Receipt Notification constitutes an acceptence of the current version of NMI Terms and Conditions or other applicable Terms referenced in the NMI Quotation. NMI Terms and Conditions are available on the web at http://www.measurement.gov.au/Services/EnvironmentalTesting/Pages/Terms-and-Conditions.aspx

REPORT OF ANALYSIS

Report No. RN1242615

Client	: AECOM AUSTRALIA PTY LTD	**Job No.**	: AECO06/190802
	LEVEL 8	**Quote No.**	: QT-02018
	540 WICKHAM STREET	**Order No.**	: 60609758_2_0
		Date Received	: 02-AUG-2019
Attention	: JAMES PEACHEY	**Sampled By**	: CLIENT
Project Name	: 60609758_2_0		
Your Client Services Manager	: Richard Coghlan	**Phone**	: 02 9449 0161

Lab Reg No.	Sample Ref	Sample Description
N19/019408	AY_QC200_190723	SOIL 23/07/2019
N19/019409	AY_QC201_190723	SOIL 23/07/2019

Lab Reg No.		N19/019408	N19/019409			
Date Sampled		23-JUL-2019	23-JUL-2019			
	Units					Method
PFAS (per-and poly-fluoroalkyl substances)						
PFBA (375-22-4)	mg/kg	<0.002	<0.002			NR70
PFPeA (2706-90-3)	mg/kg	<0.002	<0.002			NR70
PFHxA (307-24-4)	mg/kg	0.0010	<0.001			NR70
PFHpA (375-85-9)	mg/kg	0.0011	<0.001			NR70
PFOA (335-67-1)	mg/kg	0.0013	0.0012			NR70
PFNA (375-95-1)	mg/kg	0.0016	0.030			NR70
PFDA (335-76-2)	mg/kg	0.0026	<0.001			NR70
PFUdA (2058-94-8)	mg/kg	<0.002	<0.002			NR70
PFDoA (307-55-1)	mg/kg	<0.002	<0.002			NR70
PFTrDA (72629-94-8)	mg/kg	<0.002	<0.002			NR70
PFTeDA (376-06-7)	mg/kg	<0.002	<0.002			NR70
PFHxDA (67905-19-5)	mg/kg	<0.002	<0.002			NR70
PFODA (16517-11-6)	mg/kg	<0.005	<0.005			NR70
FOUEA (70887-84-2)	mg/kg	<0.001	<0.001			NR70
PFBS (375-73-5)	mg/kg	<0.001	<0.001			NR70
PFPeS (2706-91-4)	mg/kg	<0.001	<0.001			NR70
PFHxS (355-46-4)	mg/kg	0.0026	0.0064			NR70
PFHpS (375-92-8)	mg/kg	<0.001	0.0017			NR70
PFOS (1763-23-1)	mg/kg	0.062	0.21			NR70
PFNS (68259-12-1)	mg/kg	0.0017	<0.001			NR70
PFDS (335-77-3)	mg/kg	<0.001	<0.001			NR70
PFOSA (754-91-6)	mg/kg	0.0031	<0.001			NR70
N-MeFOSA (31506-32-8)	mg/kg	<0.002	<0.002			NR70
N-EtFOSA (4151-50-2)	mg/kg	<0.002	<0.002			NR70
N-MeFOSAA (2355-31-9)	mg/kg	<0.002	<0.002			NR70
N-EtFOSAA(2991-50-6)	mg/kg	<0.002	<0.002			NR70
N-MeFOSE (24448-09-7)	mg/kg	<0.005	<0.005			NR70
N-EtFOSE (1691-99-2)	mg/kg	<0.005	<0.005			NR70

REPORT OF ANALYSIS

Lab Reg No.		N19/019408	N19/019409			
Date Sampled		23-JUL-2019	23-JUL-2019			
	Units					Method
PFAS (per-and poly-fluoroalkyl substances)						
4:2 FTS (757124-72-4)	mg/kg	<0.001	<0.001			NR70
6:2 FTS (27619-97-2)	mg/kg	<0.001	<0.001			NR70
8:2 FTS (39108-34-4)	mg/kg	<0.001	<0.001			NR70
10:2 FTS (120226-60-0)	mg/kg	<0.002	<0.002			NR70
8:2 diPAP (678-41-1)	mg/kg	<0.002	<0.002			NR70
PFBA (Surrogate Recovery)	%	124	125			NR70
PFPeA (Surrogate Recovery)	%	126	120			NR70
PFHxA (Surrogate Recovery)	%	118	119			NR70
PFHpA (Surrogate Recovery)	%	117	121			NR70
PFOA (Surrogate Recovery)	%	116	123			NR70
PFNA (Surrogate Recovery)	%	115	113			NR70
PFDA (Surrogate Recovery)	%	119	134			NR70
PFUdA (Surrogate Recovery)	%	119	130			NR70
PFDoA (Surrogate Recovery)	%	116	121			NR70
PFTeDA (Surrogate Recovery)	%	119	128			NR70
PFHxDA (Surrogate Recovery)	%	162	154			NR70
FOUEA (Surrogate Recovery)	%	26	3			NR70
PFBS (Surrogate Recovery)	%	121	116			NR70
PFHxS (Surrogate Recovery)	%	115	109			NR70
PFOS (Surrogate Recovery)	%	131	116			NR70
PFOSA (Surrogate Recovery)	%	112	115			NR70
N-MeFOSA (Surrogate Recovery)	%	116	102			NR70
N-EtFOSA (Surrogate Recovery)	%	130	118			NR70
N-MeFOSAA (Surrogate Recovery)	%	88	128			NR70
N-EtFOSAA (Surrogate Recovery)	%	89	107			NR70
N-MeFOSE (Surrogate Recovery)	%	128	121			NR70
N-EtFOSE (Surrogate Recovery)	%	119	130			NR70
4:2 FTS (Surrogate Recovery)	%	77	92			NR70
6:2 FTS (Surrogate Recovery)	%	79	93			NR70
8:2 FTS (Surrogate Recovery)	%	78	99			NR70
8:2 diPAP (Surrogate Recovery)	%	45	41			NR70
Dates						
Date extracted		6-AUG-2019	6-AUG-2019			
Date analysed		12-AUG-2019	12-AUG-2019			

N19/019408
To N19/019409

REPORT OF ANALYSIS

PFOS is quantified using a combined branched and linear standard,
linear and branched isomers are totalled for reporting.
All results corrected for labelled surrogate recoveries.
Selected PFAS surrogate recoveries are biased due to matrix effects.

Danny Slee, Section Manager
Organic - NSW
Accreditation No. 198

13-AUG-2019

Lab Reg No.		**N19/019408**	**N19/019409**			
Date Sampled		**23-JUL-2019**	**23-JUL-2019**			
	Units					**Method**
Trace Elements						
Total Solids	%	90.2	93.0			NT2_49

Pankaj Barai, Analyst
Inorganics - NSW
Accreditation No. 198

13-AUG-2019

All results are expressed on a dry weight basis.

REPORT OF ANALYSIS

This Report supersedes reports: *RN1242284*

Measurement Uncertainty is available upon request.
Chemical Accreditation 198: 105 Delhi Road, North Ryde, NSW, 2113

Australian Government

National Measurement Institute

QUALITY ASSURANCE REPORT

Client: AECOM AUSTRALIA PTY LTD

NMI QA Report No: AECO06/190802/2 **Sample Matrix:** Solid

Analyte	Method	LOR	Blank	Sample Duplicates			Recoveries	
				Sample	Duplicate	RPD	LCS	Matrix Spike
		mg/kg	mg/kg	mg/kg	mg/kg	%	%	%
PFBA (375-22-4)	NR70	0.002	<0.002	NA	NA	NA	114	NA
PFPeA (2706-90-3)	NR70	0.002	<0.002	NA	NA	NA	103	NA
PFHxA (307-24-4)	NR70	0.001	<0.001	NA	NA	NA	108	NA
PFHpA (375-85-9)	NR70	0.001	<0.001	NA	NA	NA	104	NA
PFOA (335-67-1)	NR70	0.001	<0.001	NA	NA	NA	103	NA
PFNA (375-95-1)	NR70	0.001	<0.001	NA	NA	NA	115	NA
PFDA (335-76-2)	NR70	0.001	<0.001	NA	NA	NA	108	NA
PFUdA (2058-94-8)	NR70	0.002	<0.002	NA	NA	NA	108	NA
PFDoA (307-55-1)	NR70	0.002	<0.002	NA	NA	NA	104	NA
PFTrDA (72629-94-8)	NR70	0.002	<0.002	NA	NA	NA	100	NA
PFTeDA (376-06-7)	NR70	0.002	<0.002	NA	NA	NA	118	NA
PFHxDA (67905-19-5)	NR70	0.002	<0.002	NA	NA	NA	91	NA
PFODA (16517-11-6)	NR70	0.005	<0.005	NA	NA	NA	99	NA
FOUEA (70887-84-2)	NR70	0.001	<0.001	NA	NA	NA	104	NA
PFBS (375-73-5)	NR70	0.001	<0.001	NA	NA	NA	95	NA
PFPeS (2706-91-4)	NR70	0.001	<0.001	NA	NA	NA	96	NA
PFHxS (355-46-4)	NR70	0.001	<0.001	NA	NA	NA	102	NA
PFHpS (375-92-8)	NR70	0.001	<0.001	NA	NA	NA	110	NA
PFOS (1763-23-1)	NR70	0.002	<0.002	NA	NA	NA	107	NA
PFNS (68259-12-1)	NR70	0.001	<0.001	NA	NA	NA	108	NA
PFDS (335-77-3)	NR70	0.001	<0.001	NA	NA	NA	106	NA
PFOSA (754-91-6)	NR70	0.001	<0.001	NA	NA	NA	106	NA
N-MeFOSA (31506-32-8)	NR70	0.002	<0.002	NA	NA	NA	96	NA
N-EtFOSA (4151-50-2)	NR70	0.002	<0.002	NA	NA	NA	98	NA
N-MeFOSAA (2355-31-9)	NR70	0.002	<0.002	NA	NA	NA	100	NA
N-EtFOSAA(2991-50-6)	NR70	0.002	<0.002	NA	NA	NA	101	NA
N-MeFOSE (24448-09-7)	NR70	0.005	<0.005	NA	NA	NA	89	NA
N-EtFOSE (1691-99-2)	NR70	0.005	<0.005	NA	NA	NA	128	NA
4:2 FTS (757124-72-4)	NR70	0.001	<0.001	NA	NA	NA	103	NA
6:2 FTS (27619-97-2)	NR70	0.001	<0.001	NA	NA	NA	108	NA
8:2 FTS (39108-34-4)	NR70	0.001	<0.001	NA	NA	NA	101	NA
10:2 FTS (120226-60-0)	NR70	0.002	<0.002	NA	NA	NA	89	NA
8:2 diPAP (678-41-1)	NR70	0.002	<0.002	NA	NA	NA	107	NA

Results expressed in percentage (%) or mg/kg wherever appropriate.
Acceptable Spike recovery is 50-150%.
Maximum acceptable RPDs on spikes and duplicates is 40%.
'NA ' = Not Applicable.
RPD= Relative Percentage Difference.

Signed:

Danny Slee
Organics Manager, NMI-North Ryde

Date: **13/08/2019**

ANZ

FQM - Generic Chain of Custody Form

Environmental Division
Brisbane
Work Order Reference
EB1921176

Telephone : + 61-7-3243 7222

CONSULTANT: AECOM	ADDRESS / OFFICE:	SAMPLER: NK	
PROJECT MANAGER (PM): James Peachey	SITE: QFES Home Hill	MOBILE: 0499989474	PHONE:
PROJECT NUMBER & TASK CODE: 60609758	P.O. NO.: 60609758 2.0	EMAIL REPORT TO: james.peachey@aecom.com; janelle.passler@aecom.com;	
RESULTS REQUIRED (Date):	QUOTE NO.: BN/112/19	ANALYSIS REQUIRED including SUITES (note - suite codes must be listed to attract su	

FOR LABORATORY USE ONLY
COOLER SEAL (circle appropriate)
Intact: Yes No N/A
SAMPLE TEMPERATURE
CHILLED: Yes No

COMMENTS / SPECIAL HANDLING / STORAGE OR DISPOSAL:
Hold onto samples for further TOPA Selection

SAMPLE INFORMATION (note: S = Soil, W=Water)					CONTAINER INFORMATION		EP231X-LL: PFAS Low Level	EP231X-LL (TOPA): PFAS TOPA Low Level		EP231X-ST: PFAS Full Suite Super Trace		EP231X: PFAS Full Suite						

RELINQUISHED BY:		RECEIVED BY		RECEIVED BY		METHOD OF SHIPMENT
Name: N. Sutton	Date: 9/8/19	Name: N. SUTTON	Date: 9/8/19	Name: WB	Date: 13/8/19	Con' Note No:
Of:	Time: 1500	Of: ALS MACKAY	Time: 3:00	Of: ALS BRIS	Time: 9:30am	Transport Co:

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. **Soil Container Codes:** Jar = Unpreserved glass jar

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AECOM

ANZ

FQM - Generic Chain of Custody Form

Q4AN(EV)-007-FM1

CONSULTANT: AECOM	ADDRESS / OFFICE:	SAMPLER: NK	**Destination Laboratory** Brisbane
PROJECT MANAGER (PM): James Peachey	SITE: QFES Ayr	MOBILE: 0499989474	PHONE:
PROJECT NUMBER & TASK CODE: 60609758	P.O. NO.: 60609758 2.0	EMAIL REPORT TO: james.peachey@aecom.com; janelle.passier@aecom.com;	
RESULTS REQUIRED (Date):	QUOTE NO.: BN/112/19	ANALYSIS REQUIRED including SUITES (note - suite codes must be listed to attract suite prices)	

FOR LABORATORY USE ONLY
COOLER SEAL (circle appropriate)
Intact: Yes No N/A
SAMPLE TEMPERATURE
CHILLED: Yes No

COMMENTS / SPECIAL HANDLING / STORAGE OR DISPOSAL:
Hold onto samples for further TOPA Selection

Notes: e.g. Highly contaminated samples e.g. "High PAHs expected". Extra volume for QC or trace LORs etc.

SAMPLE INFORMATION (note: S = Soil, W=Water)					CONTAINER INFORMATION		EP231X-LL: PFAS Low Level	EP231X-LL (TOPA): PFAS TOPA Low Level		EP231X-ST: PFAS Full Suite Super Trace		EP231X: PFAS Full Suite						HOLD
ALS ID	SAMPLE ID	MATRIX	DATE	Time	Type / Code	Total bottles												
10.	AY_MW01_19080606	W	6/08/19	0920	P	1		X										
11.	AY_MW02_190806	W	06/08//19	1100	P	1		X										
12.	AY_MW03_190806	W	06/08//19	1020	P	1		X										
13.	AY_MW04_190806	W	06/08//19	0840	P	1		X										
14.	AY_SW02_190806	W	06/08//19	1730	P	1						X						
15	AY_SW03_190806	W	06/08//19	1700	P	1						X						X
16	AY_SED01_190806	S	06/08//19	1630	J	1								X				
17.	AY_SED02_190806	S	06/08//19	1730	J	1								X				
18	AY_SED03_190806	S	06/08//19	1700	J	1								X				
19.	AY_Tap01_190806	W	06/08//19	1715	P	1						X						
20	AY_QC105_190806	W	06/08//19		P	1		X										
21.	AY_QC106_190806	S	06/08//19		J	1								X				
8	AY_QC205_190806	W	06/08//19		P	1		X										Forward to NMI
	AY_QC206_190806	S	06/08//19		J	1								X				Forward to NMI
22.	AY_QC303_190806	W	06/08//19		P	1		X										

RELINQUISHED BY:		RECEIVED BY		RECEIVED BY		METHOD OF SHIPMENT
Name: N. Hino	Date: 9/8/19	Name: N. SUTTON	Date: 9/8/19	Name:	Date:	Con' Note No:
Of:	Time: 1500	Of: ALS MACKAY	Time: 3:00	Of:	Time:	Transport Co:

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. **Soil Container Codes**: Jar = Unpreserved glass jar

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ANZ

FQM - Generic Chain of Custody Form

AECOM

Q4AN(EV)-007-FM1

CONSULTANT: AECOM	ADDRESS / OFFICE:	SAMPLER: NK	**Destination Laboratory**
PROJECT MANAGER (PM): **James Peachey**	SITE: **QFES Airlie Beach**	MOBILE: 0499989474 PHONE:	Brisbane
PROJECT NUMBER & TASK CODE: **60609758**	P.O. NO.: 60609758 2.0	EMAIL REPORT TO: james.peachey@aecom.com; janelle.passier@aecom.com;	
RESULTS REQUIRED (Date):	QUOTE NO.: BN/112/19	**ANALYSIS REQUIRED including SUITES** (note - suite codes must be listed to attract suite prices)	

FOR LABORATORY USE ONLY
COOLER SEAL (circle appropriate)
Intact: Yes No N/A
SAMPLE TEMPERATURE
CHILLED: Yes No

COMMENTS / SPECIAL HANDLING / STORAGE OR DISPOSAL:
Hold onto samples for further TOPA Selection

SAMPLE INFORMATION (note: S = Soil, W=Water)				CONTAINER INFORMATION			PFAS Low Level	PFAS TOPA Low Level		PFAS Full Suite Super Trace		PFAS Full Suite						Notes: e.g. Highly contaminated samples e.g. "High PAHs expected". Extra volume for QC or trace LORs etc.

