PFAS Detailed Site Investigation

Toowoomba (Anzac Avenue) Fire Station, 201 Anzac Avenue, Harristown, Queensland

Queensland Fire and Emergency Services

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PFAS Detailed Site Investigation

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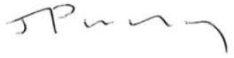
0	26-Feb-2020	Final	James Peachey Project Manager	

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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	Finished 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.
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.
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 Toowoomba (Anzac Avenue) Fire Station, located at 201 Anzac Avenue, Harristown, Toowoomba, QLD 4350 (the site). The location of the site is shown in **Figure 1** in **Appendix A**.

QFES is conducting the PFAS environmental investigation at Toowoomba (Anzac Avenue) 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 the site and environmental setting and historical operations and practices. The PSI identified that firefighting training using aqueous film forming foam (AFFF) containing PFAS occurred at the fire station between the late 1980s and 2003. The areas formerly used for firefighting training exercises and foam storage were identified as potential PFAS source areas.

Based on the findings of a site inspection and anecdotal information from site staff, firefighting training using AFFFs took place in the training area (which was sealed with concrete) and in the tower in the central portion of the site, typically at a frequency of once a month. After the training exercises were completed, the waste foam was captured in the site's concrete lined perimeter drains, which run to the north-eastern corner of the site. The waste foam was left to evaporate or drain away to the municipal system. Equipment testing using foam also occurred weekly in the training area. Foam concentrate was stored in 20 L containers, which were originally stored in an open grassed area east of the training tower. In 2006, a shed was built at the same location, which is now used to store the foam concentrate. The inventory of foam concentrate stored at the site was reported to be less than 200 L for the last 20 years.

Objectives

The objectives of the works were to characterise potential PFAS impacts in soil and groundwater, including concentration and distribution, within and at the boundaries of the Toowoomba (Anzac Avenue) 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 works was completed in accordance with the SAQP (AECOM, 2019). The scope included the drilling of five soil bores on the site (drilled to between 16.0 and 19.0 metres below ground level, mbgl) that were converted to groundwater monitoring wells, advancement of three soil bores to 0.5 mbgl, advancement of four soil bores to 0.1 mbgl and collection of soil and groundwater samples from the bores. Two co-located sediment and surface water samples were collected from on-site surface water drains. Laboratory analysis was undertaken for PFAS followed by preparation of this interpretative report.

Key Findings of the DSI

The key findings of the PFAS DSI are presented below.

- Five deep soil bores were drilled and indicated variable thickness of fill (sand, gravel and clay) between 0.3 and 3.6 mbgl overlying clay of the Main Range Volcanics to at least 19.0 mbgl, the

maximum depth of the investigation. Groundwater was encountered between 14.0 and 17.0 mbgl with stabilised depth to groundwater between 10.9 and 12.3 metres below top of casing indicating a semi-confined aquifer is present beneath the site. Groundwater flow was inferred to locally flow toward the west / northwest.

- PFAS compounds were detected in all 24 soil samples analysed with perfluorooctanesulfonic acid (PFOS) and perfluorohexanesulfonic acid (PFHxS) the main compounds present. The highest ∑(PFHxS+PFOS)[1] concentration present was 0.54 mg/kg within shallow soil at 0.5 mbgl at TW_SS1, located in the landscaped area in the central portion of the site, adjacent and to the east of, the former foam training area. The landscaped area is at a higher elevation (approximately 1.0 m higher) compared to the former foam training area and is separated by a retaining wall. The source of the PFAS may be potentially due to the application of foam to the soil as a wetting agent or foam dispersed by wind during training exercises. The lateral and vertical extent of PFAS in soil in the landscaped area is not known as soil bore TW_SS1 was only advanced to 0.5 mbgl. ∑(PFHxS+PFOS) concentrations in soil samples collected at three locations from beneath the concrete in the former foam training area were more than two orders of magnitude lower that the concentrations detected in soil samples at TW_SS1.
- ∑(PFHxS+PFOS) and perfluorooctanoic acid (PFOA) concentrations in 24 soil samples analysed from five deep bores and seven shallow surface bores did not exceed National Environmental Management Plan (NEMP) (Heads of Environmental Protection Agencies (HEPA), 2018) health guideline values for a commercial land use. PFOS concentrations in the two soil samples from TW_SS1 (at 0.1 and 0.5 mbgl) exceeded the NEMP (HEPA, 2018) ecological indirect exposure guideline value for a commercial land use (0.14 mg/kg).
- The primary PFAS compounds detected in groundwater were PFHxS and PFOS with ∑(PFHxS+PFOS) in the range 0.02 to 8.56 ug/L in the five groundwater samples collected. ∑(PFHxS+PFOS) groundwater concentrations in four out of five groundwater samples exceeded the NEMP (HEPA, 2018) drinking water guideline value. The three groundwater samples with the higher ∑(PFHxS+PFOS) concentrations in groundwater were from monitoring wells within the former foam training area (TW_MW02, TW_MW03 and TW_MW05) and concentrations in these wells also exceeded the National Health Medical Research Council (NHMRC, 2019) human health (recreational water) guideline value. Drinking water and recreational guideline values for PFOA were not exceeded in any of the groundwater samples.
- The lateral extent of the area of groundwater with elevated ∑(PFHxS+PFOS) concentrations hydraulically down-gradient (west / northwest) of the former foam training area is not known. The lateral extent to the east and northeast of the former foam training area (in the landscaped area with TW_SS1) is not known. The lateral extent to the southeast (up-gradient) and southwest (cross-gradient) is indicated by the relatively lower ∑(PFHxS+PFOS) concentrations reported for TW_MW01 and TW_MW04.
- There is the potential for PFAS in groundwater to extend off-site beyond the northern and western site boundaries at concentrations above human health and ecological guideline values. Residential, commercial / industrial properties and recreational land are present to the west and northwest of the site. The risk to potential down-gradient receptors may be mitigated by the relatively low hydraulic conductivity of the soil, the retardation of PFAS in the aqueous phase by sorption of PFAS compounds to clay particles and the distance to the nearest down-gradient registered bore (RN119640) used for water supply, which is approximately 575 m beyond the western site boundary.
- The PSI identified that waste foam was washed into the on-site drains following training exercises, indicating the potential for PFAS to migrate within the surface water drainage system and off-site. The analytical results for co-located surface water and sediment samples from two on-site surface water drains indicated PFOS concentrations in both surface water samples (up to 0.37 µg/L at TW_SW2), which exceeded both the NEMP (HEPA, 2018) and proposed updated (Batley et al., 2018) ecological guideline value for 99% freshwater species protection. PFAS was also detected in the two co-located sediment samples with the highest ∑(PFHxS+PFOS) concentration detected

[1] ∑(PFHxS+PFOS) is sum of PFHxS and PFOS

at TW_SED01 (0.07 mg/kg). The nearest surface water feature is an unnamed ephemeral channel located at distance (approximately 325 m northwest) from the site. The unnamed surface water course appears to flow to the southwest, discharging into Spring Creek approximately 3.6 km to the southwest of the site. The site appears to be within the Spring Creek catchment.

- The laboratory analytical technique for total oxidisible precursor assay (TOPA) is used to detect certain harder to analyse PFAS precursor compounds that may be present. The results of TOPA analysis on soil sample indicated the potential for precursors to be present while the TOPA results for the groundwater samples did not indicate the presence of PFAS precursors. Overall, the results indicated a degraded PFAS product that is unlikely to significantly increase through bio-transformation or oxidation processes.
- Based on information provided as part of the PSI, the source of the PFAS detected in soil and groundwater samples is considered likely to be related to the historical firefighting training practices at the fire station, and spills from storage containers, product transfer and other maintenance activities.

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.

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 Toowoomba (Anzac Avenue) Fire Station, located at 201 Anzac Avenue, Harristown, Toowoomba, QLD 4350 (the site). The location of the site is shown in **Figure 1** in **Appendix A**.

Historical practices and operations at QFES facilities including Toowoomba (Anzac Avenue) Fire Station may have involved using firefighting foam containing PFAS. PFAS are an emerging family of compounds that are highly soluble, persistent and bio-accumulative 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 Toowoomba (Anzac Avenue) 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 in soil and groundwater, including concentration and distribution, within and at the boundaries of the Toowoomba (Anzac Avenue) 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 and groundwater sampling at Toowoomba (Anzac Avenue) 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 (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 five soil bores (TW_BH01 to TW_BH05) to between approximately 16.0 – 19.0 metres below ground level (mbgl), which were converted to groundwater monitoring wells (TW_MW01 to TW_MW05). Collection of soil samples at approximately 1.0m intervals. Development of groundwater monitoring wells.
    - Collection of soil samples from five shallow soil bores advanced to 0.5 mbgl (TW_SS1 to TW_SS5) located in unsealed landscaped areas at various locations across the site.
    - Collection of co-located sediment and surface water samples (TW_SW1/SED01 and TW_SW2/SED02) from surface water drains on site.
    - Collection of groundwater samples from the five new groundwater monitoring wells.
    - Surveying of the top of the casing at each monitoring well to MGA94 coordinates and Australian Height Datum (AHD).
    - Laboratory analysis of soil and groundwater for PFAS, with groundwater analysed for trace level concentrations.
- Preparation of an SIR (this report), which includes an update of the PFAS CSM.

As two of the shallow soil bores could not be advanced below 0.1 mbgl (TW_SS2 and TW_SS5), two additional surface soil samples (TW_SS6 and TW_SS7) were collected from unsealed areas adjacent to the former foam training area.

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 (NEMP, [HEPA][2]). 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.

[2] Noting that the Draft NEMP Version 2.0 is currently out for public comment until June 2019 with expected publication in early 2020.

Table 1 Compounds analysed in the PFAS suite

PFAS Group	Compound	Abbreviation	CAS No.
Perfluoroalkyl Sulfonic Acids	Perfluoro butane 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

Toowoomba (Anzac Avenue) Fire Station is located in Harristown, Toowoomba, and is accessed via Anzac Avenue. Site identification details as identified in the PSI (AECOM, 2019) are shown in **Table 2**.

Table 2 Toowoomba (Anzac Avenue) Fire Station site identification

Item	Details
Site Address	201 Anzac Avenue, Harristown, Toowoomba, QLD 4350
Registered Site Owner	The State of Queensland
Registered Address of Site Owner	Public Safety Business Agency, L13 Makerston House, 30 Makerston Street, Brisbane, Queensland, 4000
Site Occupier	QFES
Local Government Area	Toowoomba Regional Council
Zoning	Medium impact industry / Manufacturing and industrial land use
Future Zoning	Medium impact industry / Manufacturing and industrial land use
Lot and Plan	Lot 2 / RP132831
Tenure	Freehold
Latitude / Longitude	-27.571767, 151.924085
Site Area	6,457m^2
Current / Future Site Use	Current and future site use is as a fire station (i.e. commercial / industrial land use).
Environmental Management Register (EMR) / Contaminated Land Register (CLR)	A search of the DES EMR and CLR for Lot 2 / RP132831 conducted as part of the PSI (AECOM, 2019) indicated that this lot 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** with site infrastructure summarised below:

- The engine bay is present on the eastern boundary of the site (bordering Anzac Avenue) and has side rooms attached.
- A concrete open area in the central portion of the site is used for car parking and training exercises.
- A shed located near the entrance of the site in the central southern portion, is currently used for storage of foam, firefighting appliances, and operative equipment (identified as the foam storage shed identified on Figure 2). Prior to being built in 2006, the area was covered by grass and was also formerly used as a foam storage area.
- A training tower and smoke room is present in the southern central portion of the site.

- The fire and emergency services office and training building is connected to the training tower and smoke room. The building operates as maintenance facility for equipment and PPE with a designated washroom room at the rear of the building. Within these buildings is a breathing apparatus (BA) / HAZMAT facility.
- A concrete in-ground tank, Case 4 Pit (165,400 L capacity) is present in the northwestern corner of the car parking / foam training area and was used for static water supply and collection of stormwater run-off. The pit was decommissioned during 2018.
- Four buildings in the north western portion of the site are used by the State Emergency Service (SES), including three demountable buildings designated for storage and training purposes and one building located on concrete hard stand utilised by office staff. This is the regional office for SES operations in the southwestern region. A 2,000 L water tank is located at the rear (west) of the building.
- A shed is present in the central portion of the western boundary of the site is used by QFES Regional Technical Rescue (RTS). The shed is used for storage of equipment.
- A demountable building is located on the southern portion of western boundary of the site and is used by the Rural Fire Service (RFS). A 2,000 L water tank is located at the rear (west) of the demountable.
- A confined space training area which includes an old grain silo, several large concrete pipes and drains is present along the central northern portion of the site.
- A perimeter drain, running along the northern site boundary in the western portion of the site, discharging to the north approximately at the northwestern corner of the boundary.
- There is a small garden shed located along the northern boundary within the landscaped area to the east of the confined space training area. Signalling is connected to the shed.

There is minimal vegetation on the site. There is a raised grassed area present in the centre north of the site, which is separated from the car park / foam training area by a 1.0 m high retaining wall. A grassed area is present along the western boundary of the site (and surrounding the RFS demountable building) and garden beds present along the southern boundary line.

A number of underground services are present at the site (refer to **Figure 2**, **Appendix A**) including sewer lines, stormwater lines, electrical and communications cables, main hydrant water lines, town water connections, The material used to infill around these services 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 decommissioned Case 4 Pit also has the potential to act as a preferential pathway. Due to the elevation difference between the eastern and western portions of the site, there is the potential for fill to be present such as at the location of landscaped area, which has a retaining wall present. No information was identified in the PSI (AECOM, 2019) on the type of fill that may have been used at the site.

2.3 Surrounding Land Use

Details of surrounding land uses are provided in **Table 3** below.

Table 3 Toowoomba (Anzac Avenue) Fire Station surrounding land use

Direction	Land Use
North	A commercial retail park at 189 Anzac Avenue is adjacent to the eastern portion of the site's northern boundary. A metal working workshop is adjacent to the western portion of the site's northern boundary. Further commercial and industrial properties are present further north between the site and Stephen Street. Residential properties are present on the northern side of Stephen Street, approximately 195 m from the northern site boundary. There is a service station at the northwestern corner of Anzac Avenue and Stephen Street. Toowoomba Regional Council depots are present approximately 130 m to the north of the site, on the western side of Anzac Avenue (Harristown West depot) and on the eastern side of Anzac Avenue (Harristown East depot).
East	Anzac Avenue bounds the site to the east, beyond which is the Stock Exchange Hotel, an automotive mechanical workshop, other commercial properties and the South Western Railway line. Further east is the Concordia Lutheran College (approximately 350 m) and Harristown State High School (approximately 580 m).
South	Adjacent south of the site are commercial buildings and a former scrap yard. The Drayton and Toowoomba cemetery is present approximately 300m to the south-southeast of the site. A BP fuel depot is present approximately 800 m south of the site. Beyond Anzac Avenue to the southeast is the South Western Railway line and various commercial / industrial properties. The nearest residential properties are approximately 470 m to the southeast of the site along Warwick Street.
West	Adjacent west of the site is cleared grassland, which is understood to be a former scrap yard. No scrap remains, but the buildings are still present. Beyond the scrap yard to the west is an Ergon Energy depot and welding works. Adjacent southwest of the site is a stone mason yard.

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, the fire station has been present since 1975 (approximately 44 years) and had previously been developed for residential land use.
- Based on the anecdotal information, firefighting foams have been used at the site since at least the late 1980s. Historical firefighting foams used prior to 2003 were protein foams and AFFF (3M Lightwater). 3M Lightwater is known to contain PFAS, the potential for the protein foam to have contained PFAS is not known. Since 2003, Solberg foam has been used, which is PFAS-free[3]. There is uncertainty on the types of foam used prior to the late 1990s and the potential for use of other types of foam concentrates containing PFAS cannot be discounted.
- Historically, foam concentrate was stored in 20 L containers and the total volume of foam concentrate stored on site was reported to not exceed 200 L at any time. Foam has always been decanted directly from containers into trucks. Inadvertent releases of foam may have occurred when decanting foam from drums during training exercises. The containers were originally stored in a grassed area east of the training tower and are now stored in a shed that was built in 2006 at the same location.
- Training exercises at the site were conducted in the concreted carpark / training area in the western portion of the site with foam sprayed directly to ground. Appliance / equipment testing was carried out regularly with foam pumps in the trucks activated once a week and finished foam sprayed across the carpark/ training area to ensure systems were functioning. Dissipation of foam (by evaporation or draining away to the stormwater system) reportedly took between one and two weeks. Finished foam levels were reported to reach ~2 m high which drained towards the north

[3] Reported by the manufacturer at https://www.solbergfoam.com/Foam-Concentrates/RE-HEALING-Foam.aspx

western corner of the carpark. The waste foam was captured in the concrete lined perimeter stormwater drain that runs along the northern boundary and drains to the northwestern corner of the site. Foam training exercises no longer take place on site and are carried out at a facility in Charlton.