RELINQUISHED BY:		RECEIVED BY		RECEIVED BY		METHOD OF SHIPMENT
Name: N. Kelso	Date: 9/8/19	Name: N. SUTTON	Date: 9/8/19	Name:	Date:	Con' Note No:
Of:	Time: 1500	Of: ALS MACKAY	Time: 3:00	Of:	Time:	Transport Co:

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. **Soil Container Codes**: Jar = Unpreserved glass jar

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AECOM

ANZ

FQM - Generic Chain of Custody Form

Q4AN(EV)-007-FM1

CONSULTANT: AECOM	ADDRESS / OFFICE:	SAMPLER: NK	**Destination Laboratory**
PROJECT MANAGER (PM): **James Peachey**	SITE: **QFES Proserpine**	MOBILE: 0499989474 PHONE:	Brisbane
PROJECT NUMBER & TASK CODE: **60609758**	P.O. NO.: 60609758 2.0	EMAIL REPORT TO: james.peachey@aecom.com; janelle.passier@aecom.com;	
RESULTS REQUIRED (Date):	QUOTE NO.: BN/112/19	**ANALYSIS REQUIRED including SUITES** (note - suite codes must be listed to attract suite prices)	

FOR LABORATORY USE ONLY

COOLER SEAL (circle appropriate)

Intact: Yes No N/A

SAMPLE TEMPERATURE

CHILLED: Yes No

COMMENTS / SPECIAL HANDLING / STORAGE OR DISPOSAL:

Hold onto samples for further TOPA Selection

-LL: PFAS Low Level	L (TOPA): PFAS TOPA Low Level	-ST: PFAS Full Suite Super Trace	IX: PFAS Full Suite										

Notes: e.g. Highly contaminated samples e.g. "High PAHs expected". Extra volume for QC or trace LORs etc.

RELINQUISHED BY:		RECEIVED BY		RECEIVED BY		METHOD OF SHIPMENT
Name: N. Vann	Date: 9/8/19	Name: N.SUTTON	Date: 9/8/19	Name:	Date:	Con' Note No:
Of:	Time: 15:00	Of: ALS MACKAY	Time: 3:00	Of:	Time:	Transport Co:

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. **Soil Container Codes:** Jar = Unpreserved glass jar

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SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **EB1921176**

Client	: **AECOM Australia Pty Ltd**	Laboratory	: Environmental Division Brisbane
Contact	: MR JAMES PEACHEY	Contact	: Carsten Emrich
Address	: Brisbane	Address	: 2 Byth Street Stafford QLD Australia 4053
E-mail	: james.peachey@aecom.com	E-mail	: carsten.emrich@alsglobal.com
Telephone	: +61 07 3553 2000	Telephone	: +61 7 3552 8616
Facsimile	: +61 07 3553 2050	Facsimile	: +61-7-3243 7218
Project	: 60609758	Page	: 1 of 4
Order number	: 60609758 2.0	Quote number	: EB2019AECOMAU0002 (BN/112/19)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: QFES		
Sampler	: NK		

Dates

Date Samples Received	: 13-Aug-2019 09:30	Issue Date	: 13-Aug-2019
Client Requested Due Date	: 22-Aug-2019	Scheduled Reporting Date	: **22-Aug-2019**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Intact.
No. of coolers/boxes	: 2	Temperature	: 1.4, 1.2°C - Ice present
Receipt Detail	: MEDIUM ESKIES	No. of samples received / analysed	: 39 / 37

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- **Please be advised that samples "AY_QC205_190806","AY_QC206_190806"," will be forwarded to NMI for analysis. Please note that this will incur a freight forwarding fee.**
- **Please be advised that for sample "AY_SW03_190806"(ALS ID#15), on the submitted Chain of Custody, Super Trace PFAS analysis has been selected as well as an instruction to "HOLD"the sample. This sample will be placed on hold and will not be analysed unless ALS is otherwise advised. If you wish to assign analysis to the sample, please contact Client Services at ALSEnviro.Brisbane@alsglobal.com with your instructions.**
-
- **Please be advised that sample identification "AY_MW01_19080606" (ALS#10) as per the Chain of Custody, has been corrected to "AY_MW01_190806" as per the identification on the container. If this is incorrect please contact Client Services at ALSEnviro.Brisbane@alsglobal.com.**
- Discounted Package Prices apply only when specific ALS Group Codes ('W', 'S', 'NT' suites) are referenced on COCs.
- **Super Trace 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 (3 weeks), Solid (2 months ± 1 week) from receipt of samples.
- Analysis will be conducted by ALS Environmental, Brisbane, NATA accreditation no. 825, Site No. 818 (Micro site no. 18958).
- **Sample(s) requiring volatile organic compound analysis received in airtight containers (ZHE).**
- **Breaches in recommended extraction / analysis holding times (if any) are displayed overleaf in the Proactive Holding Time Report table.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.

Sample Container(s)/Preservation Non-Compliances

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

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **SOIL**

Laboratory sample ID	Client sampling date / time	Client sample ID	SOIL - EA055-103 Moisture Content	SOIL - EP231X (solids) PFAS - Full Suite (28 analytes)
E				
EB1921176-016	06-Aug-2019 16:30	AY_SED01_190806	✓	✓
EB1921176-017	06-Aug-2019 17:30	AY_SED02_190806	✓	✓
EB1921176-018	06-Aug-2019 17:00	AY_SED03_190806	✓	✓
EB1921176-021	06-Aug-2019 00:00	AY_QC106_190806	✓	✓

Matrix: **WATER**

Laboratory sample ID	Client sampling date / time	Client sample ID	(On Hold) WATER No analysis requested	WATER - EP231X-LL (EB) PFAS - Full Suite Low Level (28 analytes)	WATER - EP231X-ST PFAS - Super Trace Waters Long Suite (28
EB1921176-010	06-Aug-2019 09:20	AY_MW01_190806		✓	
EB1921176-011	06-Aug-2019 11:00	AY_MW02_190806		✓	
EB1921176-012	06-Aug-2019 10:20	AY_MW03_190806		✓	
EB1921176-013	06-Aug-2019 08:40	AY_MW04_190806		✓	
EB1921176-014	06-Aug-2019 17:30	AY_SW02_190806			✓

			(On Hold) WATER No analysis requested	WATER - EP231X-LL (EB) PFAS - Full Suite Low Level (28 analytes)	WATER - EP231X-ST PFAS - Super Trace Waters Long Suite (28
EB1921176-015	06-Aug-2019 17:00	AY_SW03_190806	✓		
EB1921176-019	06-Aug-2019 17:15	AY_Tap01_190806			✓
EB1921176-020	06-Aug-2019 00:00	AY_QC105_190806		✓	
EB1921176-022	06-Aug-2019 00:00	AY_QC303_190806		✓	

Proactive Holding Time Report

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

Requested Deliverables

ACCOUNTS PAYABLE

- A4 - AU Tax Invoice (INV)	Email	AP_CustomerService.ANZ@aecom.com

JAMES PEACHEY

- *AU Certificate of Analysis - NATA (COA)	Email	james.peachey@aecom.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	james.peachey@aecom.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	james.peachey@aecom.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	james.peachey@aecom.com
- A4 - AU Tax Invoice (INV)	Email	james.peachey@aecom.com
- Chain of Custody (CoC) (COC)	Email	james.peachey@aecom.com
- EDI Format - ESDAT (ESDAT)	Email	james.peachey@aecom.com

JANELLE PASSIER

- *AU Certificate of Analysis - NATA (COA)	Email	janelle.passier@aecom.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	janelle.passier@aecom.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	janelle.passier@aecom.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	janelle.passier@aecom.com
- A4 - AU Tax Invoice (INV)	Email	janelle.passier@aecom.com
- Chain of Custody (CoC) (COC)	Email	janelle.passier@aecom.com
- EDI Format - ESDAT (ESDAT)	Email	janelle.passier@aecom.com

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB1921176-AK**	Page	: 1 of 13
Amendment	: **3**		
Client	: **AECOM Australia Pty Ltd**	Laboratory	: Environmental Division Brisbane
Contact	: MR JAMES PEACHEY	Contact	: Carsten Emrich
Address	: Brisbane	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: +61 07 3553 2000	Telephone	: +61 7 3552 8616
Project	: 60609758	Date Samples Received	: 13-Aug-2019 09:30
Order number	: 60609758 2.0	Date Analysis Commenced	: 15-Aug-2019
C-O-C number	: ----	Issue Date	: 04-Sep-2019 13:58
Sampler	: NK		
Site	: QFES		
Quote number	: BN/112/19		
No. of samples received	: 13		
No. of samples analysed	: 13		

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*
Diana Mesa	2IC Organic Chemist	Brisbane Organics, Stafford, QLD
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW
Kim McCabe	Senior Inorganic Chemist	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 sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

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

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

- EP231X-LL: Samples were diluted due to matrix interference. LOR adjusted accordingly.
- **Super Trace PFAS analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911 (Micro site no. 14913).**
- Amendment (04/09/2019): This report has been amended and re-released to allow the reporting of additional analytical data.
- Amendment (29/8/19): This report has been amended to allow the splitting of the work order into 5 separate reports. All analysis results are as per the previous report.
- Amendment (30/8/19): This report has been amended to allow the the work order to be split into 4 separate reports. All analysis results are as per the previous report.
- EP231X-ST: Sample EB1921176_015 required dilution prior to extraction due to matrix interferences (high sediment content). LOR values have been adjusted accordingly.
- EP231X-LL & EP231X: Matrix spike shows results out of control limit due to primary sample matrix interference. Confirmed by re-extraction and re-analysis.
- EP231X: Particular samples show poor surrogate recovery due to matrix interference. Confirmed by re-extraction and re-analysis.
- EP231X: Duplicate shows results out of control limit due to sample heterogeneity. Confirmed by re-extraction and re-analysis.

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	AY_SED01_190806	AY_SED02_190806	AY_SED03_190806	AY_QC106_190806	----
				Client sampling date / time	06-Aug-2019 16:30	06-Aug-2019 17:30	06-Aug-2019 17:00	06-Aug-2019 00:00	----
Compound	CAS Number	LOR	Unit		EB1921176-016	EB1921176-017	EB1921176-018	EB1921176-021	--------
					Result	Result	Result	Result	----
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	0.1	%		**28.5**	**24.5**	**58.0**	**26.1**	----
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	**0.0004**	<0.0002	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg		<0.0002	<0.0002	**0.0003**	<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		**0.0009**	**0.0005**	**0.0047**	**0.0006**	----
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	**0.0002**	**0.0003**	<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	**0.0003**	<0.0002	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	AY_SED01_190806	AY_SED02_190806	AY_SED03_190806	AY_QC106_190806	----
				Client sampling date / time	06-Aug-2019 16:30	06-Aug-2019 17:30	06-Aug-2019 17:00	06-Aug-2019 00:00	----
Compound	CAS Number	LOR	Unit		EB1921176-016	EB1921176-017	EB1921176-018	EB1921176-021	--------
					Result	Result	Result	Result	----
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	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	**0.0003**	<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	**0.0010**	**0.0025**	<0.0005	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg		<0.0005	<0.0005	**0.0010**	<0.0005	----
EP231P: PFAS Sums									
Sum of PFAS	----	0.0002	mg/kg		**0.0009**	**0.0019**	**0.0098**	**0.0006**	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg		**0.0009**	**0.0005**	**0.0050**	**0.0006**	----
Sum of PFAS (WA DER List)	----	0.0002	mg/kg		**0.0009**	**0.0019**	**0.0078**	**0.0006**	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.0002	%		**80.5**	**75.5**	**69.5**	**70.5**	----
13C8-PFOA	----	0.0002	%		**89.5**	**86.5**	**76.5**	**75.0**	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	AY_MW01_190806	AY_MW02_190806	AY_MW03_190806	AY_MW04_190806	AY_SW02_190806
				Client sampling date / time	06-Aug-2019 09:20	06-Aug-2019 11:00	06-Aug-2019 10:20	06-Aug-2019 08:40	06-Aug-2019 17:30
Compound	CAS Number	LOR	Unit		EB1921176-010	EB1921176-011	EB1921176-012	EB1921176-013	EB1921176-014
					Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0005	µg/L		----	----	----	----	<0.0005
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.002	µg/L		<0.100	**0.010**	**0.840**	<0.100	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0005	µg/L		----	----	----	----	**0.0086**
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.002	µg/L		**0.110**	<0.010	**1.32**	**0.200**	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0005	µg/L		----	----	----	----	**0.0679**
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.002	µg/L		**3.74**	**0.054**	**7.13**	**5.30**	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0005	µg/L		----	----	----	----	**0.0036**
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.002	µg/L		**0.270**	<0.010	**0.240**	**0.360**	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0003	µg/L		----	----	----	----	**0.0737**
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.002	µg/L		**50.0**	**2.05**	**12.0**	**37.7**	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0005	µg/L		----	----	----	----	<0.0005
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.002	µg/L		<0.100	<0.010	<0.100	<0.100	----
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.002	µg/L		----	----	----	----	<0.002
Perfluorobutanoic acid (PFBA)	375-22-4	0.01	µg/L		<0.50	<0.05	<0.50	<0.50	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0005	µg/L		----	----	----	----	**0.0090**
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.002	µg/L		**0.250**	<0.010	**1.05**	**0.600**	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0005	µg/L		----	----	----	----	**0.0263**
Perfluorohexanoic acid (PFHxA)	307-24-4	0.002	µg/L		**0.360**	<0.010	**2.42**	**0.940**	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0005	µg/L		----	----	----	----	**0.0095**
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.002	µg/L		**0.580**	<0.010	**0.840**	**0.930**	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.0005	µg/L		----	----	----	----	**0.0230**
Perfluorooctanoic acid (PFOA)	335-67-1	0.002	µg/L		**0.900**	**0.035**	**0.770**	**0.830**	----
Perfluorononanoic acid (PFNA)	375-95-1	0.0005	µg/L		----	----	----	----	**0.0015**