- The training tower was historically used for foam training exercises where firefighting foam, smoke and water were pumped into the tower. This training was discontinued in 2003. Foam concentrate (type not identified) was also reported to be applied to grass and plants on site as a wetting agent.
- Out of date foam concentrate was historically used for training purposes on-site, with any waste foams or old fire extinguishers collected from site by a waste removal contractor.
- Foam types stored on site as of February 2019 included Solberg RF3x6 ATC Class B foam and Fire Brake Class A foam. These were stored in the foam storage shed near the entrance of the site. Equipment and personal protective equipment involved in foam usage off-site now undergoes decontamination procedures off-site before being brought back to the washroom facility on-site. It was reported that Toowoomba Regional Council now manages the stormwater from the washroom.
- The 2016 QFES investigation (QFES, 2016) indicated that the Case 4 Pit at the site was empty and dry. Samples were therefore not collected, and no analytical results are available for the site. The report indicates that the in-ground tank is 165,400 L capacity and is located at the rear of the training station car park. The tank had not been used for 8 to 10 years and was decommissioned in 2018.
- A number of potential off-site sources of PFAS were identified. These include a former fuel farm that was historically located immediately adjacent to the northern site boundary, a large industrial estate approximately 250 m to the southeast, a fuel depot located approximately 800 m to the south of the site and an airport (Toowoomba City Aerodrome) located approximately 2.9 km northwest of the site.

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[4] for the nearest weather station (Toowoomba Airport, station number 041529) for the period 1996 to 2019. Toowoomba has a humid sub-tropical climate, characteristic of warm summers and cool winters. The wet season occurs between November and March. Mean annual rainfall is 718.1 mm.

Table 4 Summary of monthly climate at Toowoomba Airport between 1996 and 2019

Month	Mean maximum temperature (ºC)	Mean minimum temperature (ºC)	Mean rainfall (mm)
January	28.4	17.6	90.6
February	27.6	17.6	102.2
March	26.2	16.5	86.4
April	23.3	13.4	26.2
May	19.9	10.0	36.5
June	17.0	7.6	36.1
July	16.8	6.6	26.6
August	18.8	7.5	29.8
September	22.4	10.6	34.3
October	24.5	12.8	63.2
November	26.2	14.8	75.8
December	27.6	16.6	104.0

3.2 Site Topography

Toowoomba Regional Council (TRC) online interactive mapping accessed during the PSI (AECOM, 2019) indicated the site slopes gently from the east towards the west / northwest, sloping from 648 to 645 mAHD. Based on the elevation of ground surface at the location of the new monitoring wells installed during the DSI (see **Figure 2** in **Appendix A** and **Table T1** in **Appendix B**), the ground elevation of the well in the eastern side of the site was 647.0 mAHD with the ground elevation in wells in the western side of the site between 644.8 and 645.1 mAHD. This indicates an elevation difference of between 1.9 and 2.3 m between the eastern and western halves of the site. A ramp was noted to be present which slopes down in the centre of the site, joining these two areas. With the exception of this ramp, both areas of the site are relatively flat.

In the western half of the site, surface water runoff is captured by a drain that runs along the northern boundary to the northwestern corner of site, where is connects to municipal drainage, which drains to the west along Stark Court. There are no surface water drains in the eastern portion of the site and surface water is likely to runoff with topographic fall to the west and be captured in the perimeter drains in the western portion of the site.

The QFES representative interviewed during the PSI indicated that surface water run-off is towards the northwest into the perimeter drain, located along the northern site boundary.

[4] http://www.bom.gov.au/climate/averages/tables/cw_041529.shtml

3.3 Soil Type and Acid Sulphate Soils (ASS)

Mapping from Queensland Globe indicates the soils underlying the site and surrounding area are deep red clay soils with lateritic fragments from the Ruthven-Middle Ridge.

Mapping from Australian Soil Resources Information System (ASRIS) indicated there to be an extremely low probability of occurrence of ASS.

3.4 Geology

Based on the Geological Survey of Queensland geological maps (Bureau of Mineral Resources, 1980), the site is underlain by Tertiary Main Range Volcanics, which comprise basalt, agglomerate, shale and dolomite.

The bore card for the closest registered groundwater bore to the site (RN87119, located 25 m to the south of the site) indicates the geology beneath the site comprises clay to 42 mbgl underlain by basalt to 76 mbgl.

3.5 Hydrology

The closest hydrological feature to the site is an unnamed water course located approximately 325 m to the northwest of the site boundary. The water course is listed as 'non-perennial' and therefore it is likely that this creek is ephemeral. There are no other surface water features within 500 m of the site. The unnamed surface water course appears to flow to the southwest, discharging into Spring Creek approximately 3.6 km to the southwest of the site. The site appears to be within the Spring Creek catchment. Gowrie Creek is located approximately 2.3 km to the west of the site.

Toowoomba Regional Council online interactive mapping indicates there is a stormwater pipe which is located within an easement, along the northern edge of the site.

Toowoomba Regional Council online interactive mapping indicates the site and adjacent land is not within a flood risk area (mapped as 'property not affected').

3.6 Hydrogeology

The Groundwater Resources of Queensland 1:2,500,000 mapping indicates the aquifer beneath the site comprises basic volcanics (Main Range Volcanics), with a yield of 5 to 15 L/s and salinity of 500 to 1500 mg/L. The groundwater is noted to be suitable for most purposes, marginal for human consumption and low salt tolerant crops.

A search of the Department of Natural Resources, Mines and Energy (NRME) registered groundwater bore database was completed in January 2019 (AECOM, 2019) which identified eighteen bores within 1 km of the site, four of which are located within 500 m of the site. The registered bore locations are shown on **Figure 2, Appendix A**. Bore logs were included in the PSI report (AECOM, 2019) and summarised in **Table 5**.

Table 5 Registered groundwater bores within 1 km of Toowoomba (Anzac Avenue) Fire Station

Bore ID	Distance & Direction	Screened Depth	Additional comments
RN87119	25 m south	54 – 73 m in basalt	Unknown use. Standing water level (SWL) listed as 21.5 mbgl. Listed as potable.
RN83682	121 m north	34 – 46 m in basalt	Unknown use. SWL listed as 19.3 mbgl. Suitability not listed, noted as 'supply'.
RN87103	340 m north	24 – 35 m in basalt	Unknown use. SWL listed as 18.3 mbgl. Listed as potable.
RN119640	575 m north west	58 – 94 m in basalt	For water supply. SWL listed as 26.0 mbgl. Suitability not listed.
RN66765	585 m east/south-east	40 – 46 m, 68 – 71 m 90 – 94 m in basalt	Unknown use. SWL listed as 22.7 mbgl. Listed as potable.

Bore ID	Distance & Direction	Screened Depth	Additional comments
RN87084	595 m east	25 – 43 m, 53 – 60 m, 74 – 77 m, 83 – 86 m, 113 – 116 m, 123 – 127 m in basalt.	Unknown use. SWL listed as 29.1 mbgl. Listed as potable. Water quality parameters not provided.
RN64170	610 m east	Unknown	Unknown use. SWL listed as 17.7 mbgl. Suitability not listed. c
RN94141	610 m east	30–38 m, 42–47 m, 74–75 m, 76–79 m, 95–98 m, 107–09 m, 119–123 m in basalt	Unknown use. SWL listed as 25.6 mbgl. Listed as potable.
RN137613	730 m south-east	37 – 46 m in basalt	For water supply. SWL listed as 29.5 mbgl. Suitability not listed.
RN61281	770 m west	Unknown	Abandoned and destroyed.
RN119952	845 m north-east	34 – 41 m and 44 – 65 m in basalt	Use unknown. SWL listed as 21.0 mbgl. Suitability not listed.
RN137577	860 m north-east	34 – 41 m and 44 – 65 m in basalt	For water supply. SWL listed as 21.0 mbgl. Suitability not listed.
RN52971	865 m west	28 – 31 m and 44 – 47 m in basalt	Unknown use. SWL listed as 12.5 mbgl. Listed as potable.
RN119652	885 m south-east	127 – 133 m, 157 – 163 m and 181 – 187 m in basalt	For water supply. SWL listed as 65.8 mbgl. Suitability not listed.
RN55035	920 m north-east	39.6 – 45.7 m in basalt	Unknown use. SWL listed as 12.2 mbgl. Suitability not listed.
RN52879	920 m west	33.5 – 35.3 m and 64.0 – 69.0 m in basalt	Unknown use. SWL listed as 28.7 mbgl. Listed as potable. Abandoned but still useable.
RN64375	920 m west	55 – 58 m, 70 – 78 m 86 – 88 m in basalt, 83 – 83m in coal	Unknown use. SWL listed as 30.1 mbgl. Listed as potable.
RN119637	930 m south/south-west	52 – 58m and 88 – 94m in clay/basalt, 130 – 136m in shale	For water supply. SWL listed as 24.2 mbgl. Suitability not listed.

3.7 Environmental Values

Environmental values (EVs) and water quality objectives are not yet defined for the Toowoomba Region area under EPP Water and are under development at the time of writing. As per DES guidance, in areas where no water quality objectives are scheduled, the Queensland water quality guidelines apply as default objectives. **Table 6** highlights the applicable EVs.

Table 6 Surface water environmental values

Waterway Name	Aquatic Ecosystems	Irrigation	Farm Supply/Use	Stock water	Aquaculture	Human Consumer	Primary Recreation	Secondary Recreation	Visual Recreation	Drinking Water	Industrial Use	Cultural and Spiritual Values
Queensland water quality guidelines	X	X	X	X	X	X	X	X	X	X	X	X

3.8 Groundwater Dependent Ecosystems and Environmentally Sensitive Areas

A search of the groundwater dependent ecosystems (GDE) database[5] indicates the following aquatic ecosystems are present within 4 km of the site:

- Wetlands
    - Spring Creek located 2 km west of the site was classed as a moderate potential GDE associated with low rainfall permeable geology (Toowoomba City Basalts).
- Soaks
    - Moderate potential aquatic GDEs described as high rainfall permeable geology (Toowoomba City Basalts) soaks were identified approximately 300 m to the northwest, 2.4 km to the east (associated with West Creek) and 200 m south of the site, respectively.

One terrestrial GDE was identified, which was for vegetation located approximately 4 km to the southwest of the site, associated with the Spring Creek wetlands. This was listed as moderate potential terrestrial GDEs described as low rainfall permeable geologies (basalts).

No subterranean GDEs were identified.

A search of the environmentally sensitive areas database[6] indicated that there are no ESAs on the site. There are several Queensland Heritage Register Places (Category A) located to the south (400 m distance, Drayton and Toowoomba Cemetery) and east (600 m distance at Concordia Lutheran College) of the site.

[5] http://www.bom.gov.au/water/groundwater/gde/map.shtml
[6] 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 of methodology outlined in the SAQP dated 2 April 2019 (AECOM, 2019). Details of the tasks completed are summarised in **Table 7**.

Table 7 Summary of fieldwork

Activity	Dates
Service clearance survey at proposed soil bore locations.	19 August 2019
Drilling of five soil bores (TW_BH01 to TW_BH05), collection of soil samples, conversion to groundwater monitoring wells (TW_MW01 to TW_MW05). Development of the five newly installed groundwater wells.	19 August – 21 August 2019
Advancement of seven shallow soil bores (TW_SS1 to TW_SS2) and collection of soil samples.	
Gauging and collection of groundwater samples from the five newly installed wells (TW_MW01 to TW_MW05).	29 – 30 August 2019
Collection of sediment samples (TW_SED01 and TW_SED02) and surface water samples (TW_SW1 and TW_SS2).	
Positional surveying of the groundwater wells.	30 August 2019

4.2 Sampling Rationale

An overview of the rationale for sampling locations is presented in **Table 8**. 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 8 Sampling rationale

Location ID	Location/Rationale
TW_BH01 / TW_MW01	To investigate PFAS in soil and groundwater adjacent to, and to the north of, the foam storage shed and within the footprint of the former foam storage area.
TW_BH02 / TW_MW02	To investigate PFAS in soil and groundwater within the southern portion of the former foam training area.
TW_BH03 / TW_MW03	To investigate PFAS in soil and groundwater within the northwestern portion of the former foam training area.
TW_BH04 / TW_MW04	To investigate PFAS in groundwater within the southwestern portion of the site. Located potentially hydraulically down or cross gradient of the former foam training area and foam storage shed.
TW_BH05 / TW_MW05	To investigate PFAS in soil and groundwater within the northern portion of the former foam training area.
TW_SS1	To investigate PFAS in soil in the unsealed grassed area in the northern portion of the site adjacent to the former foam training area.
TW_SS2 and TW_SS7	To investigate PFAS in soil in an unsealed landscaped area in the southern portion of the site adjacent to the western edge of the former foam training area.
TW_SS3	To investigate PFAS in soil in an unsealed landscaped area along the southern boundary of the site, to the south of the former foam training area and west of the foam storage shed.
TW_SS4	To investigate PFAS in soil in an unsealed landscaped area to the south of and adjacent to the foam storage shed.
TW_SS5 and TW_SS6	To investigate PFAS in soil in an unsealed landscaped area adjacent to the western edge of the northern portion of the former foam training area.
TW_SED01 / TW_SW1	Co-located sediment and surface water sampling of the drainage line to the south of the former foam training area which may have received waste foam. Collected to investigate the potential for residual PFAS impacts.
TW_SED02 / TW_SW2	Co-located sediment and surface water sampling of the drainage line in the northwestern corner of the site, northwest of the former foam training area. Collected to investigate the potential for residual PFAS impacts.

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 (HEPA, 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**.

4.3 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 9**.

Table 9 Soil investigation methodology

Activity/Item	Details
Service location	AECOM obtained on-site utility plans and Dial-Before-You-Dig service plans before the start of the works. A contractor (Utility ID Pty Ltd) conducted service location and cleared proposed bore locations for services. Concrete coring was conducted at five locations (TW_BH01 to TW_BH05). All soil bores were advanced by non-destructive digging (vacuum extraction using a water lance) to 1.5 mbgl (where possible) to confirm the absence / presence of underground utilities.
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 16.0 – 19.0 mbgl). TW_SS1, TW_SS3 and TW_SS4 were advanced using a hand auger to the target depth of 0.5 mbgl. TW_SS2, TW_SS5, TW_SS6 and TW_SS7 were surface samples only (approximately 0.1 mbgl) collected with a hand auger.
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. Sample jars 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 a laboratory NATA accredited for the analyses performed.
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[7] 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.

[7] 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/

4.4 Groundwater Investigation

The groundwater investigation methodology is described in **Table 10**.

Table 10 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. All four wells were installed to between approximately 16.0 – 19.0 mbgl. Screen length varied between wells dependent on water strike. 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 bladder 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 blanks.
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 bladder pump were decontaminated by scrubbing in a solution of Liquinox[8] 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 bladder 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 Saunders Havill Pty Ltd. The surveying report is presented in **Appendix F**.

[8] 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/

4.5 Sediment Investigation

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

Table 11 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 performed.
Decontamination	A new pair of disposable nitrile gloves was used to collect each sediment sample to avoid the potential for cross contamination.

4.6 Surface Water Investigation

The water sampling methodology is summarised in **Table 12**

Table 12 Surface water investigation methodology

Activity	Details
Surface water sampling	At the drain location, the surface water grab sample was directly collected using the laboratory-supplied container to retrieve water from near the water surface, and towards the centre of the drain. Care was taken to ensure the water column at the sampling location was not agitated during sampling.
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 performed.
Decontamination	A new pair of disposable nitrile gloves was used to collect each surface water sample to avoid the potential for cross contamination.

4.7 Laboratory Analysis and Quality Assurance / Quality Control

A summary of samples analysed for this DSI are shown in **Table 13**. The laboratory analysis was conducted by Australian Laboratory Services (ALS) (primary laboratory) and National Measurement Institute (NMI) (secondary laboratory).

Table 13 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	24	3	3	5
Groundwater / Surface water	7	1	1	
Sediment	2	1	1	

4.8 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

The guideline values relevant for the site that have been adopted for this investigation are identified in **Table 14**. The guideline values are considered to provide a suitable level of protection for all EVs identified (refer to **Section 3.7**).

Table 14 Adopted investigation levels for PFAS

Media	Environmental Value	PFAS	Guideline Value
Soil	Human health- industrial / commercial land use	∑(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 five new soil bores (TW_BH01 to TW_BH05) and seven shallow soil bores (TW_SS1 to TW_SS7) drilled in August 2019 are shown in **Appendix D**. Soil bores TW_BH01 to TW_BH05 were drilled to between 16.0 and 19.0 mbgl before conversion to groundwater monitoring wells. TW_SS1 to TW_SS7 were hand augured to 0.1 or 0.5 mbgl.

Fill was present beneath the concrete at the locations of the five deep bores to variable depth, between 0.3 mbgl at TW_BH04 and 3.6 mbgl at TW_BH02. At TW_BH01 the fill consisted of a 0.15 m layer of sand underlain by gravel aggregate including concrete, gravels brick and glass underlain to 0.9 mbgl. At the other locations, the fill consisted of mottled sandy, silty or gravelly clay. Natural soil was identified as a brown, grey/blue or red-brown clay which was present to at least 19.0 mbgl, which was the deepest depth drilled, and indicative of the basaltic ferrosols expected at depth within the region. The geology encountered beneath the site during the DSI was consistent with the geology reported in the PSI.

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

6.2 Hydrogeology

6.2.1 Depth to Groundwater and Inferred Flow Direction

Groundwater was encountered within the clay in the five deep soil bores between 14.0 and 17.0 mbgl. The depths of the groundwater strikes are shown on the bore logs in **Appendix D** and in **Table T1**, **Appendix B**. Gauging of the five groundwater monitoring wells indicated SWLs were between 10.90 and 12.32 metres below top of casing (mbtoc). The corrected groundwater elevations were between 632.58 and 635.62 m AHD. The SWLs and corrected groundwater elevations are presented in **Table T2**, **Appendix B**.

The inferred groundwater contours and local groundwater flow direction at the fire station are shown on **Figure 3**, **Appendix A**. Based on the available data, groundwater is inferred to locally flow toward the west/northwest.

6.2.2 Water Quality Parameters

Table T3, **Appendix B** presents the field water quality parameter results collected during the groundwater monitoring event. The raw data was recorded on the field sheets presented in **Appendix E**. A summary of the water quality results is presented in **Table 15**.

Table 15 Summary of groundwater quality parameter results

Well ID	Units	TW_MW01 (30/08/2019)	TW_MW02 (30/08/2019)	TW_MW04 (30/08/2019)	TW_MW05 (29/08/2019)
pH		5.59	4.95	5.20	5.13
Temperature	°C	20.6	19.7	19.4	18.7
Electrical Conductivity	µS/cm	227.9	267.9	227.8	414.7
Total Dissolved Solids	mg/L	148.1	174.1	148.1	269.6
Dissolved Oxygen	mg/L	2.25	3.72	3.08	1.54
Oxidation Reduction Potential	mV	219.2	254.2	217.8	228.1

The results indicate that the groundwater is acidic, fresh, moderately oxygenated with mildly reducing conditions.

6.2.3 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 T4**, **Appendix B** and on **Figure 4**, **Appendix A**. The laboratory analytical reports are presented in **Appendix H**. PFAS was detected in all 24 soil samples analysed.

A summary of the results assessed against the adopted human health guideline values is presented in **Table 16.** There were no exceedances of the human health guideline values for commercial land use in the soil samples analysed.

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

Com-pound	No. of samples analysed	No. of samples >LOR*	Max. concentration (mg/kg)	Human health guideline value (mg/kg)	No. of samples exceeding human health guideline value
∑(PFHxS +PFOS)	24	24	0.544**	20	0
PFOS	24	24	0.535	No guideline value	
PFOA	24	24	0.0017	50	0
Sum of PFAS	24	24	0.566	No guideline value	

*LOR = limit of reporting

** Quality assurance samples for TW_SS1_0.1 recorded ∑(PFHxS+PFOS) concentrations of 0.272 mg/kg in the primary sample, 0.158 mg/kg in the duplicate sample (TW_QC100) and 0.844 mg/kg in the triplicate sample (TW_QC200). For the purposes of this assessment, only the primary samples have been considered.

A summary of the results in comparison against the adopted ecological guideline values is presented in **Table 17.** PFOS concentrations in eleven soil samples from the inhabitable / root zone (i.e. 0-2 mbgl) exceeded the ecological guideline value for PFOS (indirect exposure) for a commercial land use[9]. All eleven exceedances were reported for samples of shallow fill (<0.5 mbgl) from a range of locations across the site.

An assessment of PFOS concentrations with the residential land use ecological guideline value for indirect exposure was also performed, as there are a number of open grassed areas and shallow garden beds on site 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 two exceedances of the ecological guideline value for PFOS for indirect exposure for residential land-use. Both exceedances were reported within shallow fill at TW_SS1 at 0.1 mbgl and 0.5 mbgl, advanced within the raised grassed area in the central northern portion of the site.

[9] The PFOS concentration in one soil samples from the saturated zone (at 18.0 mbgl at TW_BH01) also exceeded the ecological guideline value for indirect exposure for a commercial land use. However, this depth is noted to be much deeper that the ecological zone identified in NEPM (2013).

Table 17 Summary of PFAS soil analytical results and assessment with ecological guideline values

Com-pound	No. of samples analysed	No. of samples >LOR	Max. concen-tration (mg/kg)	Ecological guideline value commercial / residential (µg/L)	No. of samples exceeding of commercial guideline value	No. of samples exceeding of residential guideline value
∑(PFHxS +PFOS)	24	24	0.544	No guideline value	No guideline value	No guideline value
PFOS	24	24	0.535	0.14 / 0.01	2	12
PFOA	24	24	0.0017	No guideline value	No guideline value	No guideline value
Sum of PFAS	24	24	0.566	No guideline value	No guideline value	No guideline value

6.3.2 Groundwater

The groundwater analytical results for samples collected from the 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 18** below.

Table 18 Summary of groundwater PFAS analytical results and assessment with human health guideline values

Compound	No. of samples analysed	No. of samples >LOR	Max con-centration (µg/L)	Guideline values drinking water / recreational water (µg/L)	No. of samples exceeding drinking water guideline value	No. of samples exceeding recreational water guideline value
∑(PFHxS+PFOS)	5	5	8.560	0.07 / 2.0	4	3
PFOA	5	5	0.205	0.56 / 10.0	0	0
Sum of PFAS	5	5	10.70	No guideline		

The groundwater analytical results for ∑(PFHxS+PFOS) and PFOA concentrations are presented on **Figure 5**, **Appendix A**. Groundwater samples from four of the five monitoring wells (all except for TW_MW04) exceeded the NEMP (HEPA, 2018) human health guideline values for drinking water for ∑(PFHxS+PFOS). The maximum concentration (8.56 µg/L) was detected in TW_MW02, located in the south of the former foam training area and north of the training tower. Three of the groundwater samples also exceeded the NHMRC (2019) recreational water guideline value for ∑(PFHxS+PFOS) (TW_MW02, TW_MW03 and TW_MW05). All three wells are located within the former foam training area.

PFOA was detected in all five monitoring wells at concentrations that did not exceed the NEMP (HEPA, 2018) human health guideline value for drinking water.

The concentrations of PFOS in all five groundwater samples exceeded the NEMP (HEPA, 2018) ecological guideline values for 99% species protection for freshwater. PFOS concentrations in three of the groundwater samples also exceeded the updated 99% freshwater species protection guideline value proposed in Batley et. al (2018). 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 19**.

Table 19 Summary of TOPA soil and groundwater analytical results

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
TW_SS1_0.5_190819	mg/kg	0.566	0.659	0.426	+15%
TW_MW02_190830	µg/L	10.7	10.8	10.8	+1%

Comparison of the results for the soil sample indicates the sum of 28 PFAS by TOPA was 15% higher than the sum of 28 PFAS by standard analysis, which may indicate the presence of precursor compounds.

Comparison of the results for the groundwater sample indicates the sum of 28 PFAS by TOPA was effectively equal to the sum of 28 PFAS by standard analysis, suggesting no depletion of oxidant by compounds other than PFAS during the TOPA reaction. The result is indicative of a degraded PFAS product that is unlikely to significantly increase through biotransformation or oxidation processes.

6.3.4 Surface Water

The analytical result for two surface water samples collected from onsite surface water drains are presented in **Table T6**, **Appendix B** and displayed on **Figure 6**, **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 20** below.

Table 20 Summary of surface water PFAS analytical results and assessment with human health and ecological guideline values

Compound	No. of samples analysed	No. of samples >LOR	Max. concentration (µg/L)	Guideline values recreational / ecological (µg/L)	No. of samples exceeding recreational water guideline value	No. of samples exceeding ecological guideline value
∑(PFHxS+PFOS)	2	2	1.090	2.0 / None	0	No guideline
PFOS	2	2	0.374	None / 0.051	No guideline	2
PFOA	2	2	0.027	10 / 19	0	0
Sum of PFAS	2	2	2.920	None	No guideline	No guideline

No exceedances of NEMP (HEPA, 2018) human health (recreational water) guideline values were reported for either ∑(PFHxS+PFOS) or PFOA.

Both surface water samples exceeded the NEMP (HEPA, 2018) ecological guideline for 99% freshwater species protection for PFOS and the proposed updated guideline value presented in Batley et. al. (2018). None of the PFOA concentrations in the surface water samples exceeded the ecological guideline values.

6.3.5 Sediment

The analytical results for the two sediment samples collected from on-site surface water drains are presented in **Figure 6**, **Appendix A** and displayed on **Table T7**, **Appendix B**. 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 PFAS analytical results

Compound	No. of samples analysed	No. of samples >LOR	Maximum concentration (mg/kg)
∑(PFHxS+PFOS)	2	2	0.0744
PFOS	2	2	0.0633
PFOA	2	2	<0.005
Sum of PFAS	2	2	0.0872

No suitable criteria are available for assessing human and ecological risk from sediment. The moisture content of SED01 was reported as 42.5% and SED02 as 27.6%.

7.0 Discussion

7.1 Geological and Hydrogeological Conditions

Based on the soil conditions recorded in the bore logs, the subsurface lithology consists of fill of variable thickness (between 0.3 and 3.6 mbgl) underlain by clay, which is considered to be a weathered section of the Main Range Volcanics. The presence of a large thickness of clay beneath the site may retard vertical and lateral migration of PFAS through the unsaturated zone.

Measured groundwater elevations indicate the presence of a semi-confined aquifer, with water strikes occurring between approximately 14.0 – 17.0 mbgl across the site and depth to groundwater detected between approximately 10 and 12.0 mbtoc. Based on the groundwater elevation data (five locations), the inferred contours indicate the local groundwater flow direction is inferred to be toward the west / northwest.

As clay is the dominant soil type within the saturated zone, groundwater flow in the shallow aquifer is likely to be by matrix flow. The clay soil is likely to have a relatively low hydraulic conductivity which may retard vertical and lateral migration of PFAS through the saturated zone. The hydraulic conductivity of the clay is not known.

The former foam training area is sealed with concrete at the surface, with training exercises likely to have involved the application of AFFF to surface. The concrete may have limiting the potential for PFAS to infiltrate into the soil. There is the potential for PFAS to have impregnated within the concrete or possibly 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 decommissioned Case 4 Pit may create preferential pathways through coarse backfill materials for contaminant migration. The PSI (AECOM, 2019) identified that foam was applied to landscaped areas as a wetting agent. The unsealed elevated landscaped area east of the foam training area (i.e. at sample location TW_SS1) is likely to be underlain by fill, as indicated by the presence of the retaining wall. If foam containing PFAS was discharged to ground at this location, there is the potential for leaching and vertical migration with infiltrating rainwater to the groundwater table.

7.2 Soil Analytical Results

Chart 1 presents the ∑(PFHxS+PFOS) concentrations with depth for soil bores across the site. The graph indicates that all elevated ∑(PFHxS+PFOS) concentrations were detected in the near-surface soil (0.1 to 0.5 mbgl). The highest soil ∑(PFHxS+PFOS) concentrations detected at the site were at bore TW_SS01 advanced in the unsealed raised landscaped area to the east of the foam training area. The vertical extent of ∑(PFHxS+PFOS) in soil at this location has not been established as the deepest sample collected from 0.5 mbgl had the highest ∑(PFHxS+PFOS) concentration detected. landscaped area is at a higher elevation (approximately 1.0 m) compared to the former foam training area and is separated by a retaining wall. The results indicate that ∑(PFHxS+PFOS) impacts are present in shallow soil in this unsealed area as a result of the firefighting training exercises (e.g. from foam dispersed by wind during training exercises) or potentially directly applied to ground as a wetting agent as identified during the PSI (AECOM, 2019).

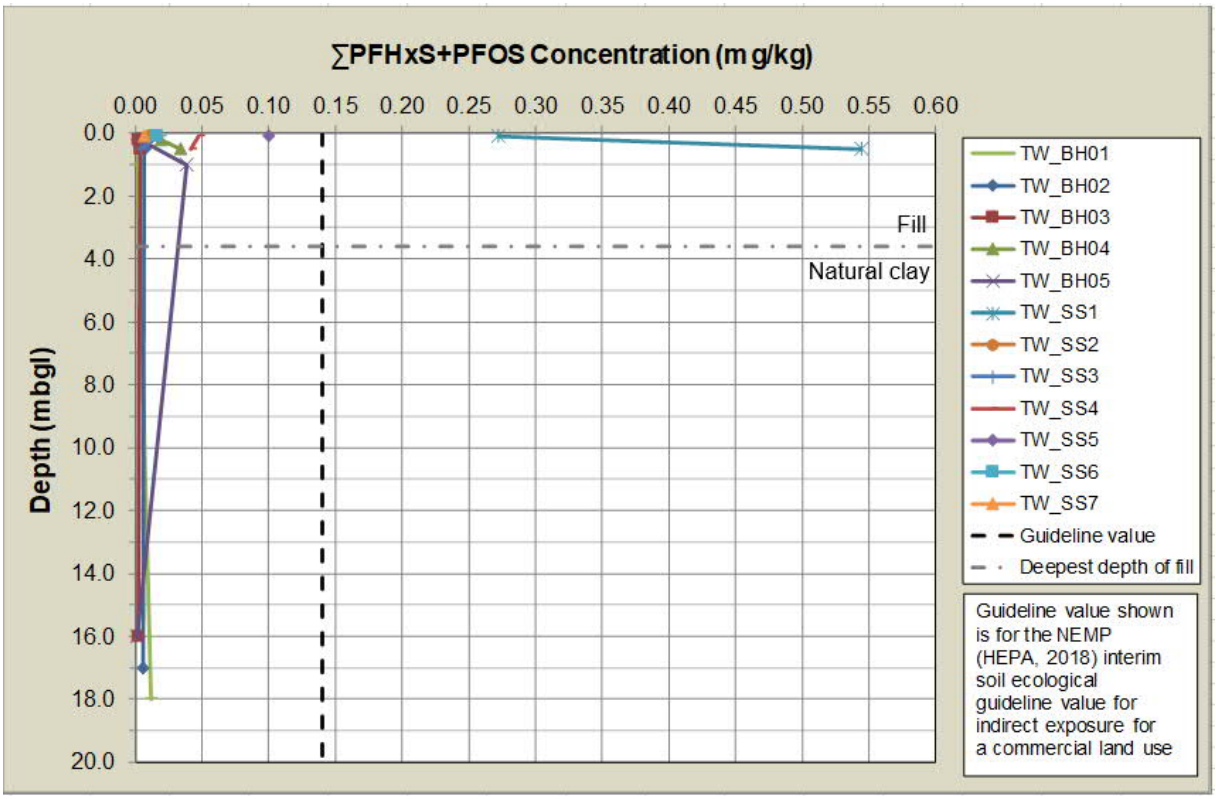
∑(PFHxS+PFOS) concentration in soil samples collected from bores within the foam training area were approximately two orders of magnitude lower than the concentrations reported for soil samples from TW_SS01. This provides a line of evidence that the concrete capping may have reduced migration of PFAS into the underlying soil. However, it is noted that the soil samples collected represent small areas within the foam training area and the distribution of PFAS impacts are likely to be uneven and depend on the locations where firefighting training was undertaken.