Analytical Results

Sub-Matrix: **WATER**
(Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Client sample ID	AY_MW01_190806	AY_MW02_190806	AY_MW03_190806	AY_MW04_190806	AY_SW02_190806
				Client sampling date / time	06-Aug-2019 09:20	06-Aug-2019 11:00	06-Aug-2019 10:20	06-Aug-2019 08:40	06-Aug-2019 17:30
					EB1921176-010	EB1921176-011	EB1921176-012	EB1921176-013	EB1921176-014
					Result	Result	Result	Result	Result
EP231B: Perfluoroalkyl Carboxylic Acids - Continued									
Perfluorononanoic acid (PFNA)	375-95-1	0.002	µg/L		**0.150**	<0.010	<0.100	**1.03**	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.0005	µg/L		----	----	----	----	**0.0008**
Perfluorodecanoic acid (PFDA)	335-76-2	0.002	µg/L		<0.100	<0.010	<0.100	<0.100	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0005	µg/L		----	----	----	----	<0.0005
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.002	µg/L		<0.100	<0.010	<0.100	<0.100	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0005	µg/L		----	----	----	----	<0.0005
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.002	µg/L		<0.100	<0.010	<0.100	<0.100	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0005	µg/L		----	----	----	----	<0.0005
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.002	µg/L		<0.100	<0.010	<0.100	<0.100	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	µg/L		----	----	----	----	<0.0005
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.005	µg/L		<0.250	<0.025	<0.250	<0.250	----
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0005	µg/L		----	----	----	----	**0.0007**
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.002	µg/L		<0.100	<0.010	<0.100	<0.100	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.001	µg/L		----	----	----	----	<0.001
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.005	µg/L		<0.250	<0.025	<0.250	<0.250	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.001	µg/L		----	----	----	----	<0.001
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.005	µg/L		<0.250	<0.025	<0.250	<0.250	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.001	µg/L		----	----	----	----	<0.001
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.005	µg/L		<0.250	<0.025	<0.250	<0.250	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	AY_MW01_190806	AY_MW02_190806	AY_MW03_190806	AY_MW04_190806	AY_SW02_190806
				Client sampling date / time	06-Aug-2019 09:20	06-Aug-2019 11:00	06-Aug-2019 10:20	06-Aug-2019 08:40	06-Aug-2019 17:30
Compound	CAS Number	LOR	Unit		EB1921176-010	EB1921176-011	EB1921176-012	EB1921176-013	EB1921176-014
					Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.001	µg/L		----	----	----	----	<0.001
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.005	µg/L		<0.250	<0.025	<0.250	<0.250	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0005	µg/L		----	----	----	----	<0.0005
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.002	µg/L		<0.100	<0.010	<0.100	<0.100	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0005	µg/L		----	----	----	----	<0.0005
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.002	µg/L		<0.100	<0.010	<0.100	<0.100	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.001	µg/L		----	----	----	----	<0.001
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.005	µg/L		<0.100	<0.010	<0.100	<0.100	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.001	µg/L		----	----	----	----	**0.021**
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.005	µg/L		**1.37**	<0.010	**1.33**	**0.950**	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.001	µg/L		----	----	----	----	**0.003**
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.005	µg/L		<0.100	<0.010	<0.100	<0.100	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.001	µg/L		----	----	----	----	<0.001
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.005	µg/L		<0.100	<0.010	<0.100	<0.100	----
EP231P: PFAS Sums									
Sum of PFAS	----	0.0003	µg/L		----	----	----	----	**0.249**
Sum of PFAS	----	0.002	µg/L		**57.7**	**2.15**	**27.9**	**48.8**	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	AY_MW01_190806	AY_MW02_190806	AY_MW03_190806	AY_MW04_190806	AY_SW02_190806
				Client sampling date / time	06-Aug-2019 09:20	06-Aug-2019 11:00	06-Aug-2019 10:20	06-Aug-2019 08:40	06-Aug-2019 17:30
Compound	CAS Number	LOR	Unit		EB1921176-010	EB1921176-011	EB1921176-012	EB1921176-013	EB1921176-014
					Result	Result	Result	Result	Result
EP231P: PFAS Sums - Continued									
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0003	µg/L		**----**	**----**	**----**	**----**	**0.142**
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.002	µg/L		**53.7**	**2.10**	**19.1**	**43.0**	**----**
Sum of PFAS (WA DER List)	----	0.0003	µg/L		**----**	**----**	**----**	**----**	**0.233**
Sum of PFAS (WA DER List)	----	0.002	µg/L		**57.2**	**2.15**	**26.4**	**47.2**	**----**
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.0005	%		**----**	**----**	**----**	**----**	**90.1**
13C4-PFOS	----	0.002	%		**125**	**120**	**120**	**116**	**----**
13C8-PFOA	----	0.0005	%		**----**	**----**	**----**	**----**	**96.8**
13C8-PFOA	----	0.002	%		**122**	**126**	**121**	**117**	**----**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	AY_SW03_190806	AY_Tap01_190806	AY_QC105_190806	AY_QC303_190806	----
				Client sampling date / time	06-Aug-2019 17:00	06-Aug-2019 17:15	06-Aug-2019 00:00	06-Aug-2019 00:00	----
Compound	CAS Number	LOR	Unit		EB1921176-015	EB1921176-019	EB1921176-020	EB1921176-022	--------
					Result	Result	Result	Result	----
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0005	µg/L		<0.0020	**0.0045**	----	----	----
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.002	µg/L		----	----	<0.100	<0.002	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0005	µg/L		**0.0474**	**0.0044**	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.002	µg/L		----	----	<0.100	<0.002	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0005	µg/L		**0.101**	**0.0398**	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.002	µg/L		----	----	**4.22**	<0.002	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0005	µg/L		**0.0074**	**0.0024**	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.002	µg/L		----	----	**0.250**	<0.002	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0003	µg/L		**0.335**	**0.0652**	----	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.002	µg/L		----	----	**59.9**	<0.002	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0005	µg/L		<0.0020	<0.0005	----	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.002	µg/L		----	----	<0.100	<0.002	----
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.002	µg/L		<0.002	<0.002	----	----	----
Perfluorobutanoic acid (PFBA)	375-22-4	0.01	µg/L		----	----	<0.50	<0.01	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0005	µg/L		**0.0316**	**0.0020**	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.002	µg/L		----	----	**0.260**	<0.002	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0005	µg/L		**0.0342**	**0.0037**	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.002	µg/L		----	----	**0.380**	<0.002	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0005	µg/L		**0.0174**	**0.0014**	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.002	µg/L		----	----	**0.610**	<0.002	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.0005	µg/L		**0.0790**	**0.0025**	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.002	µg/L		----	----	**0.930**	<0.002	----
Perfluorononanoic acid (PFNA)	375-95-1	0.0005	µg/L		**0.0140**	**0.0006**	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	AY_SW03_190806	AY_Tap01_190806	AY_QC105_190806	AY_QC303_190806	----
				Client sampling date / time	06-Aug-2019 17:00	06-Aug-2019 17:15	06-Aug-2019 00:00	06-Aug-2019 00:00	----
Compound	CAS Number	LOR	Unit		EB1921176-015	EB1921176-019	EB1921176-020	EB1921176-022	--------
					Result	Result	Result	Result	----
EP231B: Perfluoroalkyl Carboxylic Acids - Continued									
Perfluorononanoic acid (PFNA)	375-95-1	0.002	µg/L		----	----	**0.110**	<0.002	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.0005	µg/L		**0.0084**	<0.0005	----	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.002	µg/L		----	----	<0.100	<0.002	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0005	µg/L		<0.0020	<0.0005	----	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.002	µg/L		----	----	<0.100	<0.002	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0005	µg/L		<0.0020	<0.0005	----	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.002	µg/L		----	----	<0.100	<0.002	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0005	µg/L		<0.0020	<0.0005	----	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.002	µg/L		----	----	<0.100	<0.002	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	µg/L		<0.0050	<0.0005	----	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.005	µg/L		----	----	<0.250	<0.005	----
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0005	µg/L		**0.0034**	<0.0005	----	----	----
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.002	µg/L		----	----	<0.100	<0.002	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.001	µg/L		<0.005	<0.001	----	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.005	µg/L		----	----	<0.250	<0.005	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.001	µg/L		<0.005	<0.001	----	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.005	µg/L		----	----	<0.250	<0.005	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.001	µg/L		<0.005	<0.001	----	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.005	µg/L		----	----	<0.250	<0.005	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	AY_SW03_190806	AY_Tap01_190806	AY_QC105_190806	AY_QC303_190806	----
				Client sampling date / time	06-Aug-2019 17:00	06-Aug-2019 17:15	06-Aug-2019 00:00	06-Aug-2019 00:00	----
Compound	CAS Number	LOR	Unit		EB1921176-015	EB1921176-019	EB1921176-020	EB1921176-022	--------
					Result	Result	Result	Result	----
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.001	µg/L		<0.005	<0.001	----	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.005	µg/L		----	----	<0.250	<0.005	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0005	µg/L		<0.0020	<0.0005	----	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.002	µg/L		----	----	<0.100	<0.002	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0005	µg/L		<0.0020	<0.0005	----	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.002	µg/L		----	----	<0.100	<0.002	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.001	µg/L		<0.002	<0.001	----	----	----
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.005	µg/L		----	----	<0.100	<0.005	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.001	µg/L		**0.044**	**0.002**	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.005	µg/L		----	----	**1.35**	<0.005	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.001	µg/L		**0.141**	<0.001	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.005	µg/L		----	----	<0.100	<0.005	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.001	µg/L		**0.005**	<0.001	----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.005	µg/L		----	----	<0.100	<0.005	----
EP231P: PFAS Sums									
Sum of PFAS	----	0.0003	µg/L		**0.869**	**0.128**	----	----	----
Sum of PFAS	----	0.002	µg/L		----	----	**68.0**	<0.002	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	AY_SW03_190806	AY_Tap01_190806	AY_QC105_190806	AY_QC303_190806	----
				Client sampling date / time	06-Aug-2019 17:00	06-Aug-2019 17:15	06-Aug-2019 00:00	06-Aug-2019 00:00	----
Compound	CAS Number	LOR	Unit		EB1921176-015	EB1921176-019	EB1921176-020	EB1921176-022	--------
					Result	Result	Result	Result	----
EP231P: PFAS Sums - Continued									
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0003	µg/L		**0.436**	**0.105**	----	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.002	µg/L		----	----	**64.1**	<0.002	----
Sum of PFAS (WA DER List)	----	0.0003	µg/L		**0.783**	**0.121**	----	----	----
Sum of PFAS (WA DER List)	----	0.002	µg/L		----	----	**67.6**	<0.002	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.0005	%		**88.8**	**93.8**	----	----	----
13C4-PFOS	----	0.002	%		----	----	**128**	**85.8**	----
13C8-PFOA	----	0.0005	%		**79.4**	**103**	----	----	----
13C8-PFOA	----	0.002	%		----	----	**120**	**95.3**	----

Surrogate Control Limits

Sub-Matrix: SOIL		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP231S: PFAS Surrogate			
13C4-PFOS	----	70	130
13C8-PFOA	----	70	130

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

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EB1921176-AK**	Page	: 1 of 17
Amendment	: **3**		
Client	: **AECOM Australia Pty Ltd**	Laboratory	: Environmental Division Brisbane
Contact	: MR JAMES PEACHEY	Contact	: Carsten Emrich
Address	: Brisbane	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: +61 07 3553 2000	Telephone	: +61 7 3552 8616
Project	: 60609758	Date Samples Received	: 13-Aug-2019
Order number	: 60609758 2.0	Date Analysis Commenced	: 15-Aug-2019
C-O-C number	: ----	Issue Date	: 04-Sep-2019
Sampler	: NK		
Site	: QFES		
Quote number	: BN/112/19		
No. of samples received	: 13		
No. of samples analysed	: 13		

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*
Diana Mesa	2IC Organic Chemist	Brisbane Organics, Stafford, QLD
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW
Kim McCabe	Senior Inorganic Chemist	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 (%)*
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 2524697)									
EB1921176-005	Anonymous	EA055: Moisture Content	----	0.1	%	8.5	8.3	2.98	0% - 20%
EB1921176-030	Anonymous	EA055: Moisture Content	----	0.1	%	16.8	16.9	0.695	0% - 20%
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 2524688)									
EB1921176-005	Anonymous	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	0.0021	0.0015	35.7	0% - 50%
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
EB1921176-030	Anonymous	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	0.0013	# 0.0022	54.0	0% - 50%
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	0.0004	0.0007	46.9	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 2524688)									
EB1921176-005	Anonymous	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

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 (%)*
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 2524688) - continued									
EB1921176-005	Anonymous	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
EB1921176-030	Anonymous	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	0.0006	0.0009	45.5	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	0.0008	0.0015	53.7	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: 2524688)									
EB1921176-005	Anonymous	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)	24448-09-7	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
EB1921176-030	Anonymous	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)	24448-09-7	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

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 (%)
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 2524688)									
EB1921176-005	Anonymous	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
EB1921176-030	Anonymous	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: 2524698)									
EB1921176-001	Anonymous	EP231X-LL: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.002	µg/L	<0.010	<0.010	0.00	No Limit
		EP231X-LL: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.002	µg/L	<0.010	0.010	0.00	No Limit
		EP231X-LL: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.002	µg/L	0.090	0.083	8.09	No Limit
		EP231X-LL: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.002	µg/L	<0.010	<0.010	0.00	No Limit
		EP231X-LL: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.002	µg/L	0.056	0.031	57.5	No Limit
		EP231X-LL: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.002	µg/L	<0.010	<0.010	0.00	No Limit
EB1921176-020	AY_QC105_190806	EP231X-LL: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.002	µg/L	<0.100	<0.100	0.00	No Limit
		EP231X-LL: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.002	µg/L	<0.100	<0.100	0.00	No Limit
		EP231X-LL: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.002	µg/L	4.22	4.05	4.11	0% - 20%
		EP231X-LL: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.002	µg/L	0.250	0.300	18.2	No Limit
		EP231X-LL: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.002	µg/L	59.9	# 47.1	23.9	0% - 20%
		EP231X-LL: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.002	µg/L	<0.100	<0.100	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 (%)*
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 2531056)									
EB1921176-019	AY_Tap01_190806	EP231X-ST: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0003	µg/L	0.0652	0.0581	11.5	0% - 20%
		EP231X-ST: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0005	µg/L	0.0045	0.0043	2.73	No Limit
		EP231X-ST: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0005	µg/L	0.0044	0.0042	4.16	No Limit
		EP231X-ST: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0005	µg/L	0.0398	0.0364	8.82	0% - 20%
		EP231X-ST: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0005	µg/L	0.0024	0.0023	5.91	No Limit
		EP231X-ST: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0005	µg/L	<0.0005	<0.0005	0.00	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 2547624)									
EB1921176-015	AY_SW03_190806	EP231X-ST: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0003	µg/L	0.335	0.370	9.93	0% - 20%
		EP231X-ST: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0005	µg/L	<0.0020	<0.0020	0.00	No Limit
		EP231X-ST: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0005	µg/L	0.0474	0.0524	10.0	0% - 20%
		EP231X-ST: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0005	µg/L	0.101	0.101	0.397	0% - 20%
		EP231X-ST: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0005	µg/L	0.0074	0.0078	5.26	No Limit
		EP231X-ST: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0005	µg/L	<0.0020	<0.0020	0.00	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 2524698)									
EB1921176-001	Anonymous	EP231X-LL: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.002	µg/L	<0.010	<0.010	0.00	No Limit
		EP231X-LL: Perfluorohexanoic acid (PFHxA)	307-24-4	0.002	µg/L	<0.010	<0.010	0.00	No Limit
		EP231X-LL: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.002	µg/L	<0.010	<0.010	0.00	No Limit
		EP231X-LL: Perfluorooctanoic acid (PFOA)	335-67-1	0.002	µg/L	<0.010	<0.010	0.00	No Limit
		EP231X-LL: Perfluorononanoic acid (PFNA)	375-95-1	0.002	µg/L	<0.010	<0.010	0.00	No Limit
		EP231X-LL: Perfluorodecanoic acid (PFDA)	335-76-2	0.002	µg/L	<0.010	<0.010	0.00	No Limit
		EP231X-LL: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.002	µg/L	<0.010	<0.010	0.00	No Limit
		EP231X-LL: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.002	µg/L	<0.010	<0.010	0.00	No Limit
		EP231X-LL: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.002	µg/L	<0.010	<0.010	0.00	No Limit
		EP231X-LL: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.005	µg/L	<0.025	<0.025	0.00	No Limit
		EP231X-LL: Perfluorobutanoic acid (PFBA)	375-22-4	0.01	µg/L	<0.05	<0.05	0.00	No Limit
EB1921176-020	AY_QC105_190806	EP231X-LL: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.002	µg/L	0.260	0.260	0.00	No Limit
		EP231X-LL: Perfluorohexanoic acid (PFHxA)	307-24-4	0.002	µg/L	0.380	0.340	11.1	No Limit
		EP231X-LL: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.002	µg/L	0.610	0.550	10.3	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 (%)*
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 2524698) - continued									
EB1921176-020	AY_QC105_190806	EP231X-LL: Perfluorooctanoic acid (PFOA)	335-67-1	0.002	µg/L	0.930	0.880	5.52	No Limit
		EP231X-LL: Perfluorononanoic acid (PFNA)	375-95-1	0.002	µg/L	0.110	0.130	16.7	No Limit
		EP231X-LL: Perfluorodecanoic acid (PFDA)	335-76-2	0.002	µg/L	<0.100	<0.100	0.00	No Limit
		EP231X-LL: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.002	µg/L	<0.100	<0.100	0.00	No Limit
		EP231X-LL: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.002	µg/L	<0.100	<0.100	0.00	No Limit
		EP231X-LL: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.002	µg/L	<0.100	<0.100	0.00	No Limit
		EP231X-LL: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.005	µg/L	<0.250	<0.250	0.00	No Limit
		EP231X-LL: Perfluorobutanoic acid (PFBA)	375-22-4	0.01	µg/L	<0.50	<0.50	0.00	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 2531056)									
EB1921176-019	AY_Tap01_190806	EP231X-ST: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0005	µg/L	0.0020	0.0021	4.83	No Limit
		EP231X-ST: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0005	µg/L	0.0037	0.0037	0.00	No Limit
		EP231X-ST: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0005	µg/L	0.0014	0.0013	0.00	No Limit
		EP231X-ST: Perfluorooctanoic acid (PFOA)	335-67-1	0.0005	µg/L	0.0025	0.0023	7.59	No Limit
		EP231X-ST: Perfluorononanoic acid (PFNA)	375-95-1	0.0005	µg/L	0.0006	0.0006	0.00	No Limit
		EP231X-ST: Perfluorodecanoic acid (PFDA)	335-76-2	0.0005	µg/L	<0.0005	<0.0005	0.00	No Limit
		EP231X-ST: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0005	µg/L	<0.0005	<0.0005	0.00	No Limit
		EP231X-ST: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0005	µg/L	<0.0005	<0.0005	0.00	No Limit
		EP231X-ST: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0005	µg/L	<0.0005	<0.0005	0.00	No Limit
		EP231X-ST: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	µg/L	<0.0005	<0.0005	0.00	No Limit
		EP231X-ST: Perfluorobutanoic acid (PFBA)	375-22-4	0.002	µg/L	<0.002	<0.002	0.00	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 2547624)									
EB1921176-015	AY_SW03_190806	EP231X-ST: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0005	µg/L	0.0316	0.0322	1.88	0% - 50%
		EP231X-ST: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0005	µg/L	0.0342	0.0332	2.97	0% - 50%
		EP231X-ST: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0005	µg/L	0.0174	0.0158	9.64	No Limit
		EP231X-ST: Perfluorooctanoic acid (PFOA)	335-67-1	0.0005	µg/L	0.0790	0.0852	7.55	0% - 20%
		EP231X-ST: Perfluorononanoic acid (PFNA)	375-95-1	0.0005	µg/L	0.0140	0.0144	2.82	No Limit
		EP231X-ST: Perfluorodecanoic acid (PFDA)	335-76-2	0.0005	µg/L	0.0084	0.0094	11.2	No Limit
		EP231X-ST: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0005	µg/L	<0.0020	<0.0020	0.00	No Limit
		EP231X-ST: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0005	µg/L	<0.0020	<0.0020	0.00	No Limit
		EP231X-ST: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0005	µg/L	<0.0020	<0.0020	0.00	No Limit
		EP231X-ST: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	µg/L	<0.0050	<0.0050	0.00	No Limit
		EP231X-ST: Perfluorobutanoic acid (PFBA)	375-22-4	0.002	µg/L	<0.002	<0.002	0.00	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 2524698)									
EB1921176-001	Anonymous	EP231X-LL: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.002	µg/L	<0.010	<0.010	0.00	No Limit
		EP231X-LL: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.002	µg/L	<0.010	<0.010	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 (%)
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 2524698) - continued									
EB1921176-001	Anonymous	EP231X-LL: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.002	µg/L	<0.010	<0.010	0.00	No Limit
		EP231X-LL: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.005	µg/L	<0.025	<0.025	0.00	No Limit
		EP231X-LL: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.005	µg/L	<0.025	<0.025	0.00	No Limit
		EP231X-LL: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.005	µg/L	<0.025	<0.025	0.00	No Limit
		EP231X-LL: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.005	µg/L	<0.025	<0.025	0.00	No Limit
EB1921176-020	AY_QC105_190806	EP231X-LL: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.002	µg/L	<0.100	<0.100	0.00	No Limit
		EP231X-LL: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.002	µg/L	<0.100	<0.100	0.00	No Limit
		EP231X-LL: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.002	µg/L	<0.100	<0.100	0.00	No Limit
		EP231X-LL: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.005	µg/L	<0.250	<0.250	0.00	No Limit
		EP231X-LL: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.005	µg/L	<0.250	<0.250	0.00	No Limit
		EP231X-LL: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.005	µg/L	<0.250	<0.250	0.00	No Limit
		EP231X-LL: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.005	µg/L	<0.250	<0.250	0.00	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 2531056)									
EB1921176-019	AY_Tap01_190806	EP231X-ST: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0005	µg/L	<0.0005	<0.0005	0.00	No Limit
		EP231X-ST: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0005	µg/L	<0.0005	<0.0005	0.00	No Limit
		EP231X-ST: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0005	µg/L	<0.0005	<0.0005	0.00	No Limit
		EP231X-ST: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.001	µg/L	<0.001	<0.001	0.00	No Limit
		EP231X-ST: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.001	µg/L	<0.001	<0.001	0.00	No Limit
		EP231X-ST: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.001	µg/L	<0.001	<0.001	0.00	No Limit
		EP231X-ST: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.001	µg/L	<0.001	<0.001	0.00	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 2547624)									
EB1921176-015	AY_SW03_190806	EP231X-ST: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0005	µg/L	0.0034	0.0038	11.1	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: 2547624) - continued									
EB1921176-015	AY_SW03_190806	EP231X-ST: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0005	µg/L	<0.0020	<0.0020	0.00	No Limit
		EP231X-ST: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0005	µg/L	<0.0020	<0.0020	0.00	No Limit
		EP231X-ST: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.001	µg/L	<0.005	<0.005	0.00	No Limit
		EP231X-ST: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.001	µg/L	<0.005	<0.005	0.00	No Limit
		EP231X-ST: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.001	µg/L	<0.005	<0.005	0.00	No Limit
		EP231X-ST: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.001	µg/L	<0.005	<0.005	0.00	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 2524698)									
EB1921176-001	Anonymous	EP231X-LL: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.005	µg/L	<0.010	<0.010	0.00	No Limit
		EP231X-LL: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.005	µg/L	<0.010	<0.010	0.00	No Limit
		EP231X-LL: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.005	µg/L	<0.010	<0.010	0.00	No Limit
		EP231X-LL: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.005	µg/L	<0.010	<0.010	0.00	No Limit
EB1921176-020	AY_QC105_190806	EP231X-LL: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.005	µg/L	<0.100	<0.100	0.00	No Limit
		EP231X-LL: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.005	µg/L	1.35	1.37	1.47	0% - 50%
		EP231X-LL: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.005	µg/L	<0.100	<0.100	0.00	No Limit
		EP231X-LL: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.005	µg/L	<0.100	<0.100	0.00	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 2531056)									
EB1921176-019	AY_Tap01_190806	EP231X-ST: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.001	µg/L	<0.001	<0.001	0.00	No Limit
		EP231X-ST: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.001	µg/L	0.002	0.002	0.00	No Limit
		EP231X-ST: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.001	µg/L	<0.001	<0.001	0.00	No Limit
		EP231X-ST: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.001	µg/L	<0.001	<0.001	0.00	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 2547624)									
EB1921176-015	AY_SW03_190806	EP231X-ST: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.001	µg/L	<0.002	<0.002	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 (%)*
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 2547624) - continued									
EB1921176-015	AY_SW03_190806	EP231X-ST: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.001	µg/L	0.044	0.049	10.7	0% - 20%
		EP231X-ST: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.001	µg/L	0.141	0.143	0.845	0% - 20%
		EP231X-ST: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.001	µg/L	0.005	0.006	19.6	No Limit
EP231P: PFAS Sums (QC Lot: 2524698)									
EB1921176-001	Anonymous	EP231X-LL: Sum of PFAS	----	0.002	µg/L	0.146	0.124	16.3	0% - 50%
		EP231X-LL: Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.002	µg/L	0.146	0.114	24.6	0% - 50%
		EP231X-LL: Sum of PFAS (WA DER List)	----	0.002	µg/L	0.146	0.114	24.6	0% - 50%
EB1921176-020	AY_QC105_190806	EP231X-LL: Sum of PFAS	----	0.002	µg/L	68.0	# 55.0	21.2	0% - 20%
		EP231X-LL: Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.002	µg/L	64.1	# 51.2	22.5	0% - 20%
		EP231X-LL: Sum of PFAS (WA DER List)	----	0.002	µg/L	67.6	# 54.6	21.4	0% - 20%
EP231P: PFAS Sums (QC Lot: 2531056)									
EB1921176-019	AY_Tap01_190806	EP231X-ST: Sum of PFAS	----	0.0003	µg/L	0.128	0.117	9.11	0% - 20%
EP231P: PFAS Sums (QC Lot: 2547624)									
EB1921176-015	AY_SW03_190806	EP231X-ST: Sum of PFAS	----	0.0003	µg/L	0.869	0.923	6.07	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
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 2524688)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	0.0011 mg/kg	93.2	57	121
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	0.00117 mg/kg	92.7	55	125
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	0.00118 mg/kg	78.0	52	126
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	0.00119 mg/kg	92.8	54	123
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	0.00116 mg/kg	77.6	55	127
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	0.0012 mg/kg	90.0	54	125
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 2524688)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	0.00625 mg/kg	# 37.5	52	128
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	73.6	54	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	92.0	58	127
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	77.6	57	128
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	78.8	60	134
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	78.8	63	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	0.00125 mg/kg	58.4	55	130
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	77.2	62	130
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	73.2	53	134
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	60.0	49	129
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	59.3	59	129
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 2524688)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	78.4	52	132
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	0.00312 mg/kg	# 54.5	65	126
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	# 45.4	64	126
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	# 35.2	63	124
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	# 48.1	58	125
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	67.6	61	130
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	62.4	55	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 2524688)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	0.00116 mg/kg	79.3	54	130
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	0.00118 mg/kg	74.2	61	130
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	0.00119 mg/kg	85.3	62	130