The two exceedances of the NEMP (HEPA, 2018) guideline value for PFOS for ecological indirect exposure for a commercial land use, were reported in shallow soils (<0.5 mbgl) within the landscaped area (TW_SS1), indicating a potential risk to terrestrial ecological receptors. However, this is likely to be mitigated by the lack of open space, the extensive paving which will prevent access to the subsurface soils and the minimal vegetation to be ingested and consumed by higher order predators.

Some shorter chain compounds (with less than six perfluorinated carbons) were detected at relatively higher concentrations in the deeper soil samples collected from the saturated zone (deeper than

15 mbgl). For example, PFHxS and PFHxA was detected at relatively higher concentrations (compared to shallower soil samples) at TW_BH01, TW_BH02 and TW_BH03. The detection of these compounds in the saturated zone may reflect sorption of these compounds from groundwater onto clay particles.

Chart 1 Concentration of ∑(PFHxS+PFOS) with depth in soil bores at Toowoomba (Anzac Avenue) Fire Station



7.3 Groundwater Analytical Results

PFAS was detected in all five monitoring wells (TW_MW01 to TW_MW05) with the highest concentrations detected within the former foam training area at TW_MW02 (8.56 µg/L ∑(PFHxS+PFOS)), TW_MW05 (6.71 µg/L ∑(PFHxS+PFOS)) and TW_MW03 (3.84 µg/L ∑(PFHxS+PFOS)). The lateral extent of ∑(PFHxS+PFOS) in groundwater is partially informed to the southwest and east by the relatively lower ∑(PFHxS+PFOS) concentrations detected. Monitoring well TW_MW04 (0.015 µg/L) is located hydraulically cross-gradient and to the west of the former foam training area, while TW_MW01 (0.113 µg/L) is located hydraulically up-gradient and to the southeast of the former foam training area. The lateral extent of PFAS in groundwater to the east and northeast of the former foam training area (in the landscaped area with TW_SS1) is not known.

The lateral extent of PFAS contaminants in groundwater hydraulically down-gradient (to the west and northwest) of the site has not been established and it is possible that PFAS contaminated groundwater has migrated off-site at concentrations that exceed human health and ecological guideline values. The risk to potential down-gradient receptors may be mitigated by the relatively low hydraulic conductivity of the soil, the retardation of PFAS in the unsaturated zone and aqueous phase by sorption of PFAS compounds to clay particles and the distance to the nearest registered bore down-gradient of the site (RN119640), which is approximately 575 m beyond the western site boundary. The closest registered bore to the site (RN87119) is approximately 25 m south of the southern site boundary within a commercial property, however this is considered to be hydraulically cross-gradient (to the south) of the main source area (former foam training area) at the fire station.

Shorter chain compounds (i.e. compounds with six or fewer perfluorinated carbons) have higher mobility in groundwater relative to longer chain compounds. The analytical results indicate that the relatively higher concentrations of shorter chain compounds were in groundwater samples from monitoring wells (TW_MW02 and TW_MW05) adjacent to the main source area (former foam training

area) compared to results from the groundwater sample from the hydraulically down-gradient monitoring well (TW_MW03). The results suggest the mobility of the shorter chain compounds have been retarded, which is attributed to sorption to the clay particles.

7.4 Comparison of PFAS composition in soil and groundwater samples

Table 22 below presents a comparison of the compounds detected in soil and groundwater samples.

Table 22 PFAS composition in soil and groundwater samples at Toowoomba (Anzac Avenue) Fire Station

PFAS	Carbon Chain Length	Average soil ratio at different sample depths			Average groundwater ratio (n=5)
		0.1-0.5 mbgl (n = 18)	1.0 mbgl (n = 2)	16 - 18.0 mbgl (n = 4)	
PFBA	4	0.05%	0%	0%	0.2%
PFBS	4	0.5%	0%	1.8%	6.3%
PFPeS	5	0.4%	0%	1.4%	3.8%
PFPeA	5	1.7%	0.4%	0%	0.5%
PFHxS	6	7.9%	0.8%	43.7%	47.6%
PFHxA	6	3.4%	0.5%	3.6%	2.9%
6:2 FTS	6	0.05%	2.4%	0%	0.3%
PFHpS	7	0.5%	0%	0%	1.2%
PFHpA	7	0.7%	0%	0.5%	0.6%
PFOS	8	69.8%	95.0%	47.9%	35.7%
PFOA	8	1.4%	0.2%	1.1%	0.9%
PFNA	8	0.3%	0%	0%	0%
FOSA	8	4.8%	0.7%	0%	0%*
8:2 FTS	8	3%	0%	0%	0%
PFDS	10	5.4%	0%	0%	0%
PFUnDA	11	0.1%	0%	0%	0%

Note: FOSA was detected at a low concentration in one groundwater sample (MW05). However, overall the average ratio was 0.01%. As results are shown to one decimal place, the ratio for FOSA has been rounded to 0.0%

7.4.1 Soil Profile

Table 22 shows that the PFAS present in soil samples ranged from short (four perfluorinated carbons) to long chain (eleven perfluorinated carbons). Comparison of the average ratio of compounds detected in soil, indicates a larger range of compounds were detected in shallow soils (at depths from 0.1 to 0.5 mbgl) compared to the deeper intervals (1.0 mbgl and saturated zone samples). This may be due to the longer chain PFAS having a greater potential to sorb to soil particles compared to shorter chain PFAS.

The main compound present in soil samples from the 0.1 to 0.5 mbgl depth interval was PFOS (70%) with minor amounts of PFHxS (8%), PFDS (5%), FOSA (5%) and PFHxA (3%). Soil samples from 1.0 mbgl were dominated by PFOS (95%) with samples from the saturated zone (16.0 – 18.0 mbgl) dominated by PFOS and PFHxS (48% and 44%, respectively). This indicates the longer chain PFAS have less mobility compared to shorter chain compounds.

7.4.2 Groundwater Profile

Compared to soil samples, the groundwater samples had a smaller range of chain lengths, between four and eight perfluorinated carbons, see **Table 22**. The main compounds present in groundwater

samples were PFOS and PFHxS (36% and 48%, respectively) with minor amounts of lower chain perfluoroalkyl sulfonic acids (PFSAs) (6% PFBS and 4% PFPeS).

The smaller number of chain lengths present in samples at depth and within groundwater may be due to the longer chain PFAS having a greater potential to sorb to soil particles compared to shorter chain PFAS, or due to longer chain PFAS having lower solubilities than shorter chain compounds.

The composition of groundwater is similar to the composition of soil samples from the saturated zone indicating the PFAS detected in the saturated zone soil samples is likely to be due to the sorption of compounds in the aqueous phase to clay.

7.4.3 Summary

Based on **Table 22**, approximately 97% of the mass of PFAS in the near-surface soil (based on the sum of 28 PFAS analysed) consists of longer chain compounds with more than six perfluorinated carbons. Approximately 89% of the mass of PFAS in groundwater consists of longer chain length with more than six perfluorinated carbons.

7.5 Surface water and Sediment Analytical Results

The PSI identified that waste foam was washed into the on-site drains following training exercises, indicating the potential for PFAS to migrate within the surface water drainage system and off-site. The surface water samples were collected from onsite surface water drains to investigate the potential for residual PFAS impacts within surface water drainage features. Concentrations of PFOS in both samples, TW_SW1 (0.243 µg/L) and TW_SW2 (0.374 µg/L)) exceeded the proposed updated 99% species protection guideline value (0.051 µg/L (Batley, 2018)). PFAS was also detected in the two collocated sediment samples with ∑(PFHxS+PFOS) concentration reported as 0.0744 mg/kg (TW_SED01) and 0.0399 mg/kg (TW_SED02). As identified in **Section 3.5**, it is noted that the nearest water course is located at distance from the site, approximately 325 m to the northwest of the western site boundary.

A summary of the composition of PFAS in surface water and sediment is summarised in **Table 23**. The main PFAS compounds detected in surface water were C4 to C8 PFSAs including PFBS (41%), PFPeS (11%), PFHxS (24%) and PFOS (13%). The composition of PFAS in sediment is generally dominated by the longer chained perfluorinated carbons (>C6) with 78% PFOS, 12% PFHxS and 5.4% EtFOSA, which may be due to longer chain compounds sorbing to sediment particles. It is noted that EtFOSA (and PFDoDA), which are potentially intermediate environment transformation products, were not detected in soil and groundwater samples. The non-detection of these compounds may reflect transformational processes occurring with migration through soil. The factors influencing PFAS sorption in soil aren't fully understood (Li et al., 2018) and are influenced by pH, organic carbon and clay content.

Table 23 PFAS composition in surface water and sediment samples at Toowoomba (Anzac Avenue) Fire Station

PFAS	Carbon Chain Length	Surface water (n = 2)	Sediment (n = 2)
PFBS	4	41.0%	0.4%
PFPeS	5	10.8%	0.3%
PFPeA	5	2.2%	0%
PFHxS	6	23.9%	11.5%
PFHxA	6	2.9%	0.9%
6:2 FTS	6	3.5%	0.5%
PFHpS	7	0.8%	1.2%
PFHpA	7	0.4%	0%
PFOS	8	13.0%	77.8%
PFOA	8	1.0%	0%
PFNA	8	0.2%	0%
8:2 FTS	8	0.2%	0.6%
PFDcA	10	0.1%	0%
10:2 FTS	10	0%	0.7%
EtFOSA	10	0%	5.4%
PFUnDA	11	0%	0%
PFDoDA	12	0%	0.7%

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 risk. 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 area and training tower (see **Figure 2**)
- Appliance / equipment testing of AFFF carrying equipment
- Leaks and spills of AFFF containing PFAS from storage areas, during product transfer and vehicle maintenance

- Application of foam concentrate to grass and plants on site as a wetting agent.

8.3.2 Secondary Sources

The following secondary sources were identified 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 (e.g. Case 4 Pit, concrete in the foam training area)
- Sediment and surface water within stormwater perimeter concrete-lined drainage lines.

8.3.3 Off-Site

The following off-site land uses have the potential to affect groundwater quality beneath the site:

- Activities at the industrial estate located approximately 250 m to the southeast of the site
- A fuel depot, located approximately 800 m to the south of the site
- Toowoomba City Aerodrome located approximately 2.9 km northwest of the site.

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 unsealed areas
- Localised dispersion of firefighting foams with wind during historical application
- Surface water run-off containing PFAS flowing into surface water 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 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 which may act as preferential pathways for PFAS in the unsaturated zone
- Use of groundwater offsite for industrial activities, recreational activities, irrigation for parks and gardens and domestic activities
- 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 concrete-lined stormwater drains and discharging to 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 and/or stormwater and/or groundwater
- Visitors to the site who stay for a short period and are not frequently present at the site who may come into contact with impacted soil and/or stormwater
- 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 nearby surface water bodies
- The terrestrial ecosystem (flora and fauna) both on and off site
- The aquatic ecosystems of nearby waterways

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 groundwater
- Dermal contact and/or incidental ingestion of PFAS impacted 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 24**. A figure showing the key features of the CSM is presented as **Figure 7**, **Appendix A**.

Table 24 Toowoomba (Anzac Avenue) Fire Station PFAS conceptual site model

Primary Source	Secondary Sources	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. No anticipated change to future land use.
			Ecological: ingestion of plants and terrestrial biota by higher order ecological receptors	Terrestrial ecosystem	Possible	Considered possible due to exceedances of the indirect ecological guideline value for commercial/industrial land use and residential land use criteria. Near surface soils are considered accessible to ecological receptors. However, this is likely to be mitigated by the lack of open space, the extensive paving which will prevent access to the subsurface soils and the minimal vegetation to be ingested and consumed by higher order predators.
		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. No anticipated change to future land use.
	PFAS in concrete capping and concrete	Leaching of PFAS within concrete and concrete structures to	Human health - Incidental ingestion or contact with soil, groundwater or surface water.	Off-site surface water users	Unlikely	Considered unlikely. Although PFAS concentrations in soil and groundwater may be partly sourced from concrete impregnated with PFAS (i.e. including the concrete slab overlying soils in the former

Primary Source	Secondary Sources	Transport Mechanism	Exposure Pathways	Receptor	Likelihood of complete linkage	Comments
	lined pits and drains	soil, groundwater and surface water.	Uptake and bioaccumulation in aquatic biota.	Flora and fauna		foam training area), the drainage line does not connect directly with Spring Creek. The nearest water course is at distance (325 m away) and ephemeral, which means aquatic ecosystems are unlikely to be present.
			Uptake and bioaccumulation in terrestrial biota	Flora and fauna	Possible	Considered possible as the lot adjacent the site's western boundary is undeveloped grassed area that could be a disturbed terrestrial ecosystem.
	PFAS in groundwater	Groundwater transport in aquifer followed by extraction and use for domestic, recreational, industrial uses and irrigation (parks)	Human health: direct ingestion or incidental ingestion or direct contact with groundwater (off-Site)	Off-Site groundwater users	Possible	Considered possible as the lateral extent of PFAS in groundwater at concentrations that exceed human health drinking water guideline values has not been assessed and may extend off-site. However, the risk may be mitigated by the lack of nearby registered bores (the nearest hydraulically down-gradient bore (RN119640) is 575 m away to the northwest) and the likely low hydraulic conductivity of the clay soil, which is likely to retard the migration of PFAS.
			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 with groundwater (off-site)	Livestock	Unlikely	Considered unlikely as the fire station is located in a mixed urban and commercial / industrial area. Groundwater in the vicinity of the sites is therefore unlikely to be used for stock watering purposes Additionally, registered groundwater bores have not been identified at the stock yards to the southeast of the site.

Primary Source	Secondary Sources	Transport Mechanism	Exposure Pathways	Receptor	Likelihood of complete linkage	Comments
	PFAS in surface water	Surface water transport via overland flow into on- and off-site drains that discharge into channels and potentially the Spring 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 due to the distance to the nearest permanent water body located 3.6 km to the west. PFAS in surface water samples from the on-site drains did not exceed recreational water guideline values.
			Ecological: direct exposure as well as ingestion of biota by higher order ecological receptors	Terrestrial / aquatic ecosystems	Possible	It is considered possible that residual PFAS impacts may be present at the discharge point of the drainage system to the ephemeral water course (325 m distance) that flows to Spring Creek.
	Accumulation of PFAS in creek sediment	Dispersion via surface water	Human health: incidental ingestion or direct contact with sediment (off-site). Direct ingestion of aquatic biota	Recreational users	Unlikely	Considered unlikely due to the distance of the site to the nearest permanent surface water body, Spring Creek, located 3.6 km to the west of the site. There is the potential for other sources of PFAS within the Harristown area to impact Spring Creek.
			Ecological: direct exposure, as well as ingestion of biota by higher order ecological receptors	Aquatic ecosystem	Unlikely	Considered unlikely as the drainage line does not connect directly with Spring Creek. The nearest water course is at distance (325 m away) and ephemeral, which means aquatic ecosystems are unlikely to be present.

9.0 Conclusions

The key findings of the PFAS DSI are presented below.