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
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 2524688) - continued								
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	0.0012 mg/kg	100	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
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 2524698)								
EP231X-LL: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.002	µg/L	<0.002	0.0442 µg/L	93.7	50	130
EP231X-LL: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.002	µg/L	<0.002	0.0469 µg/L	99.1	50	130
EP231X-LL: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.002	µg/L	<0.002	0.0473 µg/L	85.2	50	130
EP231X-LL: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.002	µg/L	<0.002	0.0476 µg/L	93.5	50	130
EP231X-LL: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.002	µg/L	<0.002	0.0464 µg/L	77.6	50	130
EP231X-LL: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.002	µg/L	<0.002	0.0482 µg/L	64.1	40	130
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 2531056)								
EP231X-ST: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0005	µg/L	<0.0005	0.01 µg/L	78.4	50	130
EP231X-ST: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0005	µg/L	<0.0005	0.01 µg/L	72.0	50	130
EP231X-ST: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0005	µg/L	<0.0005	0.01 µg/L	68.2	50	130
EP231X-ST: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0005	µg/L	<0.0005	0.01 µg/L	82.8	50	130
EP231X-ST: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0003	µg/L	<0.0003	0.01 µg/L	64.4	50	130
EP231X-ST: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0005	µg/L	<0.0005	0.01 µg/L	53.8	50	130
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 2547624)								
EP231X-ST: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0005	µg/L	<0.0005	0.01 µg/L	71.2	50	130
EP231X-ST: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0005	µg/L	<0.0005	0.01 µg/L	79.4	50	130
EP231X-ST: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0005	µg/L	<0.0005	0.01 µg/L	58.0	50	130
EP231X-ST: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0005	µg/L	<0.0005	0.01 µg/L	76.8	50	130
EP231X-ST: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0003	µg/L	<0.0003	0.01 µg/L	65.8	50	130
EP231X-ST: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0005	µg/L	<0.0005	0.01 µg/L	51.8	50	130
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 2524698)								
EP231X-LL: Perfluorobutanoic acid (PFBA)	375-22-4	0.01	µg/L	<0.01	0.25 µg/L	85.6	50	130
EP231X-LL: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.002	µg/L	<0.002	0.05 µg/L	86.2	50	130
EP231X-LL: Perfluorohexanoic acid (PFHxA)	307-24-4	0.002	µg/L	<0.002	0.05 µg/L	91.2	50	130
EP231X-LL: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.002	µg/L	<0.002	0.05 µg/L	90.6	50	130
EP231X-LL: Perfluorooctanoic acid (PFOA)	335-67-1	0.002	µg/L	<0.002	0.05 µg/L	88.0	50	130
EP231X-LL: Perfluorononanoic acid (PFNA)	375-95-1	0.002	µg/L	<0.002	0.05 µg/L	75.6	50	130
EP231X-LL: Perfluorodecanoic acid (PFDA)	335-76-2	0.002	µg/L	<0.002	0.05 µg/L	64.4	50	130
EP231X-LL: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.002	µg/L	<0.002	0.05 µg/L	69.6	40	130
EP231X-LL: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.002	µg/L	<0.002	0.05 µg/L	67.8	40	130
EP231X-LL: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.002	µg/L	<0.002	0.05 µg/L	61.8	40	130
EP231X-LL: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.005	µg/L	<0.005	0.125 µg/L	79.3	40	130
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 2531056)								

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: 2531056) - continued								
EP231X-ST: Perfluorobutanoic acid (PFBA)	375-22-4	0.002	µg/L	<0.002	0.05 µg/L	61.7	30	130
EP231X-ST: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0005	µg/L	<0.0005	0.01 µg/L	68.2	50	130
EP231X-ST: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0005	µg/L	<0.0005	0.01 µg/L	81.4	50	130
EP231X-ST: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0005	µg/L	<0.0005	0.01 µg/L	79.8	50	130
EP231X-ST: Perfluorooctanoic acid (PFOA)	335-67-1	0.0005	µg/L	<0.0005	0.01 µg/L	78.0	50	130
EP231X-ST: Perfluorononanoic acid (PFNA)	375-95-1	0.0005	µg/L	<0.0005	0.01 µg/L	69.8	50	130
EP231X-ST: Perfluorodecanoic acid (PFDA)	335-76-2	0.0005	µg/L	<0.0005	0.01 µg/L	57.8	50	130
EP231X-ST: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0005	µg/L	<0.0005	0.01 µg/L	45.6	40	130
EP231X-ST: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0005	µg/L	<0.0005	0.01 µg/L	43.4	40	130
EP231X-ST: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0005	µg/L	<0.0005	0.01 µg/L	42.0	40	130
EP231X-ST: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	µg/L	<0.0005	0.025 µg/L	48.7	40	130
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 2547624)								
EP231X-ST: Perfluorobutanoic acid (PFBA)	375-22-4	0.002	µg/L	<0.002	0.05 µg/L	59.8	30	130
EP231X-ST: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0005	µg/L	<0.0005	0.01 µg/L	64.8	50	130
EP231X-ST: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0005	µg/L	<0.0005	0.01 µg/L	65.8	50	130
EP231X-ST: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0005	µg/L	<0.0005	0.01 µg/L	69.2	50	130
EP231X-ST: Perfluorooctanoic acid (PFOA)	335-67-1	0.0005	µg/L	<0.0005	0.01 µg/L	73.0	50	130
EP231X-ST: Perfluorononanoic acid (PFNA)	375-95-1	0.0005	µg/L	<0.0005	0.01 µg/L	75.6	50	130
EP231X-ST: Perfluorodecanoic acid (PFDA)	335-76-2	0.0005	µg/L	<0.0005	0.01 µg/L	62.8	50	130
EP231X-ST: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0005	µg/L	<0.0005	0.01 µg/L	44.4	40	130
EP231X-ST: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0005	µg/L	<0.0005	0.01 µg/L	47.2	40	130
EP231X-ST: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0005	µg/L	<0.0005	0.01 µg/L	40.0	40	130
EP231X-ST: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	µg/L	<0.0005	0.025 µg/L	67.6	40	130
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 2524698)								
EP231X-LL: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.002	µg/L	<0.002	0.05 µg/L	81.8	40	130
EP231X-LL: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.005	µg/L	<0.005	0.125 µg/L	88.2	40	130
EP231X-LL: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.005	µg/L	<0.005	0.125 µg/L	57.3	40	130
EP231X-LL: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.005	µg/L	<0.005	0.125 µg/L	57.3	50	130
EP231X-LL: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.005	µg/L	<0.005	0.125 µg/L	60.6	40	130
EP231X-LL: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.002	µg/L	<0.002	0.05 µg/L	53.4	50	130
EP231X-LL: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.002	µg/L	<0.002	0.05 µg/L	51.2	40	130
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 2531056)								
EP231X-ST: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0005	µg/L	<0.0005	0.01 µg/L	65.6	40	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
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 2531056) - continued								
EP231X-ST: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.001	µg/L	<0.001	0.025 µg/L	42.2	40	130
EP231X-ST: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.001	µg/L	<0.001	0.025 µg/L	43.2	40	130
EP231X-ST: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.001	µg/L	<0.001	0.025 µg/L	44.1	40	130
EP231X-ST: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.001	µg/L	<0.001	0.025 µg/L	54.0	40	130
EP231X-ST: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0005	µg/L	<0.0005	0.01 µg/L	40.8	40	130
EP231X-ST: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0005	µg/L	<0.0005	0.01 µg/L	40.0	40	130
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 2547624)								
EP231X-ST: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0005	µg/L	<0.0005	0.01 µg/L	61.0	40	130
EP231X-ST: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.001	µg/L	<0.001	0.025 µg/L	47.0	40	130
EP231X-ST: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.001	µg/L	<0.001	0.025 µg/L	41.3	40	130
EP231X-ST: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.001	µg/L	<0.001	0.025 µg/L	49.7	40	130
EP231X-ST: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.001	µg/L	<0.001	0.025 µg/L	45.8	40	130
EP231X-ST: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0005	µg/L	<0.0005	0.01 µg/L	50.8	40	130
EP231X-ST: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0005	µg/L	<0.0005	0.01 µg/L	42.8	40	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 2524698)								
EP231X-LL: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.005	µg/L	<0.005	0.0467 µg/L	89.9	50	130
EP231X-LL: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.005	µg/L	<0.005	0.0474 µg/L	96.0	50	130
EP231X-LL: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.005	µg/L	<0.005	0.0479 µg/L	72.0	50	130
EP231X-LL: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.005	µg/L	<0.005	0.0482 µg/L	56.6	50	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 2531056)								
EP231X-ST: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.001	µg/L	<0.001	0.01 µg/L	77.4	50	130
EP231X-ST: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.001	µg/L	<0.001	0.01 µg/L	86.6	50	130
EP231X-ST: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.001	µg/L	<0.001	0.01 µg/L	70.0	50	130
EP231X-ST: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.001	µg/L	<0.001	0.01 µg/L	51.0	50	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 2547624)								
EP231X-ST: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.001	µg/L	<0.001	0.01 µg/L	72.8	50	130
EP231X-ST: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.001	µg/L	<0.001	0.01 µg/L	72.4	50	130
EP231X-ST: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.001	µg/L	<0.001	0.01 µg/L	63.8	50	130
EP231X-ST: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.001	µg/L	<0.001	0.01 µg/L	58.4	50	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
EP231P: PFAS Sums (QCLot: 2524698)								
EP231X-LL: Sum of PFAS	----	0.002	µg/L	<0.002	----	----	----	----
EP231X-LL: Sum of PFHxS and PFOS	355-46-4/17 63-23-1	0.002	µg/L	<0.002	----	----	----	----
EP231X-LL: Sum of PFAS (WA DER List)	----	0.002	µg/L	<0.002	----	----	----	----
EP231P: PFAS Sums (QCLot: 2531056)								
EP231X-ST: Sum of PFAS	----	0.0003	µg/L	<0.0003	----	----	----	----
EP231P: PFAS Sums (QCLot: 2547624)								
EP231X-ST: Sum of PFAS	----	0.0003	µg/L	<0.0003	----	----	----	----

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
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 2524688)							
EB1921176-006	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.00125 mg/kg	66.8	57	121
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.00125 mg/kg	70.0	55	125
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.00125 mg/kg	54.4	52	126
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.00125 mg/kg	70.0	54	123
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.00125 mg/kg	# 37.3	55	127
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.00125 mg/kg	54.0	54	125
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 2524688)							
EB1921176-006	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.00625 mg/kg	# 26.1	52	128
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.00125 mg/kg	57.3	54	129
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.00125 mg/kg	74.5	58	127
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.00125 mg/kg	60.9	57	128
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.00125 mg/kg	64.5	60	134
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.00125 mg/kg	# 62.2	63	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.00125 mg/kg	# 37.0	55	130
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.00125 mg/kg	# 51.8	62	130
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.00125 mg/kg	# 51.3	53	134
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.00125 mg/kg	# 41.6	49	129
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.00312 mg/kg	# 49.2	59	129
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 2524688)							
EB1921176-006	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.00125 mg/kg	65.6	52	132

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	Recovery Limits (%): Low	Recovery Limits (%): High
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 2524688) - continued							
EB1921176-006	Anonymous	EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.00312 mg/kg	# 49.2	65	126
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.00312 mg/kg	# 48.6	64	126
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.00312 mg/kg	# 33.0	63	124
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.00312 mg/kg	# 39.7	58	125
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.00125 mg/kg	61.6	61	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.00125 mg/kg	# 51.2	55	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 2524688)							
EB1921176-006	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.00125 mg/kg	63.2	54	130
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.00125 mg/kg	# 57.6	61	130
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.00125 mg/kg	65.2	62	130
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.00125 mg/kg	# 46.8	60	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	Recovery Limits (%): Low	Recovery Limits (%): High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 2524698)							
EB1921176-002	Anonymous	EP231X-LL: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.05 µg/L	114	50	130
		EP231X-LL: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.05 µg/L	108	50	130
		EP231X-LL: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.05 µg/L	82.4	50	130
		EP231X-LL: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.05 µg/L	123	50	130
		EP231X-LL: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.05 µg/L	# Not Determined	50	130
		EP231X-LL: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.05 µg/L	107	40	130
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 2531056)							
ES1926014-001	Anonymous	EP231X-ST: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.01 µg/L	102	50	130
		EP231X-ST: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.01 µg/L	99.6	50	130
		EP231X-ST: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.01 µg/L	91.0	50	130
		EP231X-ST: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.01 µg/L	91.0	50	130
		EP231X-ST: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01 µg/L	78.4	50	130
		EP231X-ST: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.01 µg/L	59.0	30	130
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 2524698)							
EB1921176-002	Anonymous	EP231X-LL: Perfluorobutanoic acid (PFBA)	375-22-4	0.25 µg/L	103	50	130
		EP231X-LL: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.05 µg/L	110	50	130
		EP231X-LL: Perfluorohexanoic acid (PFHxA)	307-24-4	0.05 µg/L	107	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: 2524698) - continued							
EB1921176-002	Anonymous	EP231X-LL: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.05 µg/L	108	50	130
		EP231X-LL: Perfluorooctanoic acid (PFOA)	335-67-1	0.05 µg/L	106	50	130
		EP231X-LL: Perfluorononanoic acid (PFNA)	375-95-1	0.05 µg/L	103	50	130
		EP231X-LL: Perfluorodecanoic acid (PFDA)	335-76-2	0.05 µg/L	87.0	50	130
		EP231X-LL: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.05 µg/L	125	40	130
		EP231X-LL: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.05 µg/L	110	40	130
		EP231X-LL: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.05 µg/L	97.8	40	130
		EP231X-LL: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.125 µg/L	106	40	130
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 2531056)							
ES1926014-001	Anonymous	EP231X-ST: Perfluorobutanoic acid (PFBA)	375-22-4	0.05 µg/L	47.5	30	130
		EP231X-ST: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.01 µg/L	91.4	50	130
		EP231X-ST: Perfluorohexanoic acid (PFHxA)	307-24-4	0.01 µg/L	95.0	50	130
		EP231X-ST: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.01 µg/L	91.8	50	130
		EP231X-ST: Perfluorooctanoic acid (PFOA)	335-67-1	0.01 µg/L	86.2	50	130
		EP231X-ST: Perfluorononanoic acid (PFNA)	375-95-1	0.01 µg/L	85.2	50	130
		EP231X-ST: Perfluorodecanoic acid (PFDA)	335-76-2	0.01 µg/L	82.0	50	130
		EP231X-ST: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.01 µg/L	69.4	30	130
		EP231X-ST: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.01 µg/L	61.8	30	130
		EP231X-ST: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.01 µg/L	35.4	30	130
		EP231X-ST: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.025 µg/L	33.2	30	130
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 2524698)							
EB1921176-002	Anonymous	EP231X-LL: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.05 µg/L	123	40	130
		EP231X-LL: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.125 µg/L	129	40	130
		EP231X-LL: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.125 µg/L	112	40	130
		EP231X-LL: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.125 µg/L	96.1	50	130
		EP231X-LL: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.125 µg/L	114	40	130
		EP231X-LL: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.05 µg/L	112	50	130
		EP231X-LL: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.05 µg/L	81.4	40	130
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 2531056)							
ES1926014-001	Anonymous	EP231X-ST: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.01 µg/L	38.8	30	130
		EP231X-ST: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.025 µg/L	61.0	30	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: 2531056) - continued							
ES1926014-001	Anonymous	EP231X-ST: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.025 µg/L	47.4	30	130
		EP231X-ST: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.025 µg/L	50.8	30	130
		EP231X-ST: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.025 µg/L	37.8	30	130
		EP231X-ST: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.01 µg/L	57.2	30	130
		EP231X-ST: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.01 µg/L	52.0	30	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 2524698)							
EB1921176-002	Anonymous	EP231X-LL: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05 µg/L	117	50	130
		EP231X-LL: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05 µg/L	116	50	130
		EP231X-LL: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05 µg/L	119	50	130
		EP231X-LL: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05 µg/L	114	50	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 2531056)							
ES1926014-001	Anonymous	EP231X-ST: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.01 µg/L	98.8	50	130
		EP231X-ST: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.01 µg/L	86.8	50	130
		EP231X-ST: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.01 µg/L	82.6	50	130
		EP231X-ST: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.01 µg/L	60.8	50	130

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EB1921176**	Page	: 1 of 13
Amendment	: **3**		
Client	: **AECOM Australia Pty Ltd**	Laboratory	: Environmental Division Brisbane
Contact	: MR JAMES PEACHEY	Telephone	: +61 7 3552 8616
Project	: 60609758	Date Samples Received	: 13-Aug-2019
Site	: QFES	Issue Date	: 04-Sep-2019
Sampler	: NK	No. of samples received	: 39
Order number	: 60609758 2.0	No. of samples analysed	: 39

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.**
- **Duplicate outliers exist - please see following pages for full details.**
- **Laboratory Control outliers exist - please see following pages for full details.**
- **Matrix Spike outliers exist - please see following pages for full details.**
- **Surrogate recovery outliers exist for all regular sample matrices - please see following pages for full details.**

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
Duplicate (DUP) RPDs							
EP231A: Perfluoroalkyl Sulfonic Acids			**Perfluorooctane sulfonic acid (PFOS)**	1763-23-1	54.0 %	0% - 50%	**RPD exceeds LOR based limits**
Laboratory Control Spike (LCS) Recoveries							
EP231B: Perfluoroalkyl Carboxylic Acids	QC-2524688-002	----	**Perfluorobutanoic acid (PFBA)**	375-22-4	37.5 %	52-128%	**Recovery less than lower control limit**
EP231C: Perfluoroalkyl Sulfonamides	QC-2524688-002	----	**N-Methyl perfluorooctane sulfonamide (MeFOSA)**	31506-32-8	54.5 %	65-126%	**Recovery less than lower control limit**
EP231C: Perfluoroalkyl Sulfonamides	QC-2524688-002	----	**N-Ethyl perfluorooctane sulfonamide (EtFOSA)**	4151-50-2	45.4 %	64-126%	**Recovery less than lower control limit**
EP231C: Perfluoroalkyl Sulfonamides	QC-2524688-002	----	**N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)**	24448-09-7	35.2 %	63-124%	**Recovery less than lower control limit**
EP231C: Perfluoroalkyl Sulfonamides	QC-2524688-002	----	**N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)**	1691-99-2	48.1 %	58-125%	**Recovery less than lower control limit**
Matrix Spike (MS) Recoveries							
EP231A: Perfluoroalkyl Sulfonic Acids			**Perfluorooctane sulfonic acid (PFOS)**	1763-23-1	37.3 %	55-127%	**Recovery less than lower data quality objective**
EP231B: Perfluoroalkyl Carboxylic Acids			**Perfluorobutanoic acid (PFBA)**	375-22-4	26.1 %	52-128%	**Recovery less than lower data quality objective**
EP231B: Perfluoroalkyl Carboxylic Acids			**Perfluorononanoic acid (PFNA)**	375-95-1	62.2 %	63-130%	**Recovery less than lower data quality objective**
EP231B: Perfluoroalkyl Carboxylic Acids			**Perfluorodecanoic acid (PFDA)**	335-76-2	37.0 %	55-130%	**Recovery less than lower data quality objective**
EP231B: Perfluoroalkyl Carboxylic Acids			**Perfluoroundecanoic acid (PFUnDA)**	2058-94-8	51.8 %	62-130%	**Recovery less than lower data quality objective**
EP231B: Perfluoroalkyl Carboxylic Acids			**Perfluorododecanoic acid (PFDoDA)**	307-55-1	51.3 %	53-134%	**Recovery less than lower data quality objective**
EP231B: Perfluoroalkyl Carboxylic Acids			**Perfluorotridecanoic acid (PFTrDA)**	72629-94-8	41.6 %	49-129%	**Recovery less than lower data quality objective**
EP231B: Perfluoroalkyl Carboxylic Acids			**Perfluorotetradecanoic acid (PFTeDA)**	376-06-7	49.2 %	59-129%	**Recovery less than lower data quality objective**
EP231C: Perfluoroalkyl Sulfonamides			**N-Methyl perfluorooctane sulfonamide (MeFOSA)**	31506-32-8	49.2 %	65-126%	**Recovery less than lower data quality objective**

Matrix: **SOIL**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries - Continued							
EP231C: Perfluoroalkyl Sulfonamides			**N-Ethyl perfluorooctane sulfonamide (EtFOSA)**	4151-50-2	48.6 %	64-126%	**Recovery less than lower data quality objective**
EP231C: Perfluoroalkyl Sulfonamides			**N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)**	24448-09-7	33.0 %	63-124%	**Recovery less than lower data quality objective**
EP231C: Perfluoroalkyl Sulfonamides			**N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)**	1691-99-2	39.7 %	58-125%	**Recovery less than lower data quality objective**
EP231C: Perfluoroalkyl Sulfonamides			**N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)**	2991-50-6	51.2 %	55-130%	**Recovery less than lower data quality objective**
EP231D: (n:2) Fluorotelomer Sulfonic Acids			**6:2 Fluorotelomer sulfonic acid (6:2 FTS)**	27619-97-2	57.6 %	61-130%	**Recovery less than lower data quality objective**
EP231D: (n:2) Fluorotelomer Sulfonic Acids			**10:2 Fluorotelomer sulfonic acid (10:2 FTS)**	120226-60-0	46.8 %	60-130%	**Recovery less than lower data quality objective**

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Duplicate (DUP) RPDs							
EP231A: Perfluoroalkyl Sulfonic Acids	EB1921176--020	AY_QC105_190806	**Perfluorooctane sulfonic acid (PFOS)**	1763-23-1	23.9 %	0% - 20%	**RPD exceeds LOR based limits**
EP231P: PFAS Sums	EB1921176--020	AY_QC105_190806	**Sum of PFAS**	----	21.2 %	0% - 20%	**RPD exceeds LOR based limits**
EP231P: PFAS Sums	EB1921176--020	AY_QC105_190806	**Sum of PFHxS and PFOS**	355-46-4/1763-23-1	22.5 %	0% - 20%	**RPD exceeds LOR based limits**
EP231P: PFAS Sums	EB1921176--020	AY_QC105_190806	**Sum of PFAS (WA DER List)**	----	21.4 %	0% - 20%	**RPD exceeds LOR based limits**
Matrix Spike (MS) Recoveries							
EP231A: Perfluoroalkyl Sulfonic Acids			**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	EB1921138--003	Anonymous	**Perfluoroundecanoic acid (PFUnDA)**	2058-94-8	156 %	40-130%	**Recovery greater than upper data quality objective**
EP231C: Perfluoroalkyl Sulfonamides	EB1921138--003	Anonymous	**N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)**	2991-50-6	35.2 %	40-130%	**Recovery less than lower data quality objective**
EP231D: (n:2) Fluorotelomer Sulfonic Acids	EB1921138--003	Anonymous	**6:2 Fluorotelomer sulfonic acid (6:2 FTS)**	27619-97-2	135 %	50-130%	**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 - Continued							
EP231D: (n:2) Fluorotelomer Sulfonic Acids	EB1921138--003	Anonymous	**10:2 Fluorotelomer sulfonic acid (10:2 FTS)**	120226-60-0	136 %	50-130%	**Recovery greater than upper data quality objective**

Regular Sample Surrogates

Sub-Matrix: **SOIL**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Samples Submitted							
EP231S: PFAS Surrogate			**13C4-PFOS**	----	67.5 %	70-130 %	**Recovery less than lower data quality objective**
EP231S: PFAS Surrogate	EB1921176-018	AY_SED03_190806	**13C4-PFOS**	----	69.5 %	70-130 %	**Recovery less than lower data quality objective**
EP231S: PFAS Surrogate			**13C4-PFOS**	----	21.5 %	70-130 %	**Recovery less than lower data quality objective**
EP231S: PFAS Surrogate			**13C4-PFOS**	----	12.5 %	70-130 %	**Recovery less than lower data quality objective**
EP231S: PFAS Surrogate			**13C4-PFOS**	----	30.5 %	70-130 %	**Recovery less than lower data quality objective**
EP231S: PFAS Surrogate			**13C4-PFOS**	----	40.5 %	70-130 %	**Recovery less than lower data quality objective**
EP231S: PFAS Surrogate			**13C8-PFOA**	----	21.5 %	70-130 %	**Recovery less than lower data quality objective**
EP231S: PFAS Surrogate			**13C8-PFOA**	----	14.0 %	70-130 %	**Recovery less than lower data quality objective**
EP231S: PFAS Surrogate			**13C8-PFOA**	----	35.5 %	70-130 %	**Recovery less than lower data quality objective**
EP231S: PFAS Surrogate			**13C8-PFOA**	----	49.0 %	70-130 %	**Recovery less than lower data quality objective**

Sub-Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Samples Submitted							
EP231S: PFAS Surrogate			**13C4-PFOS**	----	35.9 %	70-130 %	**Recovery less than lower data quality objective**
EP231S: PFAS Surrogate			**13C8-PFOA**	----	45.5 %	70-130 %	**Recovery less than lower data quality objective**

Analysis Holding Time Compliance

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

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

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

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

Matrix: **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
EA055: Moisture Content (Dried @ 105-110°C)							
HDPE Soil Jar (EA055) AY_SED01_190806, AY_SED02_190806, AY_SED03_190806, AY_QC106_190806	**06-Aug-2019**	**----**	----	----	**15-Aug-2019**	20-Aug-2019	✓
HDPE Soil Jar (EA055)	**08-Aug-2019**	**----**	----	----	**15-Aug-2019**	22-Aug-2019	✓
EP231A: Perfluoroalkyl Sulfonic Acids							
HDPE Soil Jar (EP231X) AY_SED01_190806, AY_SED02_190806, AY_SED03_190806, AY_QC106_190806	**06-Aug-2019**	**15-Aug-2019**	02-Feb-2020	✓	**19-Aug-2019**	24-Sep-2019	✓
HDPE Soil Jar (EP231X)	**08-Aug-2019**	**15-Aug-2019**	04-Feb-2020	✓	**19-Aug-2019**	24-Sep-2019	✓
EP231B: Perfluoroalkyl Carboxylic Acids							
HDPE Soil Jar (EP231X) AY_SED01_190806, AY_SED02_190806, AY_SED03_190806, AY_QC106_190806	**06-Aug-2019**	**15-Aug-2019**	02-Feb-2020	✓	**19-Aug-2019**	24-Sep-2019	✓
HDPE Soil Jar (EP231X)	**08-Aug-2019**	**15-Aug-2019**	04-Feb-2020	✓	**19-Aug-2019**	24-Sep-2019	✓

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
EP231C: Perfluoroalkyl Sulfonamides							
HDPE Soil Jar (EP231X) AY_SED01_190806, AY_SED02_190806, AY_SED03_190806, AY_QC106_190806	**06-Aug-2019**	**15-Aug-2019**	02-Feb-2020	✓	**19-Aug-2019**	24-Sep-2019	✓
HDPE Soil Jar (EP231X)	**08-Aug-2019**	**15-Aug-2019**	04-Feb-2020	✓	**19-Aug-2019**	24-Sep-2019	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE Soil Jar (EP231X) AY_SED01_190806, AY_SED02_190806, AY_SED03_190806, AY_QC106_190806	**06-Aug-2019**	**15-Aug-2019**	02-Feb-2020	✓	**19-Aug-2019**	24-Sep-2019	✓
HDPE Soil Jar (EP231X)	**08-Aug-2019**	**15-Aug-2019**	04-Feb-2020	✓	**19-Aug-2019**	24-Sep-2019	✓
EP231P: PFAS Sums							
HDPE Soil Jar (EP231X) AY_SED01_190806, AY_SED02_190806, AY_SED03_190806, AY_QC106_190806	**06-Aug-2019**	**15-Aug-2019**	02-Feb-2020	✓	**19-Aug-2019**	24-Sep-2019	✓
HDPE Soil Jar (EP231X)	**08-Aug-2019**	**15-Aug-2019**	04-Feb-2020	✓	**19-Aug-2019**	24-Sep-2019	✓

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

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-LL) AY_MW01_190806, AY_MW02_190806, AY_MW03_190806, AY_MW04_190806, AY_QC105_190806, AY_QC303_190806	**06-Aug-2019**	**15-Aug-2019**	02-Feb-2020	✓	**15-Aug-2019**	02-Feb-2020	✓
HDPE (no PTFE) (EP231X-ST) AY_SW02_190806, AY_Tap01_190806	**06-Aug-2019**	**19-Aug-2019**	02-Feb-2020	✓	**19-Aug-2019**	02-Feb-2020	✓
HDPE (no PTFE) (EP231X-ST) AY_SW03_190806	**06-Aug-2019**	**27-Aug-2019**	02-Feb-2020	✓	**27-Aug-2019**	02-Feb-2020	✓
HDPE (no PTFE) (EP231X-LL)	**07-Aug-2019**	**15-Aug-2019**	03-Feb-2020	✓	**15-Aug-2019**	03-Feb-2020	✓
HDPE (no PTFE) (EP231X-LL)	**07-Aug-2019**	**16-Aug-2019**	03-Feb-2020	✓	**16-Aug-2019**	03-Feb-2020	✓
HDPE (no PTFE) (EP231X-LL)	**08-Aug-2019**	**02-Sep-2019**	04-Feb-2020	✓	**02-Sep-2019**	04-Feb-2020	✓
HDPE (no PTFE) (EP231X-LL)	**08-Aug-2019**	**15-Aug-2019**	04-Feb-2020	✓	**15-Aug-2019**	04-Feb-2020	✓

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-LL) AY_MW01_190806, AY_MW02_190806, AY_MW03_190806, AY_MW04_190806, AY_QC105_190806, AY_QC303_190806	**06-Aug-2019**	**15-Aug-2019**	02-Feb-2020	✓	**15-Aug-2019**	02-Feb-2020	✓
HDPE (no PTFE) (EP231X-ST) AY_SW02_190806, AY_Tap01_190806	**06-Aug-2019**	**19-Aug-2019**	02-Feb-2020	✓	**19-Aug-2019**	02-Feb-2020	✓
HDPE (no PTFE) (EP231X-ST) AY_SW03_190806	**06-Aug-2019**	**27-Aug-2019**	02-Feb-2020	✓	**27-Aug-2019**	02-Feb-2020	✓
HDPE (no PTFE) (EP231X-LL)	**07-Aug-2019**	**15-Aug-2019**	03-Feb-2020	✓	**15-Aug-2019**	03-Feb-2020	✓
HDPE (no PTFE) (EP231X-LL)	**07-Aug-2019**	**16-Aug-2019**	03-Feb-2020	✓	**16-Aug-2019**	03-Feb-2020	✓
HDPE (no PTFE) (EP231X-LL)	**08-Aug-2019**	**02-Sep-2019**	04-Feb-2020	✓	**02-Sep-2019**	04-Feb-2020	✓
HDPE (no PTFE) (EP231X-LL)	**08-Aug-2019**	**15-Aug-2019**	04-Feb-2020	✓	**15-Aug-2019**	04-Feb-2020	✓