- Five deep soil bores were drilled and indicated variable thickness of fill (sand, gravel and clay) between 0.3 and 3.6 mbgl overlying clay of the Main Range Volcanics to at least 19.0 mbgl, the maximum depth of the investigation. Groundwater was encountered between 14.0 and 17.0 mbgl with stabilised depth to groundwater between 10.90 and 12.32 metres below top of casing indicating a semi-confined aquifer is present beneath the site. Groundwater flow was inferred to flow locally from the east towards the west / northwest.
- PFAS compounds were detected in all 24 soil samples analysed with PFOS and PFHxS the main compounds present. The highest ∑(PFHxS+PFOS) concentration present was 0.54 mg/kg within shallow soil at 0.5 mbgl at TW_SS1, located in the landscaped area in the central portion of the site, adjacent and to the east of, the former foam training area. The landscaped area is at a higher elevation (approximately 1.0 m higher) compared to the former foam training area and is separated by a retaining wall. The source of the PFAS may be potentially due to the application of foam to the soil as a wetting agent or foam dispersed by wind during training exercises. The lateral and vertical extent of PFAS in soil in the landscaped area is not known as soil bore TW_SS1 was only advanced to 0.5 mbgl. ∑(PFHxS+PFOS) concentrations in soil samples collected at three locations from beneath the concrete in the former foam training area were more than two orders of magnitude lower that the concentrations detected in soil samples at TW_SS1.
- ∑(PFHxS+PFOS) and PFOA concentrations in 24 soil samples analysed from five deep bores and seven shallow surface bores did not exceed NEMP (HEPA, 2018) health guideline values for a commercial land use. PFOS concentrations in the two soil samples from TW_SS1 (at 0.1 and 0.5 mbgl) exceeded the NEMP (HEPA, 2018) ecological indirect exposure guideline value for a commercial land use (0.14 mg/kg).
- The primary PFAS compounds detected in groundwater were PFHxS and PFOS with ∑(PFHxS+PFOS) in the range 0.02 to 8.56 ug/L in the five groundwater samples collected. ∑(PFHxS+PFOS) groundwater concentrations in four out of five groundwater samples exceeded the NEMP (HEPA, 2018) drinking water guideline value. The three groundwater samples with the higher ∑(PFHxS+PFOS) concentrations in groundwater were from monitoring wells within the former foam training area (TW_MW02, TW_MW03 and TW_MW05) and concentrations in these wells also exceeded the NHMRC (2019) human health (recreational water) guideline value. Drinking water and recreational guideline values for PFOA were not exceeded in any of the groundwater samples.
- The lateral extent of the area of groundwater with elevated ∑(PFHxS+PFOS) concentrations hydraulically down-gradient (west / northwest) of the former foam training area is not known. The lateral extent to the east and northeast of the former foam training area (in the landscaped area with TW_SS1) is not known. The lateral extent to the southeast (up-gradient) and southwest (cross-gradient) is indicated by the relatively lower ∑(PFHxS+PFOS) concentrations reported for TW_MW01 and TW_MW04.
- There is the potential for PFAS in groundwater to extend off-site beyond the northern and western site boundaries at concentrations above human health and ecological guideline values. Residential, commercial / industrial properties and recreational land are present to the west and northwest of the site. The risk to potential down-gradient receptors may be mitigated by the relatively low hydraulic conductivity of the soil, the retardation of PFAS in the aqueous phase by sorption of PFAS compounds to clay particles and the distance to the nearest down-gradient registered bore (RN119640) used for water supply, which is approximately 575 m beyond the western site boundary.
- The PSI identified that waste foam was washed into the on-site drains following training exercises, indicating the potential for PFAS to migrate within the surface water drainage system and off-site. The analytical results for co-located surface water and sediment samples from two on-site surface water drains indicated PFOS concentrations in both surface water samples (up to 0.37 µg/L at

TW_SW2), which exceeded both the NEMP (HEPA, 2018) and proposed updated (Batley et al., 2018) ecological guideline value for 99% freshwater species protection. PFAS was also detected in the two co-located sediment samples with the highest ∑(PFHxS+PFOS) concentration detected at TW_SED01 (0.07 mg/kg). The nearest surface water feature is an unnamed ephemeral channel located at distance (approximately 325 m northwest) from the site. The unnamed surface watercourse appears to flow to the southwest, discharging into Spring Creek approximately 3.6 km to the southwest of the site. The site appears to be within the Spring Creek catchment.

- The laboratory analytical technique for TOPA is used to detect certain harder to analyse PFAS precursor compounds that may be present. The results of TOPA analysis on soil sample indicated the potential for precursors to be present while the TOPA results for the groundwater samples did not indicate the presence of PFAS precursors. Overall, the results indicated a degraded PFAS product that is unlikely to significantly increase through bio-transformation or oxidation processes.
- Based on information provided as part of the PSI, the source of the PFAS detected in soil and groundwater samples is considered likely to be related to the historical firefighting training practices at the fire station, and spills from storage containers, product transfer and other maintenance activities.

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.

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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 19 August 2019 and 19 December 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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List of Appendices

Appendix A

Figures

Appendix A Figures

AECOM

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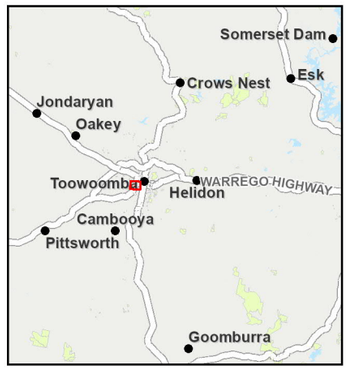
Meters

Legend

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



Queensland Fire and Emergency Services (QFES)

FIGURE 1
Site Location

PFAS Detailed Site Investigation at
ANZAC Avenue Fire Station

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

AECOM

0 5 10 15
Meters

Legend

- Montioring Well Sample Locations
- Sediment/ Surface Water Sample Locations
- Surface Soil Sample Locations
- Former Case 4 Pit
- Electrical Comms Box
- Electrical/Comms
- Light/Comms Tower
- Signalling
- Manhole
- Sewer
- Storm Water Pits
- Stormwater pipe /drain
- Hydrant
- Inferred Water Network
- Approximate area used for foam training exercises
- Structures
- Site Boundary
- Cadastre

Queensland Fire and Emergency Services (QFES)

FIGURE 2
Site Layout and Sampling Locations

PFAS Detailed Site Investigation at ANZAC Avenue Fire Station

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

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AECOM

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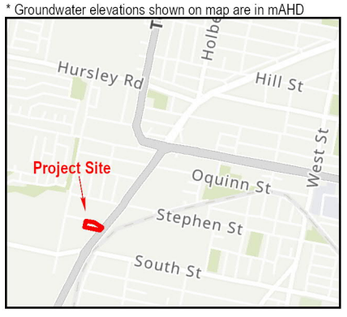
Meters

Legend

- Montioring Well Sample Locations
- Sediment/ Surface Water Sample Locations
- Surface Soil Sample Locations
- Former Case 4 Pit
- Electrical Comms Box
- Electrical/Comms
- Light/Comms Tower
- Signalling
- Manhole
- Sewer
- Storm Water Pits
- Stormwater pipe /drain
- Hydrant
- Inferred Water Network
- Inferred Groundwater Contours (mAHD)
- Approximate area used for foam training exercises
- Structures
- 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 ANZAC Avenue Fire Station

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

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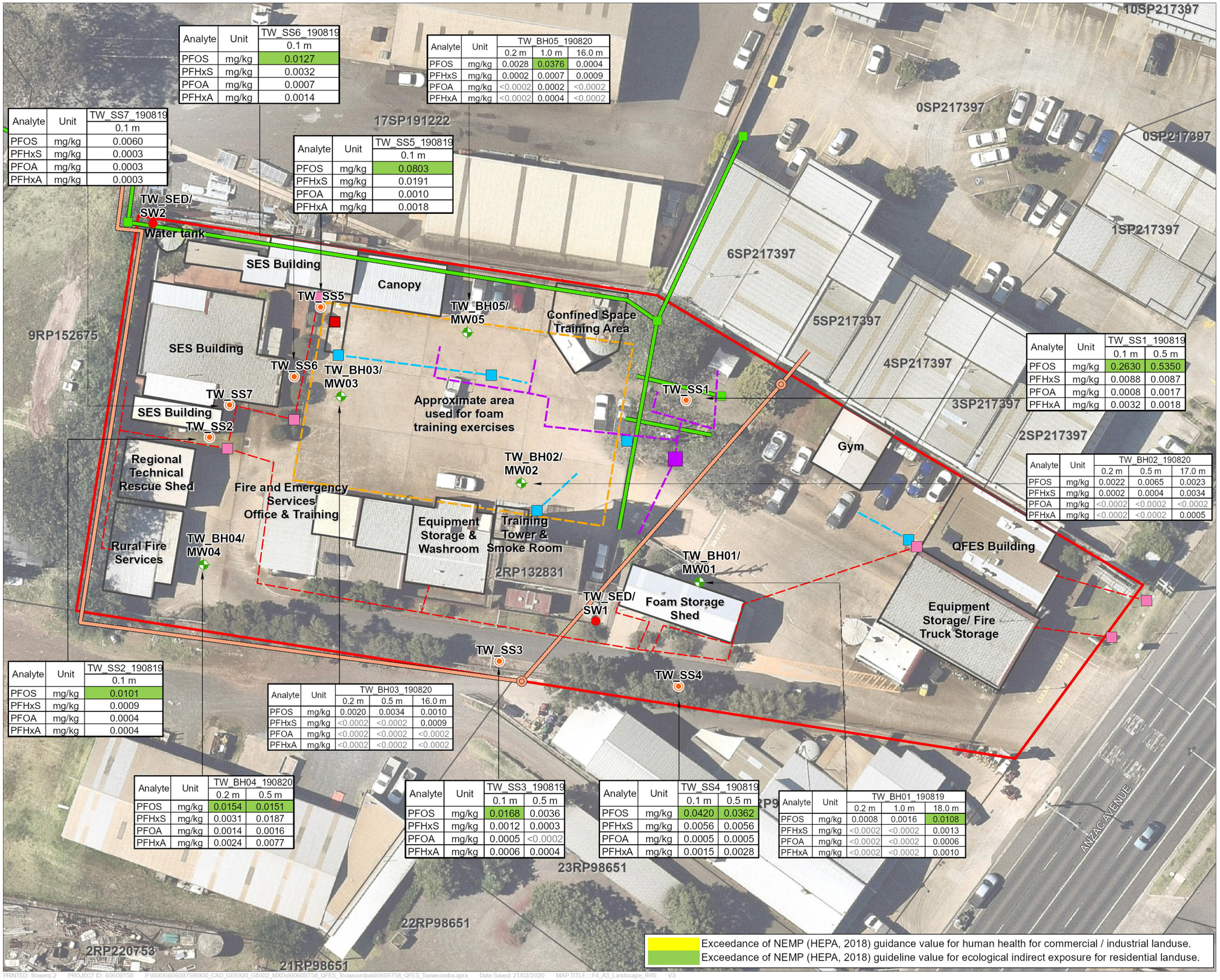

AECOM

0 5 10 15
Meters

Legend

- Montioring Well Sample Locations
- Sediment/ Surface Water Sample Locations
- Surface Soil Sample Locations
- Former Case 4 Pit
- Electrical Comms Box
- Electrical/Comms
- Light/Comms Tower
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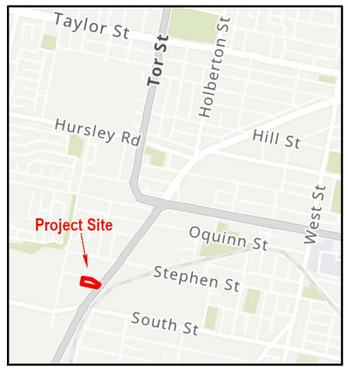
- Manhole
- Sewer
- Storm Water Pits
- Stormwater pipe /drain
- Hydrant
- Inferred Water Network
- Approximate area used for foam training exercises
- Structures
- Site Boundary
- Cadastre



Queensland Fire and Emergency Services (QFES)

FIGURE 4
Soil PFAS Analytical Results

PFAS Detailed Site Investigation at ANZAC Avenue Fire Station

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

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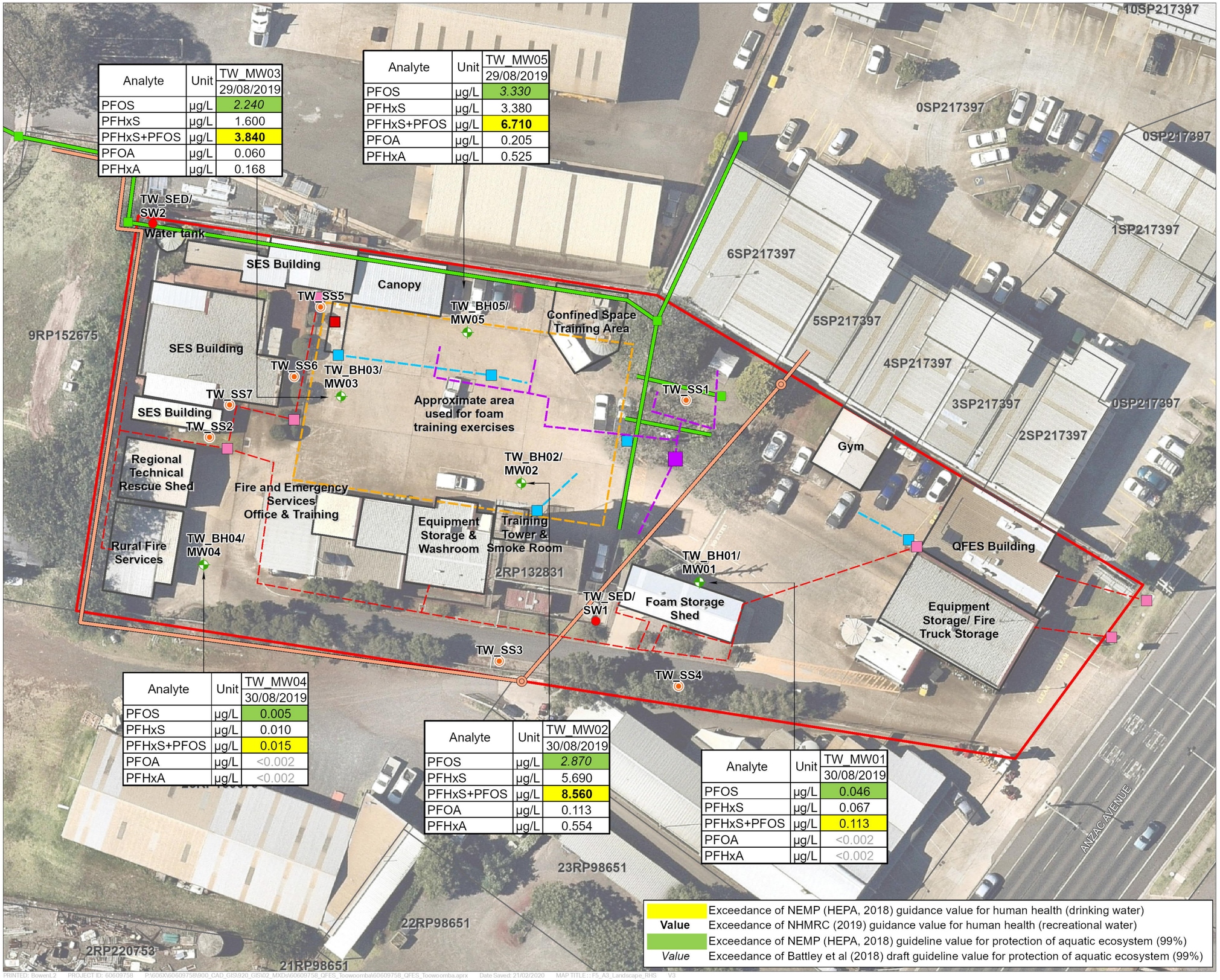

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Legend

- Montioring Well Sample Locations
- Sediment/ Surface Water Sample Locations
- Surface Soil Sample Locations
- Former Case 4 Pit
- Electrical Comms Box
- Electrical/Comms
- Light/Comms Tower
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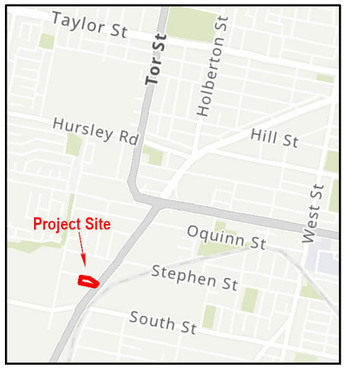
- Sewer
- Storm Water Pits
- Stormwater pipe /drain
- Hydrant
- Inferred Water Network
- Approximate area used for foam training exercises
- Structures
- Site Boundary
- Cadastre



Queensland Fire and Emergency Services (QFES)

FIGURE 5
Groundwater PFAS Analytical Results

PFAS Detailed Site Investigation at ANZAC Avenue Fire Station

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

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Analyte	Unit	TW_SW2
		29/08/2019
PFOS	mg/kg	*0.374*
PFHxS+PFOS	mg/kg	**1.090**
PFOA	mg/kg	0.027

Analyte	Unit	TW_SED02
		29/08/2019
PFOS	mg/kg	0.0355
PFHxS+PFOS	mg/kg	0.0399
PFOA	mg/kg	<0.0005

Analyte	Unit	TW_SW1
		29/08/2019
PFOS	mg/kg	*0.243*
PFHxS+PFOS	mg/kg	**0.672**
PFOA	mg/kg	0.021

Analyte	Unit	TW_SED01
		29/08/2019
PFOS	mg/kg	0.0633
PFHxS+PFOS	mg/kg	0.0744
PFOA	mg/kg	<0.0005

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 Battley et al (2018) draft guideline value for protection of aquatic ecosystem (99%)

AECOM

0 5 10 15
Meters

Legend

- Montioring Well Sample Locations
- Sediment/ Surface Water Sample Locations
- Surface Soil Sample Locations
- Former Case 4 Pit
- Electrical Comms Box
- Electrical/Comms
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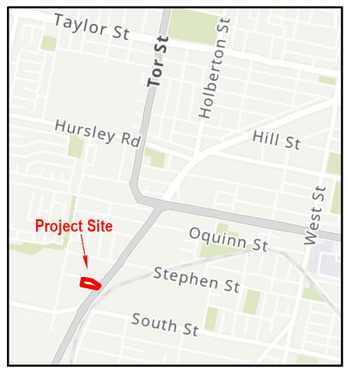
- Inferred Water Network
- Approximate area used for foam training exercises
- Structures
- Site Boundary
- Cadastre



Queensland Fire and Emergency Services (QFES)

FIGURE 6
Surface Water & Sediment PFAS Analytical Results
PFAS Detailed Site Investigation at ANZAC Avenue Fire Station

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

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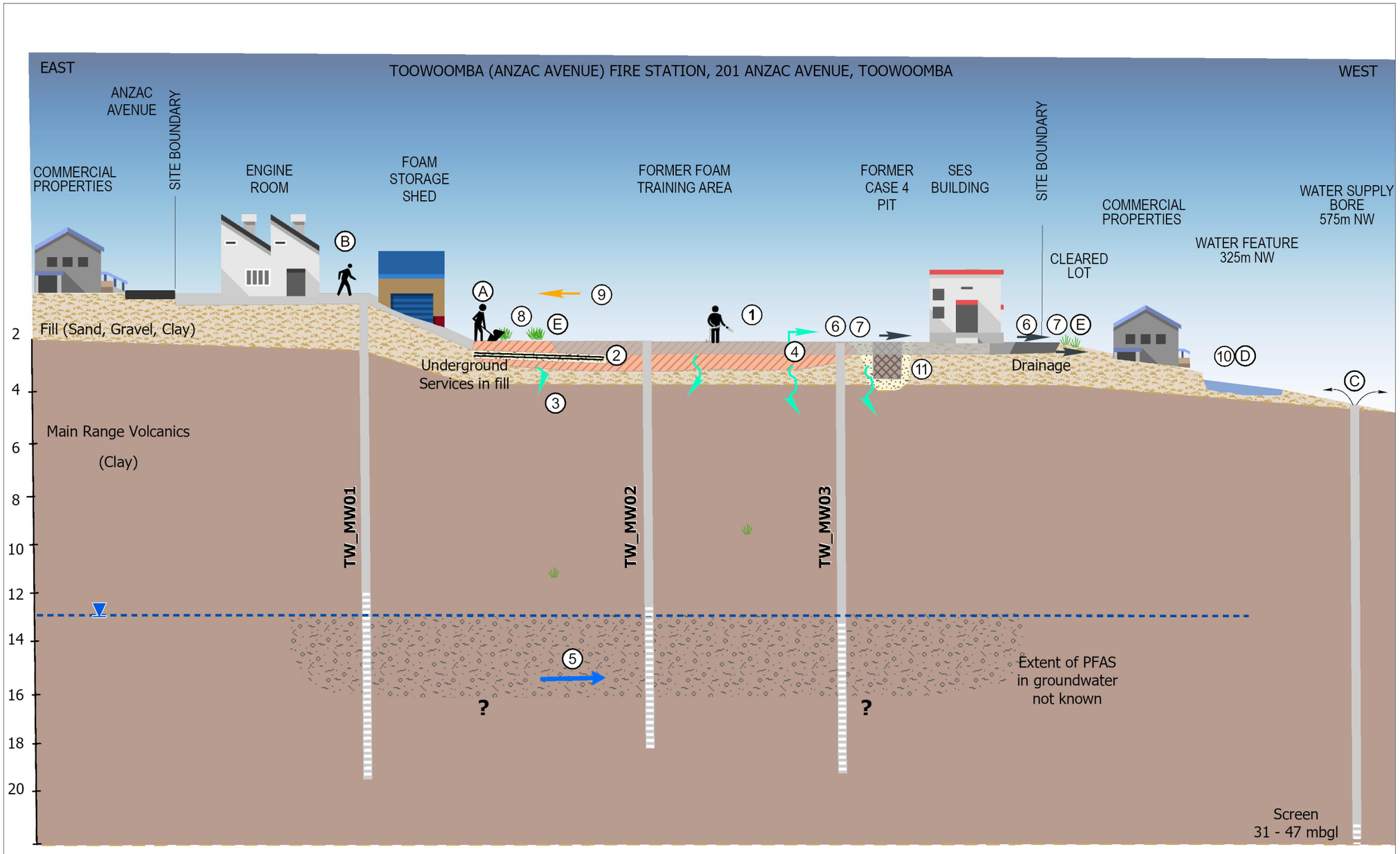


TRANSPORT PATHWAYS

1. Historical 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 / discharge
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. Migration in backfill around underground services and structures

RECEPTORS

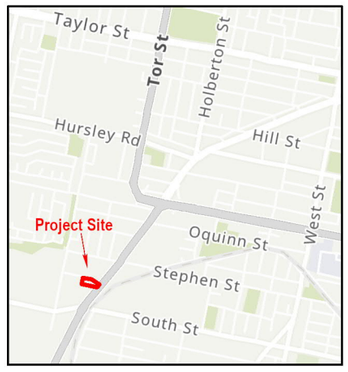
- A. Intrusive construction workers
- B. QFES personnel
- C. Off-site groundwater users
- D. Off-site surface water recreational users
- E. Terrestrial ecosystems
- F. Aquatic ecosystems

AECOM

NOT TO SCALE

Legend

- PFAS in groundwater
- PFAS in soil
- Concrete
- Case 4 Pit
- Backfill
- Inferred groundwater flow direction
- Infiltration / Leaching
- Migration in stormwater drains
- Wind dispersion of foam
- Inferred groundwater depth
- Groundwater table



Queensland Fire and Emergency Services (QFES)

FIGURE 7
PFAS Conceptual Site Model

PFAS Detailed Site Investigation at ANZAC Avenue Fire Station

Source: AECOM, 2019.

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Appendix B

Tables

Appendix B Tables

Location ID Area	Date of Installation	Easting	Northing	Top of Casing Elevation (mAHD)	Cover	Ground levelLevel Elevation (mAHD)	Drilled Depth (m)	Top of screen (mbgs)	Water Strike (mbgs)	Lithology of screened section
TW_BH01/MW01	19/08/2019	393811.52	6949756.65	646.919	Gatic	647.02	19.0	13.0	17.0	CLAY
TW_BH02/MW02	20/08/2019	393787.49	6949769.98	644.997	Gatic	645.13	17.5	11.5	16.0	CLAY
TW_BH03/MW03	20/08/2019	393763.17	6949781.71	644.721	Gatic	644.83	16.0	10.0	14.0	CLAY
TW_BH04/MW04	21/08/2019	393744.62	6949758.99	644.895	Gatic	644.95	18.0	12.0	16.5	CLAY
TW_BH05/MW05	21/08/2019	393780.23	6949790.36	644.676	Gatic	644.78	18.0	12.0	16.0	CLAY

Notes
'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)
TW_MW01	393811.52	6949756.65	646.919	29/08/2019	19.000	11.302	635.617
TW_MW02	393787.49	6949769.98	644.997	29/08/2019	17.560	10.895	634.102
TW_MW03	393763.17	6949781.71	644.721	29/08/2019	16.031	11.680	633.041
TW_MW04	393744.62	6949758.99	644.895	29/08/2019	17.910	12.319	632.576
TW_MW05	393780.23	6949790.36	644.676	29/08/2019	17.908	10.997	633.679

Notes
'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)	Corrected ORP (mV)*
TW_MW01	30/08/2019	5.59	20.6	227.9	148.1	2.25	219.2
TW_MW02	30/08/2019	4.95	19.7	267.9	174.1	3.72	254.2
TW_MW03	29/08/2019	5.30	19	415.4	270.0	3.11	262.3
TW_MW04	30/08/2019	5.20	19.4	227.8	148.1	3.08	217.8
TW_MW05	29/08/2019	5.13	18.7	414.7	269.6	1.54	228.1

Notes
'°C' is degrees Celsius
'µS/cm' is microsiemens per centimetre
'mg/L' is milligrams per litre
'mV' is millivolt
'ORP is Oxidation Reduction Potential'
* A correction factor (+205) has been applied to the water quality meter reading to correct to the value that would be obtained by a hydrogen reference electrode.

				Sum of PFHxS and PFOS	Perfluoroalkyl Sulfonic Acids						Perfluoroalkyl Carbonic Acids											Perfluoroalkyl Sulfonamides							Fluorotelomer Sulfonic Acids				Sum of PFAS	Sum of TOP C4 - C14 as Fluorine
					PFBS	PFPeS	PFHxS	PFHpS	PFOS	PFDS	PFBA	PFPeA	PFHxA	PFHpA	PFOA	PFDcA	PFNA	PFUnDA	PFDoDA	PFTrDA	PFTeDA	FOSA	MeFOSE	EtFOSE	MeFOSA	EtFOSA	MeFOSAA	EtFOSAA	4:2 FTS	6:2 FTS	8:2 FTS	10:2 FTS		
		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	
		LOR		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	0.0002	0.0002	0.0005	0.0002	0.0005	0.0005	0.0005	0.0005	0.0002	0.0002	0.0005	0.0005	0.0005	0.0005	0.0002	
NEMP (HEPA, 2018) Human Health Industrial/Commercial				20											50																			
NEMP (HEPA, 2018) Interim Soil Eco Residential									0.01																									
NEMP (HEPA, 2018) Interim Soil Ecological Commercial									**0.14**																									
Sample ID	**Date**	**Lab Report**	**Type**																															
TW_BH01_0.2_190819	19/08/2019	EB1921880	Normal	0.0008	<0.0002	<0.0002	<0.0002	<0.0002	0.0008	0.0006	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	0.0014	-
TW_BH01_1.0_190819	19/08/2019	EB1921880	Normal	0.0016	<0.0002	<0.0002	<0.0002	<0.0002	0.0016	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	0.0016	-
TW_BH01_18.0_190819	19/08/2019	EB1921880	Normal	0.0121	0.0002	0.0002	0.0013	<0.0002	0.0108	<0.0002	<0.001	<0.0002	0.0010	0.0003	0.0006	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	0.0144	-
TW_BH02_0.2_190820	20/08/2019	EB1921880	Normal	0.0024	<0.0002	<0.0002	0.0002	<0.0002	0.0022	0.0011	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	0.0012	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	0.0047	-
TW_BH02_0.5_190820	20/08/2019	EB1921880	Normal	0.0069	<0.0002	<0.0002	0.0004	<0.0002	0.0065	0.0004	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	0.0011	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	0.0084	-
TW_QC104_190820	20/08/2019	EB1921880	Duplicate	0.0024	<0.0002	<0.0002	0.0002	<0.0002	0.0022	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	0.0026	-
TW_QC204_190820	20/08/2019	RN1245339	Triplicate	0.0046	<0.001	<0.001	<0.001	<0.001	0.0046	<0.001	<0.002	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002	<0.002	<0.001	<0.005	<0.005	<0.002	<0.002	<0.002	<0.002	<0.001	<0.001	<0.001	<0.002	0.0046	-
TW_BH02_17.0_190820	20/08/2019	EB1921880	Normal	0.0057	0.0004	0.0003	0.0034	<0.0002	0.0023	<0.0002	<0.001	<0.0002	0.0005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	0.0069	-
TW_BH03_0.2_190820	20/08/2019	EB1921880	Normal	0.0020	<0.0002	<0.0002	<0.0002	<0.0002	0.0020	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0005	0.0018	<0.0005	<0.0005	0.0038	-
TW_BH03_0.5_190820	20/08/2019	EB1921880	Normal	0.0034	<0.0002	<0.0002	<0.0002	<0.0002	0.0034	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	0.0034	-
TW_BH03_16.0_190820	20/08/2019	EB1921880	Normal	0.0019	<0.0002	<0.0002	0.0009	<0.0002	0.0010	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	0.0019	-
TW_QC106_190820	20/08/2019	EB1921880	Duplicate	0.0023	<0.0002	<0.0002	0.0013	<0.0002	0.0010	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	0.0023	-
TW_QC206_190820	20/08/2019	RN1245339	Triplicate	0.0015	<0.001	<0.001	0.0015	<0.001	<0.002	<0.001	<0.002	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002	<0.002	<0.001	<0.005	<0.005	<0.002	<0.002	<0.002	<0.002	<0.001	<0.001	<0.001	<0.002	0.0000	-
TW_BH04_0.2_190820	20/08/2019	EB1921880	Normal	0.0185	0.0007	0.0005	0.0031	0.0002	0.0154	<0.0002	<0.001	0.0008	0.0024	0.0009	0.0014	<0.0002	0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	0.0256	-
TW_BH04_0.5_190820	20/08/2019	EB1921880	Normal	0.0338	0.0022	0.0021	0.0187	0.0010	0.0151	<0.0002	<0.001	0.0033	0.0077	0.0026	0.0016	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	0.0543	-
TW_QC108_190820	20/08/2019	EB1921880	Duplicate	0.0333	0.0022	0.0018	0.0180	0.0008	0.0153	<0.0002	<0.001	0.0033	0.0074	0.0022	0.0012	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	0.0522	-
TW_BH05_0.2_190820	20/08/2019	EB1921880	Normal	0.0030	<0.0002	<0.0002	0.0002	<0.0002	0.0028	0.0016	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	0.0044	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	0.0007	<0.0005	0.0097	-
TW_BH05_1.0_190820	20/08/2019	EB1921880	Normal	0.0383	<0.0002	<0.0002	0.0007	<0.0002	0.0376	<0.0002	<0.001	0.0003	0.0004	<0.0002	0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	0.0006	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0005	0.0020	<0.0005	<0.0005	0.0418	-
TW_BH05_16.0_190821	21/08/2019	EB1921880	Normal	0.0013	<0.0002	<0.0002	0.0009	<0.0002	0.0004	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	0.0013	-
TW_SS1_0.1_190819	19/08/2019	EB1921880	Normal	0.2720	0.0010	0.0007	0.0088	0.0007	**0.2630**	0.0038	0.0010	0.0041	0.0032	0.0015	0.0008	<0.0002	0.0004	<0.0002	<0.0002	<0.0002	<0.0005	0.0025	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	0.2920	-
TW_QC100_190819	19/08/2019	EB1921880	Duplicate	0.1580	0.0006	<0.0005	0.0076	<0.0005	**0.1500**	<0.0005	<0.002	0.0035	0.0028	0.0013	0.0006	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0012	0.0018	<0.0012	<0.0012	<0.0012	<0.0012	<0.0005	<0.0005	<0.0005	0.0005	<0.0005	<0.0005	0.1690	-
TW_QC200_190819	19/08/2019	RN1245339	Triplicate	0.8440	0.0014	0.0012	0.0240	0.0017	**0.8200**	0.0054	0.0030	0.0053	0.0037	0.0022	0.0021	<0.001	0.0011	<0.002	<0.002	<0.002	<0.002	0.0051	<0.005	<0.005	<0.002	<0.002	<0.002	<0.002	<0.001	<0.001	<0.001	<0.002	0.8479	-
TW_SS1_0.5_190819	19/08/2019	EB1921880	Normal	0.5440	0.0004	0.0004	0.0087	0.0014	**0.5350**	0.0044	<0.001	0.0038	0.0018	0.0011	0.0017	<0.0002	0.0004	<0.0002	<0.0002	<0.0002	<0.0005	0.0042	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0005	0.0023	<0.0005	<0.0005	0.5660	-
TW_SS2_0.1_190819	19/08/2019	EB1921880	Normal	0.0110	<0.0002	<0.0002	0.0009	<0.0002	0.0101	0.0003	<0.001	0.0005	0.0004	<0.0002	0.0004	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	0.0126	-
TW_SS3_0.1_190819	19/08/2019	EB1921880	Normal	0.0180	<0.0002	<0.0002	0.0012	<0.0002	0.0168	<0.0002	<0.001	<0.0002	0.0006	0.0002	0.0005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	0.0193	-
TW_SS3_0.5_190819	19/08/2019	EB1921880	Normal	0.0039	<0.0002	<0.0002	0.0003	<0.0002	0.0036	<0.0002	<0.001	<0.0002	0.0004	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	0.0043	-
TW_SS4_0.1_190819	19/08/2019	EB1921880	Normal	0.0476	<0.0002	<0.0002	0.0056	0.0005	0.0420	<0.0002	<0.001	0.0005	0.0015	<0.0002	0.0005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	0.0506	-
TW_SS4_0.5_190819	19/08/2019	EB1921880	Normal	0.0418	<0.0002	<0.0002	0.0056	0.0013	0.0362	<0.0002	<0.001	0.0007	0.0028	0.0003	0.0005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	0.0474	-
TW_SS5_0.1_190819	19/08/2019	EB1921880	Normal	0.0994	0.0013	0.0022	0.0191	0.0010	0.0803	0.0040	<0.001	0.0007	0.0018	0.0004	0.0010	<0.0002	<0.0002	0.0003	<0.0002	<0.0002	<0.0005	0.0009	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	0.1130	-
TW_SS6_0.1_190819	19/08/2019	EB1921880	Normal	0.0159	<0.0002	<0.0002	0.0032	0.0002	0.0127	0.0005	<0.001	0.0010	0.0014	0.0004	0.0007	<0.0002	0.0003	0.0003	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	0.0207	-
TW_SS7_190818	19/08/2019	EB1921880	Normal	0.0063	<0.0002	<0.0002	0.0003	<0.0002	0.0060	<0.0002	<0.001	0.0006	0.0003	<0.0002	0.0003	<0.0002	0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	0.0077	-
PFAS by TOPA																																		
TW_SS1_0.5_190819	19/08/2019	EB1922827	Normal	0.6060	0.0003	0.0002	0.0072	0.0012	0.5990	0.0025	0.0070	0.0171	0.0144	0.0030	0.0066	<0.0002	0.0004	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	0.6590	0.4260