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
EP231C: Perfluoroalkyl Sulfonamides							
HDPE (no PTFE) (EP231X-LL) AY_MW01_190806, AY_MW02_190806, AY_MW03_190806, AY_MW04_190806, AY_QC105_190806, AY_QC303_190806	**06-Aug-2019**	**15-Aug-2019**	02-Feb-2020	✓	**15-Aug-2019**	02-Feb-2020	✓
HDPE (no PTFE) (EP231X-ST) AY_SW02_190806, AY_Tap01_190806	**06-Aug-2019**	**19-Aug-2019**	02-Feb-2020	✓	**19-Aug-2019**	02-Feb-2020	✓
HDPE (no PTFE) (EP231X-ST) AY_SW03_190806	**06-Aug-2019**	**27-Aug-2019**	02-Feb-2020	✓	**27-Aug-2019**	02-Feb-2020	✓
HDPE (no PTFE) (EP231X-LL)	**07-Aug-2019**	**15-Aug-2019**	03-Feb-2020	✓	**15-Aug-2019**	03-Feb-2020	✓
HDPE (no PTFE) (EP231X-LL)	**07-Aug-2019**	**16-Aug-2019**	03-Feb-2020	✓	**16-Aug-2019**	03-Feb-2020	✓
HDPE (no PTFE) (EP231X-LL)	**08-Aug-2019**	**02-Sep-2019**	04-Feb-2020	✓	**02-Sep-2019**	04-Feb-2020	✓
HDPE (no PTFE) (EP231X-LL)	**08-Aug-2019**	**15-Aug-2019**	04-Feb-2020	✓	**15-Aug-2019**	04-Feb-2020	✓

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-LL) AY_MW01_190806, AY_MW02_190806, AY_MW03_190806, AY_MW04_190806, AY_QC105_190806, AY_QC303_190806	**06-Aug-2019**	**15-Aug-2019**	02-Feb-2020	✓	**15-Aug-2019**	02-Feb-2020	✓
HDPE (no PTFE) (EP231X-ST) AY_SW02_190806, AY_Tap01_190806	**06-Aug-2019**	**19-Aug-2019**	02-Feb-2020	✓	**19-Aug-2019**	02-Feb-2020	✓
HDPE (no PTFE) (EP231X-ST) AY_SW03_190806	**06-Aug-2019**	**27-Aug-2019**	02-Feb-2020	✓	**27-Aug-2019**	02-Feb-2020	✓
HDPE (no PTFE) (EP231X-LL)	**07-Aug-2019**	**15-Aug-2019**	03-Feb-2020	✓	**15-Aug-2019**	03-Feb-2020	✓
HDPE (no PTFE) (EP231X-LL)	**07-Aug-2019**	**16-Aug-2019**	03-Feb-2020	✓	**16-Aug-2019**	03-Feb-2020	✓
HDPE (no PTFE) (EP231X-LL)	**08-Aug-2019**	**02-Sep-2019**	04-Feb-2020	✓	**02-Sep-2019**	04-Feb-2020	✓
HDPE (no PTFE) (EP231X-LL)	**08-Aug-2019**	**15-Aug-2019**	04-Feb-2020	✓	**15-Aug-2019**	04-Feb-2020	✓

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
EP231P: PFAS Sums							
HDPE (no PTFE) (EP231X-LL) AY_MW01_190806, AY_MW02_190806, AY_MW03_190806, AY_MW04_190806, AY_QC105_190806, AY_QC303_190806	**06-Aug-2019**	**15-Aug-2019**	02-Feb-2020	✓	**15-Aug-2019**	02-Feb-2020	✓
HDPE (no PTFE) (EP231X-ST) AY_SW02_190806, AY_Tap01_190806	**06-Aug-2019**	**19-Aug-2019**	02-Feb-2020	✓	**19-Aug-2019**	02-Feb-2020	✓
HDPE (no PTFE) (EP231X-ST) AY_SW03_190806	**06-Aug-2019**	**27-Aug-2019**	02-Feb-2020	✓	**27-Aug-2019**	02-Feb-2020	✓
HDPE (no PTFE) (EP231X-LL)	**07-Aug-2019**	**15-Aug-2019**	03-Feb-2020	✓	**15-Aug-2019**	03-Feb-2020	✓
HDPE (no PTFE) (EP231X-LL)	**07-Aug-2019**	**16-Aug-2019**	03-Feb-2020	✓	**16-Aug-2019**	03-Feb-2020	✓
HDPE (no PTFE) (EP231X-LL)	**08-Aug-2019**	**02-Sep-2019**	04-Feb-2020	✓	**02-Sep-2019**	04-Feb-2020	✓
HDPE (no PTFE) (EP231X-LL)	**08-Aug-2019**	**15-Aug-2019**	04-Feb-2020	✓	**15-Aug-2019**	04-Feb-2020	✓

Quality Control Parameter Frequency Compliance

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

Matrix: **SOIL**

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

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Moisture Content	EA055	2	12	**16.67**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	12	**16.67**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	12	**8.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	12	**8.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	12	**8.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

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-LL	4	26	**15.38**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X-ST	2	5	**40.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Per- and Polyfluoroalkyl Substances (PFAS by LCMSMS	EP231X-LL	3	26	**11.54**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X-ST	2	5	**40.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Per- and Polyfluoroalkyl Substances (PFAS by LCMSMS	EP231X-LL	3	26	**11.54**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X-ST	2	5	**40.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Per- and Polyfluoroalkyl Substances (PFAS by LCMSMS	EP231X-LL	2	26	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X-ST	1	5	**20.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

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

Analytical Methods	Method	Matrix	Method Descriptions
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM (2013) Schedule B(3) Section 7.1 and Table 1 (14 day holding time).
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. Where commercially available, isotopically labelled analogues of the target analytes are used as internal standards for quantification. Where a labelled analogue is not commercially available, the internal standard with similar chemistry and the closest retention time to the target is used for quantification. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. This method complies with the quality control definitions as stated in QSM 5.1. Data is reviewed in line with the DQOs as stated in QSM5.1
Per- and Polyfluoroalkyl Substances (PFAS by LCMSMS	EP231X-LL	WATER	In-house: Analysis of fresh and saline waters by solid phase extraction followed by LC-Electrospray-MS-MS, Negative Mode using MRM. Where commercially available, isotopically labelled analogues of the target analytes are used as internal standards for quantification. Where a labelled analogue is not commercially available, the internal standard with similar chemistry and the closest retention time to the target is used for quantification. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. This method complies with the quality control definitions as stated in QSM 5.1. Data is reviewed in line with the DQOs as stated in QSM5.1
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X-ST	WATER	In-house: Analysis of fresh and saline waters by solid phase extraction and LC-Electrospray-MS-MS, Negative Mode using MRM. This method is targeted to pristine environmental and drinking waters reporting at sub-parts per trillion. Where commercially available, isotopically labelled analogues of the target analytes are used as internal standards for quantification. Where a labelled analogue is not commercially available, the internal standard with similar chemistry and the closest retention time to the target is used for quantification. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. This method complies with the quality control definitions as stated in QSM 5.1. Data is reviewed in line with the DQOs as stated in QSM5.1

Preparation Methods	Method	Matrix	Method Descriptions
Sample Extraction for PFAS	EP231-PR	SOIL	In house
SPE preparation for LL and saline PFCs	EP231-SPE	WATER	In house

REPORT OF ANALYSIS

Client	: AECOM AUSTRALIA PTY LTD	**Job No.**	: AECO06/190816/3
	LEVEL 8	**Quote No.**	: QT-02018
	540 WICKHAM STREET	**Order No.**	: 60609759_2_0
		Date Received	: 16-AUG-2019
Attention	: JAMES PEACHEY	**Sampled By**	: CLIENT
Project Name	: 60609758_2_0		
Your Client Services Manager	: Richard Coghlan	**Phone**	: 02 9449 0161

Lab Reg No.	Sample Ref	Sample Description
N19/020820 N	AY_QC206_190806	SOIL 6/08/19

Lab Reg No.		N19/020820		
Date Sampled		06-AUG-2019		
	Units			Method
PFAS (per-and poly-fluoroalkyl substances)				
PFBA (375-22-4)	mg/kg	<0.002		NR70
PFPeA (2706-90-3)	mg/kg	<0.002		NR70
PFHxA (307-24-4)	mg/kg	<0.001		NR70
PFHpA (375-85-9)	mg/kg	<0.001		NR70
PFOA (335-67-1)	mg/kg	<0.001		NR70
PFNA (375-95-1)	mg/kg	<0.001		NR70
PFDA (335-76-2)	mg/kg	<0.001		NR70
PFUdA (2058-94-8)	mg/kg	<0.002		NR70
PFDoA (307-55-1)	mg/kg	<0.002		NR70
PFTrDA (72629-94-8)	mg/kg	<0.002		NR70
PFTeDA (376-06-7)	mg/kg	<0.002		NR70
PFHxDA (67905-19-5)	mg/kg	<0.002		NR70
PFODA (16517-11-6)	mg/kg	<0.005		NR70
FOUEA (70887-84-2)	mg/kg	<0.01		NR70
PFBS (375-73-5)	mg/kg	<0.001		NR70
PFPeS (2706-91-4)	mg/kg	<0.001		NR70
PFHxS (355-46-4)	mg/kg	<0.001		NR70
PFHpS (375-92-8)	mg/kg	<0.001		NR70
PFOS (1763-23-1)	mg/kg	<0.002		NR70
PFNS (68259-12-1)	mg/kg	<0.001		NR70
PFDS (335-77-3)	mg/kg	<0.001		NR70
PFOSA (754-91-6)	mg/kg	<0.001		NR70
N-MeFOSA (31506-32-8)	mg/kg	<0.002		NR70
N-EtFOSA (4151-50-2)	mg/kg	<0.002		NR70
N-MeFOSAA (2355-31-9)	mg/kg	<0.002		NR70
N-EtFOSAA(2991-50-6)	mg/kg	<0.002		NR70
N-MeFOSE (24448-09-7)	mg/kg	<0.005		NR70

REPORT OF ANALYSIS

Lab Reg No.		N19/020820		
Date Sampled		06-AUG-2019		
	Units			Method
PFAS (per-and poly-fluoroalkyl substances)				
N-EtFOSE (1691-99-2)	mg/kg	<0.005		NR70
4:2 FTS (757124-72-4)	mg/kg	<0.001		NR70
6:2 FTS (27619-97-2)	mg/kg	<0.001		NR70
8:2 FTS (39108-34-4)	mg/kg	<0.001		NR70
10:2 FTS (120226-60-0)	mg/kg	<0.002		NR70
8:2 diPAP (678-41-1)	mg/kg	<0.002		NR70
PFBA (Surrogate Recovery)	%	105		NR70
PFPeA (Surrogate Recovery)	%	112		NR70
PFHxA (Surrogate Recovery)	%	114		NR70
PFHpA (Surrogate Recovery)	%	103		NR70
PFOA (Surrogate Recovery)	%	112		NR70
PFNA (Surrogate Recovery)	%	107		NR70
PFDA (Surrogate Recovery)	%	106		NR70
PFUdA (Surrogate Recovery)	%	99		NR70
PFDoA (Surrogate Recovery)	%	108		NR70
PFTeDA (Surrogate Recovery)	%	100		NR70
PFHxDA (Surrogate Recovery)	%	120		NR70
FOUEA (Surrogate Recovery)	%	0		NR70
PFBS (Surrogate Recovery)	%	103		NR70
PFHxS (Surrogate Recovery)	%	114		NR70
PFOS (Surrogate Recovery)	%	112		NR70
PFOSA (Surrogate Recovery)	%	103		NR70
N-MeFOSA (Surrogate Recovery)	%	110		NR70
N-EtFOSA (Surrogate Recovery)	%	117		NR70
N-MeFOSAA (Surrogate Recovery)	%	69		NR70
N-EtFOSAA (Surrogate Recovery)	%	91		NR70
N-MeFOSE (Surrogate Recovery)	%	113		NR70
N-EtFOSE (Surrogate Recovery)	%	114		NR70
4:2 FTS (Surrogate Recovery)	%	68		NR70
6:2 FTS (Surrogate Recovery)	%	78		NR70
8:2 FTS (Surrogate Recovery)	%	76		NR70
8:2 diPAP (Surrogate Recovery)	%	43		NR70
Dates				
Date extracted		19-AUG-2019		
Date analysed		21-AUG-2019		

N19/020818
to

REPORT OF ANALYSIS

N19/020822:

PFOS is quantified using a combined branched and linear standard,
linear and branched isomers are totalled for reporting.
All results corrected for labelled surrogate recoveries.
Selected PFAS surrogate recoveries are biased due to matrix effects.
FOUEA Surrogate Recovery was not reported.
LORs raised for selected analytes due to low surrogate recoveries.

Danny Slee, Section Manager
Organic - NSW
Accreditation No. 198

28-AUG-2019

Lab Reg No.		N19/020820		
Date Sampled		06-AUG-2019		
	Units			Method
Trace Elements				
Total Solids	%	76.7		NT2_49

Pankaj Barai, Analyst
Inorganics - NSW
Accreditation No. 198

28-AUG-2019

All results are expressed on a dry weight basis.

REPORT OF ANALYSIS

Client	: AECOM AUSTRALIA PTY LTD	**Job No.**	: AECO06/190816/3
	LEVEL 8	**Quote No.**	: QT-02018
	540 WICKHAM STREET	**Order No.**	: 60609759_2_0
		Date Received	: 16-AUG-2019
Attention	: JAMES PEACHEY	**Sampled By**	: CLIENT
Project Name	: 60609758_2_0		
Your Client Services Manager	: Richard Coghlan	**Phone**	: 02 9449 0161

Lab Reg No.	Sample Ref	Sample Description
N19/020819	AY_QC205_190806	WATER 6/08/19

Lab Reg No.		Units	N19/020819	Method
Date Sampled			06-AUG-2019	
PFAS (per-and poly-fluoroalkyl substances)				
PFBA (375-22-4)		ug/L	0.11	NR70
PFPeA (2706-90-3)		ug/L	0.30	NR70
PFHxA (307-24-4)		ug/L	0.36	NR70
PFHpA (375-85-9)		ug/L	0.44	NR70
PFOA (335-67-1)		ug/L	0.63	NR70
PFNA (375-95-1)		ug/L	0.10	NR70
PFDA (335-76-2)		ug/L	0.010	NR70
PFUdA (2058-94-8)		ug/L	0.0083	NR70
PFDoA (307-55-1)		ug/L	<0.001	NR70
PFTrDA (72629-94-8)		ug/L	<0.002	NR70
PFTeDA (376-06-7)		ug/L	<0.002	NR70
PFHxDA (67905-19-5)		ug/L	<0.002	NR70
PFODA (16517-11-6)		ug/L	<0.005	NR70
FOUEA (70887-84-2)		ug/L	<0.001	NR70
PFBS (375-73-5)		ug/L	0.036	NR70
PFPeS (2706-91-4)		ug/L	0.084	NR70
PFHxS (355-46-4)		ug/L	4.0	NR70
PFHpS (375-92-8)		ug/L	0.32	NR70
PFOS (1763-23-1)		ug/L	45	NR70
PFNS (68259-12-1)		ug/L	0.0032	NR70
PFDS (335-77-3)		ug/L	<0.001	NR70
PFOSA (754-91-6)		ug/L	0.0087	NR70
N-MeFOSA (31506-32-8)		ug/L	<0.002	NR70
N-EtFOSA (4151-50-2)		ug/L	<0.002	NR70
N-MeFOSAA (2355-31-9)		ug/L	<0.002	NR70
N-EtFOSAA(2991-50-6)		ug/L	<0.002	NR70

REPORT OF ANALYSIS

Lab Reg No.			N19/020819	
Date Sampled			06-AUG-2019	
		Units		Method
PFAS (per-and poly-fluoroalkyl substances)				
N-MeFOSE (24448-09-7)		ug/L	<0.005	NR70
N-EtFOSE (1691-99-2)		ug/L	<0.005	NR70
4:2 FTS (757124-72-4)		ug/L	<0.001	NR70
6:2 FTS (27619-97-2)		ug/L	0.81	NR70
8:2 FTS (39108-34-4)		ug/L	0.0069	NR70
10:2 FTS (120226-60-0)		ug/L	<0.001	NR70
8:2 diPAP (678-41-1)		ug/L	<0.002	NR70
PFBA (Surrogate Recovery)		%	107	NR70
PFPeA (Surrogate Recovery)		%	118	NR70
PFHxA (Surrogate Recovery)		%	122	NR70
PFHpA (Surrogate Recovery)		%	115	NR70
PFOA (Surrogate Recovery)		%	103	NR70
PFNA (Surrogate Recovery)		%	43	NR70
PFDA (Surrogate Recovery)		%	109	NR70
PFUdA (Surrogate Recovery)		%	99	NR70
PFDoA (Surrogate Recovery)		%	95	NR70
PFTeDA (Surrogate Recovery)		%	104	NR70
PFHxDA (Surrogate Recovery)		%	156	NR70
FOUEA (Surrogate Recovery)		%	61	NR70
PFBS (Surrogate Recovery)		%	129	NR70
PFHxS (Surrogate Recovery)		%	85	NR70
PFOS (Surrogate Recovery)		%	188	NR70
PFOSA (Surrogate Recovery)		%	93	NR70
N-MeFOSA (Surrogate Recovery)		%	83	NR70
N-EtFOSA (Surrogate Recovery)		%	107	NR70
N-MeFOSAA (Surrogate Recovery)		%	86	NR70
N-EtFOSAA (Surrogate Recovery)		%	88	NR70
N-MeFOSE (Surrogate Recovery)		%	157	NR70
N-EtFOSE (Surrogate Recovery)		%	117	NR70
4:2 FTS (Surrogate Recovery)		%	78	NR70
6:2 FTS (Surrogate Recovery)		%	282	NR70
8:2 FTS (Surrogate Recovery)		%	92	NR70
8:2 diPAP (Surrogate Recovery)		%	81	NR70
Dates				
Date extracted			23-AUG-2019	
Date analysed			23-AUG-2019	

REPORT OF ANALYSIS

Lab Reg No.		Units	N19/020819		Method
Date Sampled			06-AUG-2019		

Danny Slee, Section Manager
Organic - NSW
Accreditation No. 198

28-AUG-2019

NATA
ACCREDITED FOR
TECHNICAL
COMPETENCE

Accredited for compliance with ISO/IEC 17025 - Testing.
This report shall not be reproduced except in full.
Results relate only to the sample(s) tested.

This Report supersedes reports: *RN1244317*

Measurement Uncertainty is available upon request.

Australian Government

National Measurement Institute

QUALITY ASSURANCE REPORT

Client: AECOM Australia Pty Ltd

NMI QA Report No: AECO06/190816/3 **Sample Matrix:** Liquid

Analyte	Method	LOR	Blank	Sample Duplicates			Recoveries	
				Sample	Duplicate	RPD	LCS	Matrix Spike
		ug/L	ug/L	ug/L	ug/L	%	%	%
PFBA (375-22-4)	NR70	0.005	<0.005	NA	NA	NA	130	NA
PFPeA (2706-90-3)	NR70	0.002	<0.002	NA	NA	NA	97	NA
PFHxA (307-24-4)	NR70	0.001	<0.001	NA	NA	NA	96	NA
PFHpA (375-85-9)	NR70	0.001	<0.001	NA	NA	NA	94	NA
PFOA (335-67-1)	NR70	0.001	<0.001	NA	NA	NA	100	NA
PFNA (375-95-1)	NR70	0.001	<0.001	NA	NA	NA	104	NA
PFDA (335-76-2)	NR70	0.001	<0.001	NA	NA	NA	108	NA
PFUdA (2058-94-8)	NR70	0.001	<0.001	NA	NA	NA	83	NA
PFDoA (307-55-1)	NR70	0.001	<0.001	NA	NA	NA	80	NA
PFTrDA (72629-94-8)	NR70	0.002	<0.002	NA	NA	NA	90	NA
PFTeDA (376-06-7)	NR70	0.002	<0.002	NA	NA	NA	106	NA
PFHxDA (67905-19-5)	NR70	0.002	<0.002	NA	NA	NA	86	NA
PFODA (16517-11-6)	NR70	0.005	<0.005	NA	NA	NA	85	NA
FOUEA (70887-84-2)	NR70	0.001	<0.001	NA	NA	NA	90	NA
PFBS (375-73-5)	NR70	0.001	<0.001	NA	NA	NA	100	NA
PFPeS (2706-91-4)	NR70	0.001	<0.001	NA	NA	NA	99	NA
PFHxS (355-46-4)	NR70	0.001	<0.001	NA	NA	NA	104	NA
PFHpS (375-92-8)	NR70	0.001	<0.001	NA	NA	NA	101	NA
PFOS (1763-23-1)	NR70	0.002	<0.002	NA	NA	NA	99	NA
PFNS (68259-12-1)	NR70	0.001	<0.001	NA	NA	NA	98	NA
PFDS (335-77-3)	NR70	0.001	<0.001	NA	NA	NA	97	NA
PFOSA (754-91-6)	NR70	0.001	<0.001	NA	NA	NA	96	NA
N-MeFOSA (31506-32-8)	NR70	0.002	<0.002	NA	NA	NA	93	NA
N-EtFOSA (4151-50-2)	NR70	0.002	<0.002	NA	NA	NA	108	NA
N-MeFOSAA (2355-31-9)	NR70	0.002	<0.002	NA	NA	NA	91	NA
N-EtFOSAA(2991-50-6)	NR70	0.002	<0.002	NA	NA	NA	98	NA
N-MeFOSE (24448-09-7)	NR70	0.005	<0.005	NA	NA	NA	109	NA
N-EtFOSE (1691-99-2)	NR70	0.005	<0.005	NA	NA	NA	91	NA
4:2 FTS (757124-72-4)	NR70	0.001	<0.001	NA	NA	NA	98	NA
6:2 FTS (27619-97-2)	NR70	0.001	<0.001	NA	NA	NA	97	NA
8:2 FTS (39108-34-4)	NR70	0.001	<0.001	NA	NA	NA	106	NA
10:2 FTS (120226-60-0)	NR70	0.001	<0.001	NA	NA	NA	112	NA
8:2 diPAP (678-41-1)	NR70	0.002	<0.002	NA	NA	NA	103	NA

Results expressed in percentage (%) or ug/L wherever appropriate.
Acceptable Spike recovery is 50-150%.
Maximum acceptable RPDs on spikes and duplicates is 40%.
'NA ' = Not Applicable.
RPD= Relative Percentage Difference.

Signed:

Danny Slee
Organics Manager, NMI-North Ryde

Date: **28/08/2019**

Australian Government

National Measurement Institute

QUALITY ASSURANCE REPORT

Client: AECOM Australia Pty Ltd

NMI QA Report No: AECO06/190813/3 **Sample Matrix:** Solid

Analyte	Method	LOR	Blank	Sample Duplicates			Recoveries	
				Sample	Duplicate	RPD	LCS	Matrix Spike
		mg/kg	mg/kg	mg/kg	mg/kg	%	%	%
PFBA (375-22-4)	NR70	0.002	<0.002	NA	NA	NA	110	NA
PFPeA (2706-90-3)	NR70	0.002	<0.002	NA	NA	NA	97	NA
PFHxA (307-24-4)	NR70	0.001	<0.001	NA	NA	NA	101	NA
PFHpA (375-85-9)	NR70	0.001	<0.001	NA	NA	NA	94	NA
PFOA (335-67-1)	NR70	0.001	<0.001	NA	NA	NA	99	NA
PFNA (375-95-1)	NR70	0.001	<0.001	NA	NA	NA	86	NA
PFDA (335-76-2)	NR70	0.001	<0.001	NA	NA	NA	99	NA
PFUdA (2058-94-8)	NR70	0.002	<0.002	NA	NA	NA	100	NA
PFDoA (307-55-1)	NR70	0.002	<0.002	NA	NA	NA	106	NA
PFTrDA (72629-94-8)	NR70	0.002	<0.002	NA	NA	NA	100	NA
PFTeDA (376-06-7)	NR70	0.002	<0.002	NA	NA	NA	104	NA
PFHxDA (67905-19-5)	NR70	0.002	<0.002	NA	NA	NA	89	NA
PFODA (16517-11-6)	NR70	0.005	<0.005	NA	NA	NA	86	NA
FOUEA (70887-84-2)	NR70	0.001	<0.001	NA	NA	NA	99	NA
PFBS (375-73-5)	NR70	0.001	<0.001	NA	NA	NA	97	NA
PFPeS (2706-91-4)	NR70	0.001	<0.001	NA	NA	NA	97	NA
PFHxS (355-46-4)	NR70	0.001	<0.001	NA	NA	NA	96	NA
PFHpS (375-92-8)	NR70	0.001	<0.001	NA	NA	NA	92	NA
PFOS (1763-23-1)	NR70	0.002	<0.002	NA	NA	NA	110	NA
PFNS (68259-12-1)	NR70	0.001	<0.001	NA	NA	NA	94	NA
PFDS (335-77-3)	NR70	0.001	<0.001	NA	NA	NA	97	NA
PFOSA (754-91-6)	NR70	0.001	<0.001	NA	NA	NA	99	NA
N-MeFOSA (31506-32-8)	NR70	0.002	<0.002	NA	NA	NA	101	NA
N-EtFOSA (4151-50-2)	NR70	0.002	<0.002	NA	NA	NA	90	NA
N-MeFOSAA (2355-31-9)	NR70	0.002	<0.002	NA	NA	NA	102	NA
N-EtFOSAA(2991-50-6)	NR70	0.002	<0.002	NA	NA	NA	91	NA
N-MeFOSE (24448-09-7)	NR70	0.005	<0.005	NA	NA	NA	87	NA
N-EtFOSE (1691-99-2)	NR70	0.005	<0.005	NA	NA	NA	79	NA
4:2 FTS (757124-72-4)	NR70	0.001	<0.001	NA	NA	NA	91	NA
6:2 FTS (27619-97-2)	NR70	0.001	<0.001	NA	NA	NA	86	NA
8:2 FTS (39108-34-4)	NR70	0.001	<0.001	NA	NA	NA	100	NA
10:2 FTS (120226-60-0)	NR70	0.002	<0.002	NA	NA	NA	94	NA
8:2 diPAP (678-41-1)	NR70	0.002	<0.002	NA	NA	NA	93	NA

Results expressed in percentage (%) or mg/kg wherever appropriate.
Acceptable Spike recovery is 50-150%.
Maximum acceptable RPDs on spikes and duplicates is 40%.
'NA ' = Not Applicable.
RPD= Relative Percentage Difference.

Signed:

Danny Slee
Organics Manager, NMI-North Ryde

Date: **26/08/2019**

Dean McCall

From: Peachey, James <james.peachey@aecom.com>
Sent: Tuesday, 13 August 2019 3:34 PM
To: Carsten Emrich
Subject: [EXTERNAL] - Additional analysis

Hi Carsten

Please could you arrange for the following samples to be analysed for TOPA (EP231X-TOP):

EB1919839-040 AY_BH04_1.0

Environmental Division
Brisbane
Work Order Reference
EB1922766

Telephone : +61-7-3243 7222

Regards

James Peachey
Associate Director - Environment
D +61 7 3553 3909 M +61 426 206 362
james.peachey@aecom.com

AECOM
Level 8, 540 Wickham Street, Fortitude Valley, QLD 4006
PO Box 1307 Fortitude Valley QLD 4006
T +61 7 3553 2000 F +61 7 3553 2050
aecom.com

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ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB1922766**	Page	: 1 of 5
Client	: **AECOM Australia Pty Ltd**	Laboratory	: Environmental Division Brisbane
Contact	: CAMDEN McCOSKER	Contact	: Carsten Emrich
Address	: Brisbane	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: ----	Telephone	: +61 7 3552 8616
Project	: 60609758_AY	Date Samples Received	: 30-Aug-2019 10:57
Order number	: 60609758 2.0	Date Analysis Commenced	: 31-Aug-2019
C-O-C number	: ----	Issue Date	: 04-Sep-2019 15:08
Sampler	: CAMDEN McCOSKER		
Site	: ----		
Quote number	: BN/112/19		
No. of samples received	: 1		
No. of samples analysed	: 1		

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*
Diana Mesa	2IC Organic Chemist	Brisbane Organics, Stafford, QLD
Kim McCabe	Senior Inorganic Chemist	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 sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

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

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

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	AY_BH04_1.0_190724	----	----	----	----
			Client sampling date / time	24-Jul-2019 08:04	----	----	----	----
Compound	CAS Number	LOR	Unit	EB1922766-001	--------	--------	--------	--------
				Result	----	----	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	**14.6**	----	----	----	----
EP231_TOP_A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	**0.0004**	----	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	**0.338**	----	----	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	----	----	----	----
EP231_TOP_B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	----	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	**0.0010**	----	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	**0.0077**	----	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	**0.0011**	----	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	**0.0005**	----	----	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	**0.0037**	----	----	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	----	----	----	----
EP231_TOP_C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	----	----	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	----	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	AY_BH04_1.0_190724	----	----	----	----
				Client sampling date / time	24-Jul-2019 08:04	----	----	----	----
Compound	CAS Number	LOR	Unit		EB1922766-001	--------	--------	--------	--------
					Result	----	----	----	----
EP231_TOP_C: Perfluoroalkyl Sulfonamides - Continued									
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg		<0.0005	----	----	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg		<0.0005	----	----	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg		<0.0005	----	----	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg		<0.0002	----	----	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg		<0.0002	----	----	----	----
EP231_TOP_D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg		<0.0005	----	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg		<0.0005	----	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg		<0.0005	----	----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg		<0.0005	----	----	----	----
EP231_TOP_P: PFAS Sums									
Sum of PFAS	----	0.0002	mg/kg		**0.352**	----	----	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg		**0.338**	----	----	----	----
Sum of TOP C4 - C14 Carboxylates and C4 - C8 Sulfonates	----	0.0002	mg/kg		**0.352**	----	----	----	----
Sum of TOP C4 - C14 as Fluorine	----	0.0002	mg/kg		**0.228**	----	----	----	----
EP231_TOP_S: PFAS Surrogate									
13C4-PFOS	----	0.0002	%		**70.0**	----	----	----	----
13C8-PFOA	----	0.0002	%		**84.5**	----	----	----	----

Surrogate Control Limits

Sub-Matrix: **SOIL**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP231_TOP_S: PFAS Surrogate			
13C4-PFOS	----	60	130
13C8-PFOA	----	60	130

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EB1922766**	Page	: 1 of 5
Client	: **AECOM Australia Pty Ltd**	Laboratory	: Environmental Division Brisbane
Contact	: CAMDEN McCOSKER	Contact	: Carsten Emrich
Address	: Brisbane	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: ----	Telephone	: +61 7 3552 8616
Project	: 60609758_AY	Date Samples Received	: 30-Aug-2019
Order number	: 60609758 2.0	Date Analysis Commenced	: 31-Aug-2019
C-O-C number	: ----	Issue Date	: 04-Sep-2019
Sampler	: CAMDEN McCOSKER		
Site	: ----		
Quote number	: BN/112/19		
No. of samples received	: 1		
No. of samples analysed	: 1		

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*
Diana Mesa	2IC Organic Chemist	Brisbane Organics, Stafford, QLD
Kim McCabe	Senior Inorganic Chemist	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 (%)*
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 2558812)									
EB1922583-012	Anonymous	EA055: Moisture Content	----	0.1	%	75.5	75.2	0.364	0% - 20%
EP231_TOP_A: Perfluoroalkyl Sulfonic Acids (QC Lot: 2557308)									
EB1922766-001	AY_BH04_1.0_190724	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	0.0004	0.0004	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	0.338	0.281	18.5	0% - 20%
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
EP231_TOP_B: Perfluoroalkyl Carboxylic Acids (QC Lot: 2557308)									
EB1922766-001	AY_BH04_1.0_190724	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	0.0010	0.0012	18.7	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	0.0077	0.0065	17.3	0% - 20%
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	0.0011	0.0009	19.0	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	0.0005	0.0003	43.6	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	0.0037	0.0032	14.4	0% - 50%
		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
EP231_TOP_C: Perfluoroalkyl Sulfonamides (QC Lot: 2557308)									
EB1922766-001	AY_BH04_1.0_190724	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

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 (%)*
EP231_TOP_C: Perfluoroalkyl Sulfonamides (QC Lot: 2557308) - continued									
EB1922766-001	AY_BH04_1.0_190724	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)	24448-09-7	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
EP231_TOP_D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 2557308)									
EB1922766-001	AY_BH04_1.0_190724	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
EP231_TOP_P: PFAS Sums (QC Lot: 2557308)									
EB1922766-001	AY_BH04_1.0_190724	EP231X: Sum of PFAS	----	0.0002	mg/kg	0.352	0.294	18.2	0% - 20%
		EP231X: Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	0.338	0.281	18.4	0% - 20%
		EP231X: Sum of TOP C4 - C14 Carboxylates and C4 - C8 Sulfonates	----	0.0002	mg/kg	0.352	0.294	18.2	0% - 20%
		EP231X: Sum of TOP C4 - C14 as Fluorine	----	0.0002	mg/kg	0.228	0.190	18.2	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
EP231_TOP_A: Perfluoroalkyl Sulfonic Acids (QCLot: 2557308)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	----	----	----	----
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	----	----	----	----
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	0.00236 mg/kg	80.7	50	150
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	----	----	----	----
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	0.00232 mg/kg	67.9	50	150
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	----	----	----	----
EP231_TOP_B: Perfluoroalkyl Carboxylic Acids (QCLot: 2557308)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	----	----	----	----
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	----	----	----	----
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	----	----	----	----
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	----	----	----	----
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	0.0025 mg/kg	78.8	50	150
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	----	----	----	----
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	----	----	----	----
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	----	----	----	----
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	----	----	----	----
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	----	----	----	----
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	----	----	----	----
EP231_TOP_C: Perfluoroalkyl Sulfonamides (QCLot: 2557308)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	----	----	----	----
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	----	----	----	----
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	----	----	----	----
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	----	----	----	----
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	----	----	----	----
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	----	----	----	----
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	----	----	----	----
EP231_TOP_D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 2557308)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	----	----	----	----
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	0.00018 mg/kg	-11.1	0	200
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	----	----	----	----

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
EP231_TOP_D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 2557308) - continued								
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	----	----	----	----

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.