Notes
TOPA is total oxidisable precursor assay
'mg/kg' is milligrams per kilogram
'<' is less than limit of reporting
'-' not analysed

				Perfluoroalkyl Sulfonic Acids						Perfluoroalkyl Carbonic Acids											Perfluoroalkyl Sulfonamides							Fluorotelomer Sulfonic Acids					
		Sum of PFHxS and PFOS	PFBS	PFPeS	PFHxS	PFHpS	PFOS	PFDS	PFBA	PFPeA	PFHxA	PFHpA	PFOA	PFDA	PFNA	PFUnDA	PFDoDA	PFTrDA	PFTeDA	FOSA	MeFOSE	EtFOSE	MeFOSA	EtFOSA	MeFOSAA	EtFOSAA	4:2 FTS	6:2 FTS	8:2 FTS	10:2 FTS	Sum of PFAS	Sum of TOP C4 - C14 Carboxylates and C4 - C8
	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	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.01	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.005	0.002	0.005	0.005	0.005	0.005	0.002	0.002	0.005	0.005	0.005	0.005	0.002	0.002
NEMP (HEPA, 2018) Human Health Drinking Water		0.07											0.56																			
NHMRC (2019) Human Health Recreational Water		**2.0**											**10**																			
NEMP (HEPA, 2018) Ecological 99% Freshwater Species Protection							0.00023						19																			
Batley et al (2018) Ecological 99% Freshwater Species Protection							**0.051**																									
Sample ID	**Date**	**Lab Report**	**Type**																													
TW_MW01_190830	30/08/2019	EB1922854	Normal	0.113	0.006	0.006	0.067	<0.002	0.046	<0.002	<0.01	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.005	<0.002	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	<0.005	<0.005	<0.005	<0.005	0.125	-
TW_MW02_190830	30/08/2019	EB1922854	Normal	**8.560**	0.519	0.481	5.690	0.167	**2.870**	<0.002	0.050	0.088	0.554	0.085	0.113	<0.002	<0.002	<0.002	<0.002	<0.002	<0.005	<0.002	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	<0.005	0.072	<0.005	<0.005	10.7	-
TW_MW03_190829	29/08/2019	EB1922854	Normal	**3.840**	0.156	0.158	1.600	0.108	**2.240**	<0.002	0.010	0.030	0.168	0.034	0.060	<0.002	<0.002	<0.002	<0.002	<0.002	<0.005	<0.002	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	<0.005	0.036	<0.005	<0.005	4.6	-
TW_MW04_190830	30/08/2019	EB1922854	Normal	0.015	0.002	<0.002	0.010	<0.002	0.005	<0.002	<0.01	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.005	<0.002	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	<0.005	<0.005	<0.005	<0.005	0.017	-
TW_MW05_190829	29/08/2019	EB1922854	Normal	**6.710**	0.588	0.568	3.380	0.163	**3.330**	<0.002	0.040	0.086	0.525	0.116	0.205	<0.002	<0.002	<0.002	<0.002	<0.002	<0.005	0.005	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	<0.005	0.024	<0.005	<0.005	9.030	-
TW_QC112_190829	29/08/2019	EB1922854	Duplicate	**6.370**	0.614	0.543	3.210	0.159	**3.160**	<0.002	0.040	0.088	0.540	0.120	0.215	<0.002	<0.002	<0.002	<0.002	<0.002	<0.005	0.005	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	<0.005	0.047	<0.005	<0.005	8.740	-
TW_QC212_190829	29/08/2019	RN1246205	Triplicate	**7.200**	0.650	0.580	3.800	0.180	**3.400**	<0.001	0.053	0.110	0.560	0.120	0.200	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	0.005	<0.005	<0.005	<0.002	<0.002	<0.002	<0.002	<0.001	0.023	<0.001	<0.001	<0.002	-
PFAS by TOPA																																	
TW_MW02_190830	30/08/2019	EB1923753	Normal	**7.990**	0.550	0.490	5.590	0.150	**2.400**	<0.02	0.200	0.210	1.040	0.100	0.120	<0.02	<0.02	<0.02	<0.02	<0.02	<0.05	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	10.8	10.8

Notes
TOPA is total oxidisable precursor assay
'µg/L' micrograms per litre
'<' less than the limit of reporting
'-' not analysed

			Perfluoroalkyl Sulfonic Acids						Perfluoroalkyl Carbonic Acids													Perfluoroalkyl Sulfonamides						Fluorotelomer Sulfonic Acids				
		Sum of PFHxS and PFOS	PFBS	PFPeS	PFHxS	PFHpS	PFOS	PFDS	PFBA	PFPeA	PFHpA	PFHxA	PFOA	PFDA	PFNA	PFUnDA	PFDoDA	PFTrDA	PFTeDA	FOSA	MeFOSE	Et-FOSE	Me-FOSA	Et-FOSA	MeFOSAA	EtFOSAA	4:2 FTS	6:2 FTS	8:2 FTS	10:2 FTS	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	µg/L
	LOR	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.01	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.005	0.002	0.005	0.005	0.005	0.005	0.002	0.002	0.005	0.005	0.005	0.005	0.002
NHMRC (2019) Human Health Recreational Water		2.0											10																		
PFAS NEMP (2018) Ecological Freshwater 99% Species Protection							0.00023						19																		
Batley et al. (2018) Ecological Freshwater 99% Species Protection							**0.051**																								
Sample ID	**Date**	**Lab Report**	**Type**																													
TW_SW1_190829	29/08/2019	EB1922854	Normal	0.672	0.802	0.180	0.429	0.005	**0.243**	<0.0005	<0.002	0.032	0.010	0.044	0.021	0.003	0.004	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.001	0.068	0.005	<0.001	1.840
TW_SW2_190829	29/08/2019	EB1922854	Normal	1.090	1.120	0.348	0.719	0.038	**0.374**	<0.0005	<0.002	0.078	0.008	0.103	0.027	0.004	0.003	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.001	0.001	<0.0005	<0.001	0.096	0.003	<0.001	2.920

Notes
'µg/L' micrograms per litre
'<' less than the limit of reporting

	Sum of PFHxS and PFOS	Perfluoroalkyl Sulfonic Acids						Perfluoroalkyl Carbonic Acids											Perfluoroalkyl Sulfonamides							Fluorotelomer Sulfonic Acids				Sum of PFAS
		PFBS	PFPeS	PFHxS	PFHpS	PFOS	PFDS	PFBA	PFPeA	PFHxA	PFHpA	PFOA	PFNA	PFDcA	PFUnDA	PFDoDA	PFTrDA	PFTeDA	FOSA	MeFOSE	EtFOSE	MeFOSA	EtFOSA	MeFOSAA	EtFOSAA	4:2 FTS	6:2 FTS	8:2 FTS	10:2 FTS	
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
LOR	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	0.0002	0.0002	0.0005	0.0002	0.0005	0.0005	0.0005	0.0005	0.0002	0.0002	0.0005	0.0005	0.0005	0.0005	0.0002
TW_SED01_190829	29/08/2019	EB1922854	Normal	0.0744	0.0007	0.0006	0.0111	0.0008	0.0633	<0.0005	<0.001	<0.0005	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0012	<0.0005	<0.0012	<0.0065	<0.0012	0.0094	<0.0005	<0.0005	<0.0005	0.0008	<0.0005	<0.0005	0.0872
TW_QC111_190829	29/08/2019	EB1922854	Duplicate	0.0508	0.0007	0.0006	0.0093	<0.0005	0.0415	<0.0005	<0.001	<0.0005	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0012	<0.0005	<0.0012	<0.004	<0.0012	0.0071	<0.0005	<0.0005	<0.0005	0.0012	<0.0005	<0.0005	0.0609
TW_QC211_190829	29/08/2019	RN1246205	Triplicate	0.0553	<0.001	<0.001	0.0073	<0.001	0.0480	<0.001	<0.002	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.002	<0.002	<0.001	<0.005	<0.005	<0.002	<0.002	<0.002	<0.002	<0.001	<0.001	<0.001	<0.002	0.0480
TW_SED02_190829	29/08/2019	EB1922854	Normal	0.0399	<0.0005	<0.0005	0.0044	0.0006	0.0355	<0.0005	<0.001	<0.0005	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0006	<0.0005	<0.0005	<0.0012	<0.0005	<0.0012	<0.015	<0.0012	<0.0012	<0.0005	<0.0005	<0.0005	<0.0005	0.0005	0.0006	0.0427

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

Appendix C

Photographs

PHOTOGRAPHIC LOG

Site Name: Toowoomba Fire Station	**Site Location:** 201 Anzac Avenue, Harristown, Queensland	**Project No:** 60609758

Plate No.	**Date:**
1	22/01/2019

Direction Photo Taken: Southeast to northwest

Description: View of training area taken from roof of training tower. Area historically used for foam training exercises. Surface water drains to north-west boundary of the site, underneath carpark canopy. Confined space training area on the right side of image.

PHOTOGRAPHIC LOG

Site Name: Toowoomba Fire Station	**Site Location:** 201 Anzac Avenue, Harristown, Queensland	**Project No:** 60609758

Plate No.	**Date:**
2	22/01/2019

Direction Photo Taken: Northwest to southeast

Description: Training tower. Historically, smoke, water and foams were pumped into training tower for simulation exercises.

PHOTOGRAPHIC LOG

Site Name: Toowoomba Fire Station	**Site Location:** 201 Anzac Avenue, Harristown, Queensland	**Project No:** 60609758

Plate No. 3	**Date:** 22/01/2019
Direction Photo Taken: West to east	
Description: Northern boundary perimeter drain. Foam used for training exercises on the carpark drains to the northwestern boundary of the site	

PHOTOGRAPHIC LOG

Site Name: Toowoomba Fire Station	**Site Location:** 201 Anzac Avenue, Harristown, Queensland	**Project No:** 60609758

Plate No. 4	**Date:** 22/01/2019
Direction Photo Taken: East to west	
Description: Large shed at entrance of QFES Toowoomba. Shed built in 2006 and used for foam storage. Prior to 2006, the area was covered by grass and was used to store foams.	

PHOTOGRAPHIC LOG

Site Name: Toowoomba Fire Station	**Site Location:** 201 Anzac Avenue, Harristown, Queensland	**Project No:** 60609758

Plate No.	**Date:**
5	22/01/019

Direction Photo Taken:
South to north

Description:
Located on southern boundary of site, at rear of foam storage building, next to driveway.

PHOTOGRAPHIC LOG

Site Name: Toowoomba Fire Station	**Site Location:** 201 Anzac Avenue, Harristown, Queensland	**Project No:** 60609758

Plate No.	**Date:**
6	19/08/2019

Direction Photo Taken:
Southwest

Description:
Location of TW_BH01/TW_MW01. Empty foam containers present on ground in vicinity of borehole.

PHOTOGRAPHIC LOG

Site Name: Toowoomba Fire Station	**Site Location:** 201 Anzac Avenue, Harristown, Queensland	**Project No:** 60609758

Plate No. 7	**Date:** 20/08/2019
Direction Photo Taken: East to west	
Description: Drilling of TW_BH02/TW_MW02 in former foam training area.	

PHOTOGRAPHIC LOG

Site Name: Toowoomba Fire Station	**Site Location:** 201 Anzac Avenue, Harristown, Queensland	**Project No:** 60609758

Plate No. 8	**Date:** 19/08/2019
Direction Photo Taken: West to east	
Description: Location of TW_BH03/TW_MW03 in former foam training area adjacent to entrance to 'SES Building'.	

PHOTOGRAPHIC LOG

Site Name: Toowoomba Fire Station	**Site Location:** 201 Anzac Avenue, Harristown, Queensland	**Project No:** 60609758

Plate No.	**Date:**
9	19/08/2019

Direction Photo Taken:
North to south

Description:
Location of TW_BH04/TW_MW04 in southwestern corner of the site. Adjacent to the rural fire services building.

PHOTOGRAPHIC LOG

Site Name: Toowoomba Fire Station	**Site Location:** 201 Anzac Avenue, Harristown, Queensland	**Project No:** 60609758

Plate No.	**Date:**
10	19/08/2019

Direction Photo Taken:
Southeast to northwest

Description:
Location of TW_BH05/TW_MW05 within the former foam training area.

PHOTOGRAPHIC LOG

Site Name: Toowoomba Fire Station	**Site Location:** 201 Anzac Avenue, Harristown, Queensland	**Project No:** 60609758

Plate No.	**Date:**
11	19/08/2019

Direction Photo Taken:
South to north

Description:
Location of TW_SS1. The contents of the shed are unknown. A sewer stormwater pit is visible adjacent to the shed.