- **No Matrix Spike (MS) or Matrix Spike Duplicate (MSD) Results are required to be reported.**

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EB1922766**	Page	: 1 of 4
Client	: **AECOM Australia Pty Ltd**	Laboratory	: Environmental Division Brisbane
Contact	: CAMDEN McCOSKER	Telephone	: +61 7 3552 8616
Project	: 60609758_AY	Date Samples Received	: 30-Aug-2019
Site	: ----	Issue Date	: 04-Sep-2019
Sampler	: CAMDEN McCOSKER	No. of samples received	: 1
Order number	: 60609758 2.0	No. of samples analysed	: 1

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

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

Summary of Outliers

Outliers : Quality Control Samples

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

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

Outliers : Analysis Holding Time Compliance

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

Outliers : Frequency of Quality Control Samples

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

Outliers : Analysis Holding Time Compliance

Matrix: **SOIL**

Method / Container / Client Sample ID(s)	Extraction / Preparation			Analysis		
	Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA055: Moisture Content (Dried @ 105-110°C)						
HDPE Soil Jar						
AY_BH04_1.0_190724	----	----	----	02-Sep-2019	07-Aug-2019	**26**

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
EA055: Moisture Content (Dried @ 105-110°C)							
HDPE Soil Jar (EA055)							
AY_BH04_1.0_190724	**24-Jul-2019**	**----**	----	----	**02-Sep-2019**	07-Aug-2019	×
EP231_TOP_A: Perfluoroalkyl Sulfonic Acids							
HDPE Soil Jar (EP231X (TOP))							
AY_BH04_1.0_190724	**24-Jul-2019**	**31-Aug-2019**	20-Jan-2020	✓	**02-Sep-2019**	10-Oct-2019	✓
EP231_TOP_B: Perfluoroalkyl Carboxylic Acids							
HDPE Soil Jar (EP231X (TOP))							
AY_BH04_1.0_190724	**24-Jul-2019**	**31-Aug-2019**	20-Jan-2020	✓	**02-Sep-2019**	10-Oct-2019	✓
EP231_TOP_C: Perfluoroalkyl Sulfonamides							
HDPE Soil Jar (EP231X (TOP))							
AY_BH04_1.0_190724	**24-Jul-2019**	**31-Aug-2019**	20-Jan-2020	✓	**02-Sep-2019**	10-Oct-2019	✓
EP231_TOP_D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE Soil Jar (EP231X (TOP))							
AY_BH04_1.0_190724	**24-Jul-2019**	**31-Aug-2019**	20-Jan-2020	✓	**02-Sep-2019**	10-Oct-2019	✓
EP231_TOP_P: PFAS Sums							
HDPE Soil Jar (EP231X (TOP))							
AY_BH04_1.0_190724	**24-Jul-2019**	**31-Aug-2019**	20-Jan-2020	✓	**02-Sep-2019**	10-Oct-2019	✓

Quality Control Parameter Frequency Compliance

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

Matrix: **SOIL**

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

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Moisture Content	EA055	1	4	**25.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
PFAS by LCMSMS after oxidation (TOP)	EP231X (TOP)	1	1	**100.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
PFAS by LCMSMS after oxidation (TOP)	EP231X (TOP)	1	1	**100.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
PFAS by LCMSMS after oxidation (TOP)	EP231X (TOP)	1	1	**100.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

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

Analytical Methods	Method	Matrix	Method Descriptions
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM (2013) Schedule B(3) Section 7.1 and Table 1 (14 day holding time).
PFAS by LCMSMS after oxidation (TOP)	EP231X (TOP)	SOIL	In house, following oxidation per Houtz,Erika F.; Sedlak,David L. (2012): Oxidative Conversion as a Means of Detecting Precursors to Perfluoroalkyl Acids in Urban Runoff. In Environmental Science & Technology 46 (17), pp. 9342¿9349.: A portion of the oxidised sample is mixed with methanol (1:1) prior to analysis by LC-Electrospray-MS-MS,Negative Mode using MRM. Where commercially available, isotopically labelled analogues of the target analytes are used as internal standards for quantification. Where a labelled analogue is not commercially available, the internal standard with similar chemistry and the closest retention time to the target is used for quantification. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers.

Preparation Methods	Method	Matrix	Method Descriptions
Sample Extraction for PFAS	EP231-PR	SOIL	In house

From: Peachey, James <james.peachey@aecom.com>
Sent: Friday, 23 August 2019 5:47 AM
To: Carsten Emrich <Carsten.Emrich@alsglobal.com>
Cc: ALSEnviro Brisbane <ALSEnviro.Brisbane@alsglobal.com>
Subject: [EXTERNAL] - Rebatch EB1921176 and ES1925572

Hi Carsten

Please could you rebatch the following samples for TOPA (EP231X-TOP):

EB1921176

-010 (AY_MW01_190806)

Regards

James Peachey
Associate Director - Environment
D +61 7 3553 3909 M +61 426 206 362
james.peachey@aecom.com

AECOM
Level 8, 540 Wickham Street, Fortitude Valley, QLD 4006
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Environmental Division
Brisbane
Work Order Reference
EB1922105

Telephone : +61-7-3243 7222

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB1922105**	Page	: 1 of 5
Amendment	: **1**		
Client	: **AECOM Australia Pty Ltd**	Laboratory	: Environmental Division Brisbane
Contact	: MR JAMES PEACHEY	Contact	: Carsten Emrich
Address	: Brisbane	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: +61 07 3553 2000	Telephone	: +61 7 3552 8616
Project	: 60609758	Date Samples Received	: 23-Aug-2019 05:47
Order number	: 60609758 2.0	Date Analysis Commenced	: 27-Aug-2019
C-O-C number	: ----	Issue Date	: 12-Sep-2019 17:46
Sampler	: NK		
Site	: QFES		
Quote number	: BN/112/19		
No. of samples received	: 4		
No. of samples analysed	: 4		

Accreditation No. 825
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This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Diana Mesa	2IC Organic Chemist	Brisbane Organics, 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 sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

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

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

- Amendment (12/9/19): This report has been amended as a result of misinterpretation of sample identification numbers (IDs). All analysis results are as per the previous report

Analytical Results

Sub-Matrix: **WATER**
(Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Client sample ID: AY_MW01_190806	----
				Client sampling date / time: 06-Aug-2019 00:00	----
				EB1922105-002	--------
				Result	----
EP231_TOP_A: Perfluoroalkyl Sulfonic Acids					
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	**0.04**	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	**0.10**	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	**4.30**	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	**0.32**	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	**42.1**	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	----
EP231_TOP_B: Perfluoroalkyl Carboxylic Acids					
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	**0.9**	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	**2.18**	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	**6.46**	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	**0.82**	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	**1.14**	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	**0.14**	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	----
EP231_TOP_C: Perfluoroalkyl Sulfonamides					
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	----

Analytical Results

Sub-Matrix: **WATER**
(Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Client sample ID: AY_MW01_190806	----
				Client sampling date / time: 06-Aug-2019 00:00	----
				EB1922105-002	--------
				Result	----
EP231_TOP_C: Perfluoroalkyl Sulfonamides - Continued					
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	----
EP231_TOP_D: (n:2) Fluorotelomer Sulfonic Acids					
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	----
EP231_TOP_P: PFAS Sums					
Sum of PFAS	----	0.01	µg/L	**58.5**	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	**46.4**	----
Sum of TOP C4 - C14 Carboxylates and C4 - C8 Sulfonates	----	0.01	µg/L	**58.5**	----
^ **Sum of TOP C4 - C14 as Fluorine**	----	0.01	µg/L	**37.8**	----
EP231_TOP_S: PFAS Surrogate					
13C4-PFOS	----	0.02	%	**111**	----
13C8-PFOA	----	0.02	%	**130**	----

Surrogate Control Limits

Sub-Matrix: **WATER**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP231_TOP_S: PFAS Surrogate			
13C4-PFOS	----	60	130
13C8-PFOA	----	60	130

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EB1922105**	Page	: 1 of 6
Amendment	: **1**		
Client	: **AECOM Australia Pty Ltd**	Laboratory	: Environmental Division Brisbane
Contact	: MR JAMES PEACHEY	Contact	: Carsten Emrich
Address	: Brisbane	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: +61 07 3553 2000	Telephone	: +61 7 3552 8616
Project	: 60609758	Date Samples Received	: 23-Aug-2019
Order number	: 60609758 2.0	Date Analysis Commenced	: 27-Aug-2019
C-O-C number	: ----	Issue Date	: 12-Sep-2019
Sampler	: NK		
Site	: QFES		
Quote number	: BN/112/19		
No. of samples received	: 4		
No. of samples analysed	: 4		

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*
Diana Mesa	2IC Organic Chemist	Brisbane Organics, 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: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP231_TOP_A: Perfluoroalkyl Sulfonic Acids (QC Lot: 2544054)									
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	0.75	0.75	0.00	0% - 20%
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	0.05	0.04	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	0.08	0.07	15.0	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	0.81	0.76	7.14	0% - 20%
		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
EB1922179-007	Anonymous	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	0.00	No Limit
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
EP231_TOP_B: Perfluoroalkyl Carboxylic Acids (QC Lot: 2544054)									
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	0.06	0.05	0.00	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	0.17	0.10	53.7	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	0.54	0.47	13.5	0% - 20%
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	0.08	0.05	36.2	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
EB1922179-007	Anonymous	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	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 (%)*
EP231_TOP_B: Perfluoroalkyl Carboxylic Acids (QC Lot: 2544054) - continued									
EB1922179-007	Anonymous	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
EP231_TOP_C: Perfluoroalkyl Sulfonamides (QC Lot: 2544054)									
		EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EB1922179-007	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP231_TOP_D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 2544054)									
		EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	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 (%)*
EP231_TOP_D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 2544054) - continued									
		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
EB1922179-007	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
EP231_TOP_P: PFAS Sums (QC Lot: 2544054)									
		EP231X: Sum of PFAS	----	0.01	µg/L	2.57	2.32	10.2	0% - 20%
		EP231X: Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	1.56	1.51	3.26	0% - 20%
		EP231X: Sum of TOP C4 - C14 Carboxylates and C4 - C8 Sulfonates	----	0.01	µg/L	2.57	2.32	10.2	0% - 20%
		EP231X: Sum of TOP C4 - C14 as Fluorine	----	0.01	µg/L	1.64	1.48	10.3	0% - 20%
EB1922179-007	Anonymous	EP231X: Sum of PFAS	----	0.01	µg/L	<0.01	<0.01	0.00	No Limit
		EP231X: Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	<0.01	<0.01	0.00	No Limit
		EP231X: Sum of TOP C4 - C14 Carboxylates and C4 - C8 Sulfonates	----	0.01	µg/L	<0.01	<0.01	0.00	No Limit
		EP231X: Sum of TOP C4 - C14 as Fluorine	----	0.01	µg/L	<0.01	<0.01	0.00	No Limit

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

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

Sub-Matrix: **WATER**

				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
EP231_TOP_A: Perfluoroalkyl Sulfonic Acids (QCLot: 2544054)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	----	----	----	----
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	----	----	----	----
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.946 µg/L	87.4	50	150
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	----	----	----	----
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.928 µg/L	64.1	50	150
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	----	----	----	----
EP231_TOP_B: Perfluoroalkyl Carboxylic Acids (QCLot: 2544054)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	----	----	----	----
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	----	----	----	----
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	----	----	----	----
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	----	----	----	----
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	1 µg/L	99.7	50	150
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	----	----	----	----
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	----	----	----	----
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	----	----	----	----
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	----	----	----	----
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	----	----	----	----
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	----	----	----	----
EP231_TOP_C: Perfluoroalkyl Sulfonamides (QCLot: 2544054)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	----	----	----	----
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	----	----	----	----
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	----	----	----	----
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	----	----	----	----
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	----	----	----	----
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	----	----	----	----
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	----	----	----	----
EP231_TOP_D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 2544054)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	----	----	----	----
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.0948 µg/L	-1.05	0	200
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	----	----	----	----

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
EP231_TOP_D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 2544054) - continued								
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	----	----	----	----
EP231_TOP_P: PFAS Sums (QCLot: 2544054)								
EP231X: Sum of PFAS	----	0.01	µg/L	<0.01	----	----	----	----
EP231X: Sum of PFHxS and PFOS	355-46-4/17 63-23-1	0.01	µg/L	<0.01	----	----	----	----
EP231X: Sum of TOP C4 - C14 Carboxylates and C4 - C8 Sulfonates	----	0.01	µg/L	<0.01	----	----	----	----
EP231X: Sum of TOP C4 - C14 as Fluorine	----	0.01	µg/L	<0.01	----	----	----	----

Matrix Spike (MS) Report

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

- **No Matrix Spike (MS) or Matrix Spike Duplicate (MSD) Results are required to be reported.**

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EB1922105**	Page	: 1 of 5
Amendment	: **1**		
Client	: **AECOM Australia Pty Ltd**	Laboratory	: Environmental Division Brisbane
Contact	: MR JAMES PEACHEY	Telephone	: +61 7 3552 8616
Project	: 60609758	Date Samples Received	: 23-Aug-2019
Site	: QFES	Issue Date	: 12-Sep-2019
Sampler	: NK	No. of samples received	: 4
Order number	: 60609758 2.0	No. of samples analysed	: 4

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

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

Summary of Outliers

Outliers : Quality Control Samples

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

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

Outliers : Analysis Holding Time Compliance

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

Outliers : Frequency of Quality Control Samples

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

Analysis Holding Time Compliance

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

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

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

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

Matrix: **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
EP231_TOP_A: Perfluoroalkyl Sulfonic Acids							
HDPE (no PTFE) (EP231X (TOP)) AY_MW01_190806	**06-Aug-2019**	**27-Aug-2019**	02-Feb-2020	✓	**27-Aug-2019**	02-Feb-2020	✓
HDPE (no PTFE) (EP231X (TOP))	**07-Aug-2019**	**27-Aug-2019**	03-Feb-2020	✓	**27-Aug-2019**	03-Feb-2020	✓
HDPE (no PTFE) (EP231X (TOP))	**08-Aug-2019**	**27-Aug-2019**	04-Feb-2020	✓	**27-Aug-2019**	04-Feb-2020	✓
EP231_TOP_B: Perfluoroalkyl Carboxylic Acids							
HDPE (no PTFE) (EP231X (TOP)) AY_MW01_190806	**06-Aug-2019**	**27-Aug-2019**	02-Feb-2020	✓	**27-Aug-2019**	02-Feb-2020	✓
HDPE (no PTFE) (EP231X (TOP))	**07-Aug-2019**	**27-Aug-2019**	03-Feb-2020	✓	**27-Aug-2019**	03-Feb-2020	✓
HDPE (no PTFE) (EP231X (TOP))	**08-Aug-2019**	**27-Aug-2019**	04-Feb-2020	✓	**27-Aug-2019**	04-Feb-2020	✓
EP231_TOP_C: Perfluoroalkyl Sulfonamides							
HDPE (no PTFE) (EP231X (TOP)) AY_MW01_190806	**06-Aug-2019**	**27-Aug-2019**	02-Feb-2020	✓	**27-Aug-2019**	02-Feb-2020	✓
HDPE (no PTFE) (EP231X (TOP))	**07-Aug-2019**	**27-Aug-2019**	03-Feb-2020	✓	**27-Aug-2019**	03-Feb-2020	✓
HDPE (no PTFE) (EP231X (TOP))	**08-Aug-2019**	**27-Aug-2019**	04-Feb-2020	✓	**27-Aug-2019**	04-Feb-2020	✓
EP231_TOP_D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE (no PTFE) (EP231X (TOP)) AY_MW01_190806	**06-Aug-2019**	**27-Aug-2019**	02-Feb-2020	✓	**27-Aug-2019**	02-Feb-2020	✓
HDPE (no PTFE) (EP231X (TOP))	**07-Aug-2019**	**27-Aug-2019**	03-Feb-2020	✓	**27-Aug-2019**	03-Feb-2020	✓
HDPE (no PTFE) (EP231X (TOP))	**08-Aug-2019**	**27-Aug-2019**	04-Feb-2020	✓	**27-Aug-2019**	04-Feb-2020	✓

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
EP231_TOP_P: PFAS Sums							
HDPE (no PTFE) (EP231X (TOP)) AY_MW01_190806	**06-Aug-2019**	**27-Aug-2019**	02-Feb-2020	✓	**27-Aug-2019**	02-Feb-2020	✓
HDPE (no PTFE) (EP231X (TOP))	**07-Aug-2019**	**27-Aug-2019**	03-Feb-2020	✓	**27-Aug-2019**	03-Feb-2020	✓
HDPE (no PTFE) (EP231X (TOP))	**08-Aug-2019**	**27-Aug-2019**	04-Feb-2020	✓	**27-Aug-2019**	04-Feb-2020	✓

Quality Control Parameter Frequency Compliance

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

Matrix: **WATER**

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

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
PFAS by LCMSMS after oxidation (TOP)	EP231X (TOP)	2	18	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
PFAS by LCMSMS after oxidation (TOP)	EP231X (TOP)	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
PFAS by LCMSMS after oxidation (TOP)	EP231X (TOP)	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

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

Analytical Methods	Method	Matrix	Method Descriptions
PFAS by LCMSMS after oxidation (TOP)	EP231X (TOP)	WATER	In house, following oxidation per Houtz,Erika F.; Sedlak,David L. (2012): Oxidative Conversion as a Means of Detecting Precursors to Perfluoroalkyl Acids in Urban Runoff. In Environmental Science & Technology 46 (17),pp. 9342¿9349.: A portion of the oxidised sample is mixed with methanol (1:1) prior to analysis by LC-Electrospray-MS-MS,Negative Mode using MRM. Where commercially available, isotopically labelled analogues of the target analytes are used as internal standards for quantification. Where a labelled analogue is not commercially available, the internal standard with similar chemistry and the closest retention time to the target is used for quantification. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers.

Preparation Methods	Method	Matrix	Method Descriptions
Total Oxidisable Precursor Digest for PFAS	* ORG70-W	WATER	In-House with oxidation per Houtz, Erika F.; Sedlak, David L. (2012): Oxidative Conversion as a Means of Detecting Precursors to Perfluoroalkyl Acids in Urban Runoff. In Environmental Science & Technology 46 (17), pp. 9342¿9349: A 5 mL sample is digested with persulfate under alkaline conditions, neutralised and prepared for analysis per EP231.