PHOTOGRAPHIC LOG

Site Name: Toowoomba Fire Station	**Site Location:** 201 Anzac Avenue, Harristown, Queensland	**Project No:** 60609758

Plate No.	**Date:**
12	19/08/2019

Direction Photo Taken:
Southeast to northwest

Description:
Location of TW_SS2 and TW_SS7.

PHOTOGRAPHIC LOG

Site Name: Toowoomba Fire Station	**Site Location:** 201 Anzac Avenue, Harristown, Queensland	**Project No:** 60609758

Plate No.	**Date:**
13	19/08/2019

Direction Photo Taken:
North to south

Description:
Location of TW_SS3.

PHOTOGRAPHIC LOG

Site Name: Toowoomba Fire Station	**Site Location:** 201 Anzac Avenue, Harristown, Queensland	**Project No:** 60609758

Plate No.	**Date:**
14	19/08/2019

Direction Photo Taken:
North to south

Description:
Location of TW_SS4

PHOTOGRAPHIC LOG

Site Name: Toowoomba Fire Station	**Site Location:** 201 Anzac Avenue, Harristown, Queensland	**Project No:** 60609758

Plate No.	**Date:**
15	19/08/2019

Direction Photo Taken:
West to east

Description:
Location of TW_SS5 and TW_SS6.

PHOTOGRAPHIC LOG

Site Name: Toowoomba Fire Station	**Site Location:** 201 Anzac Avenue, Harristown, Queensland	**Project No:** 60609758

Plate No.	**Date:**
16	19/08/2019

Direction Photo Taken:
N/A

Description:
Gravel aggregate removed from TW_BH01 between 0.3 – 0.9 mbgl. Aggregate consisted of concrete, coarse angular gravels and cobbles, brick and isolated glass bottles and glass fragments.

Appendix D

Bore Logs

MONITORING WELL LOG TW_BH01/TW_MW01

PROJECT NUMBER 60609758
QFES PFAS DSIs - Toowoomba
LOCATION 201 Anzac Av, Harristown, 4350
DRILLING METHOD NDD, Hand Auger, Push Tube & SSA
SAMPLING METHOD Grab
SURFACE ELEVATION 646.919 m AHD
WELL HEAD/TOC
LOGGED BY C.McCosker
COMMENTS

DATE 19/8/2019
BLANK 0.0 - 13.0 m bgl
SCREEN 13.0 - 19.0 m bgl
GRAVEL PACK 12.5 - 19.0 m bgl
SANITARY SEAL/BENTONITE 11.5 - 12.5 m bgl

NORTHING 6949756.65
EASTING 393811.52

PID (ppm)	Penetrometer (Kg/cm2)	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGL)	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
0.2			TW_BH01_0.2_190819				FILL: CONCRETE	0.15
							FILL: SAND, brown, dry, dense, coarse grained, with medium-coarse sub-angular gravels.	0.30
							FILL: Gravel aggregate. Concrete, coarse angular gravels and cobbles, brick and isolated glass bottles and fragments.	0.90
0.7			TW_BH01_1.0_190819		1.0		DISTURBED NATURAL: Silty CLAY, dark red, dry, stiff, low plasticity, with glass fragments.	
0.5			TW_BH01_1.5_190819				Trace of glass fragments @ 1.50m bgs.	1.70
0.0			TW_BH01_2.0_190819		2.0		Silty CLAY, dark red, dry, stiff, low plasticity.	
0.0			TW_BH01_3.0_190819		3.0		Minor grey mottle @ 3.20m bgs.	
0.0			TW_BH01_4.0_190819		4.0		Grey/light brown mottle @ 3.80m bgs.	3.90
							Sandy CLAY, red-brown, dry, very stiff, low plasticity.	
0.0			TW_BH01_5.0_190819		5.0		CLAY, grey/brown, red mottle, dry, very stiff, medium plasticity.	4.80
0.0			TW_BH01_6.0_190819		6.0			
0.0			TW_BH01_7.0_190819		7.0			
0.0			TW_BH01_8.0_190819		8.0			
0.0			TW_BH01_9.0_190819		9.0			
			TW_BH01_10.0					

WELL DIAGRAM: Grout; Casing

TW_BORELOGS.GPJ 14/2/20

MONITORING WELL LOG TW_BH01/TW_MW01

PROJECT NUMBER 60609758 **DATE** 19/8/2019

QFES PFAS DSIs - Toowoomba

LOCATION 201 Anzac Av, Harristown, 4350 **GROUND WATER ELEVATION** 635.62 m

- Continued from Previous Page -

PID (ppm)	Penetrometer (Kg/cm2)	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGL)	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH	WELL DIAGRAM
0.0			190819				CLAY, grey/brown, red mottle, dry, very stiff, medium plasticity. *(Continued)* Very slightly moist @ 10.0m bgs.		
								10.90	
0.0			TW_BH01_11.0_ 190819		11.0		CLAY, red, grey mottle, slightly moist, stiff, low-medium plasticity.		
0.0			TW_BH01_12.0_ 190819		12.0				Bentonite
0.0			TW_BH01_13.0_ 190819		13.0		Slightly moist @ 13.0m bgs.		
0.0			TW_BH01_14.0_ 190819		14.0		No mottle, moist, firm, medium plasticity @ 14.0m bgs.		
0.0			TW_BH01_15.0_ 190819		15.0				Filter Sands
0.0			TW_BH01_16.0_ 190819		16.0				Screen
0.0			TW_BH01_17.0_ 190819		17.0		Wet @ 17.0m bgs.		
0.0			TW_BH01_18.0_ 190819		18.0				
0.0			TW_BH01_19.0_ 190819		19.0		End of hole at target depth. Total Depth: 19.00 m	19.00	

TW_BORELOGS.GPJ 14/2/20

MONITORING WELL LOG TW_BH02/TW_MW02

PROJECT NUMBER 60609758
QFES PFAS DSIs - Toowoomba
LOCATION 201 Anzac Av, Harristown, 4350
DRILLING METHOD NDD, Hand Auger, Push Tube & SSA
SAMPLING METHOD Grab
SURFACE ELEVATION 644.997 m AHD
WELL HEAD/TOC
LOGGED BY C.McCosker
COMMENTS

DATE 20/8/2019
BLANK 0.0 - 11.5 m bgl
SCREEN 11.5 - 17.5 m bgl
GRAVEL PACK 11.0 - 17.5 m bgl
SANITARY SEAL/BENTONITE 10.0 - 11.0 m bgl

NORTHING 6949769.98
EASTING 393787.49

PID (ppm)	Penetrometer (Kg/cm2)	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGL)	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH	WELL DIAGRAM
			TW_BH02_0.2_190820	✳			FILL: CONCRETE	0.17	
			TW_BH02_0.5_190820	✳			FILL: Sandy CLAY, red, dry, stiff, no plasticity, brown coarse grained sand, trace of medium angular gravels.	0.40	
			TW_BH02_1.0_190820		1.0		FILL: Silty CLAY, motlted red/orange, dry, stiff, low plasticity, trace of waste including wire and glass.	0.90	
			TW_BH02_1.5_190820				FILL: Silty CLAY, motlted red/orange, dry, stiff, medium plasticity. Low plasticity @ 1.50m bgs.		
			TW_BH02_2.0_190820		2.0		Grey/red, pale blue mottle @ 2.00m bgs.		
			TW_BH02_3.0_190820		3.0				
								3.60	
			TW_BH02_4.0_190820		4.0		CLAY, grey-brown, red mottle, dry, very stiff, medium plasticity.		
			TW_BH02_5.0_190820		5.0				Grout
			TW_BH02_6.0_190820		6.0				Casing
			TW_BH02_7.0_190820		7.0				
								7.40	
			TW_BH02_8.0_190820		8.0		CLAY, red-brown, dry, firm, no-low plasticity, trace of pale grey clay clods.		
			TW_BH02_9.0_190820		9.0				
			TW_BH02_10.0						

TW_BORELOGS.GPJ 14/2/20

MONITORING WELL LOG TW_BH02/TW_MW02

PROJECT NUMBER 60609758 **DATE** 20/8/2019

QFES PFAS DSIs - Toowoomba

LOCATION 201 Anzac Av, Harristown, 4350 **GROUND WATER ELEVATION** 634.10 m

- Continued from Previous Page -

PID (ppm)	Penetrometer (Kg/cm2)	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGL)	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH	WELL DIAGRAM
			190820				CLAY, red-brown, dry, firm, no-low plasticity, trace of pale grey clay clods. *(Continued)*		Bentonite
			TW_BH02_11.0_ 90820		11.0		Low plasticity @ 11.0m bgs.		
			TW_BH02_12.0_ 190820		12.0		Slightly moist @ 12.0m bgs.		
			TW_BH02_13.0_ 190820		13.0				
			TW_BH02_14.0_ 190820		14.0				Filter Sands Screen
			TW_BH02_15.0_ 190820		15.0		Moist @ 15.0m bgs.		
					16.0		Wet @ 16.0m bgs.		
			TW_BH02_17.0_ 190820		17.0				
								17.50	
							End of hole at target depth. Total Depth: 17.50 m		

TW_BORELOGS.GPJ 14/2/20

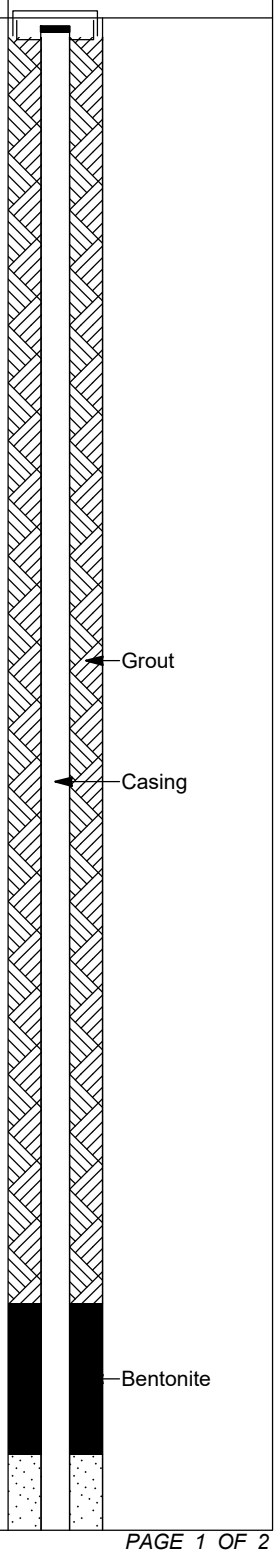
MONITORING WELL LOG TW_BH03/TW_MW03

PROJECT NUMBER 60609758
QFES PFAS DSIs - Toowoomba
LOCATION 201 Anzac Av, Harristown, 4350
DRILLING METHOD NDD, Hand Auger, Push Tube & SSA
SAMPLING METHOD Grab
SURFACE ELEVATION 644.721 m AHD
WELL HEAD/TOC
LOGGED BY C.McCosker
COMMENTS

DATE 20/8/2019
BLANK 0.0 - 10.0 m bgl
SCREEN 10.0 - 16.0 m bgl
GRAVEL PACK 9.5 - 16.0 m bgl
SANITARY SEAL/BENTONITE 8.5 - 9.5 m bgl

NORTHING 6949781.71
EASTING 393763.17

PID (ppm)	Penetrometer (Kg/cm2)	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGL)	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
			TW_BH03_0.2_190820	✳			FILL: CONCRETE	0.17
			TW_BH03_0.5_190820	✳			FILL: SAND, brown, dry, medium dense, coarse grained.	0.30
			TW_BH03_1.0_190820		1.0		FILL: Gravelly CLAY, dark brown/black, minor orange mottle, dry, very stiff, low plasticity, fine-medium angular gravels.	0.80
			TW_BH03_1.5_190820				FILL: Clayey GRAVEL, red, dry, medium dense, fine-coarse grained angular/sub-angular gravels coated in red clay.	1.30
			TW_BH03_2.0_190820		2.0		FILL: Gravelly CLAY, red-brown, dry, stiff, low plasticity, fine-medium sub-angular gravels.	1.90
							CLAY, mottled brown/yellow/grey, minor red mottle, dry, stiff, no plasticity.	
			TW_BH03_3.0_190820		3.0			
								3.80
			TW_BH03_4.0_190820		4.0		CLAY, mottled pale grey/pale blue, minor red mottle, dry, stiff, low plasticity.	
			TW_BH03_5.0_190820		5.0			
			TW_BH03_6.0_190820		6.0			
			TW_BH03_7.0_190820		7.0			
			TW_BH03_8.0_190820		8.0			
								8.40
			TW_BH03_9.0_190820		9.0		CLAY, red-brown, dry, stiff, low plasticity.	
			TW_BH03_10.0					



TW_BORELOGS.GPJ 14/2/20

MONITORING WELL LOG TW_BH03/TW_MW03

PROJECT NUMBER 60609758 **DATE** 20/8/2019

QFES PFAS DSIs - Toowoomba

LOCATION 201 Anzac Av, Harristown, 4350 **GROUND WATER ELEVATION** 633.04 m

- Continued from Previous Page -

PID (ppm)	Penetrometer (Kg/cm2)	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGL)	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH	WELL DIAGRAM
			190820				CLAY, red-brown, dry, stiff, low plasticity. *(Continued)* Medium plasticity @ 10.0m bgs.		
			TW_BH03_11.0_ 190820		11.0		Slightly miost @ 11.0m bgs.		
			TW_BH03_12.0_ 190820		12.0		Minor grey mottle, moist @ 12.0m bgs.		
			TW_BH03_13.0_ 190820		13.0				Filter Sands / Screen
			TW_BH03_14.0_ 190820		14.0		Wet @ 14.0m bgs.		
					15.0				
			TW_BH03_16.0_ 190820		16.0		End of hole at target depth. Total Depth: 16.00 m	16.00	

TW_BORELOGS.GPJ 14/2/20

MONITORING WELL LOG TW_BH04/TW_MW04

PROJECT NUMBER 60609758
QFES PFAS DSIs - Toowoomba
LOCATION 201 Anzac Av, Harristown, 4350
DRILLING METHOD NDD, Hand Auger, Push Tube & SSA
SAMPLING METHOD Grab
SURFACE ELEVATION 644.895 m AHD
WELL HEAD/TOC
LOGGED BY C.McCosker
COMMENTS

DATE 20 - 21/08/2019
BLANK 0.0 - 12.0 m bgl
SCREEN 12.0 - 18.0 m bgl
GRAVEL PACK 11.5 - 18.0 m bgl
SANITARY SEAL/BENTONITE 10.5 - 11.5 m bgl

NORTHING 6949758.99
EASTING 393744.62

PID (ppm)	Penetrometer (Kg/cm2)	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGL)	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
			TW_BH04_0.2_190820	*			FILL: CONCRETE	0.15
			TW_BH04_0.5_190820	*			FILL: Gravelly CLAY, brown, dry, stiff, medium plasticity, black fine bituminous gravels.	0.30
			TW_BH04_1.0_190820		1.0		DISTURBED NATURAL: CLAY, red-brown, dry, very stiff, low plasticity, trace of sand and fine angular gravels.	1.00
			TW_BH04_1.5_190820				CLAY, red-brown, dry, very stiff, low plasticity.	
			TW_BH04_2.0_190820		2.0		Yellow mottle, with fine sub-angular/sub-rounded gravels @ 1.60m bgs.	2.10
			TW_BH04_3.0_190820		3.0		CLAY, red-brown, grey/white mottle, dry, very stiff, low plasticity.	
			TW_BH04_3.7-3.9_190820				Mottled red/grey/white @ 3.10m bgs.	3.40
			TW_BH04_5.0_190821		5.0		CLAY, motlted grey/white, minor brown/red mottle, dry, very stiff, low plasticity.	
			TW_BH04_6.0_190820		6.0		Mottled white/pale grey/pale blue @ 6.00m bgs.	
			TW_BH04_7.0_190820		7.0			
			TW_BH04_8.0_190820		8.0		CLAY, red-brown, grey mottle, dry, stiff, low plasticity.	7.90
			TW_BH04_9.0_190820		9.0			
			TW_BH04_10.0					

WELL DIAGRAM: Grout; Casing

TW_BORELOGS.GPJ 14/2/20

MONITORING WELL LOG TW_BH04/TW_MW04

PROJECT NUMBER 60609758 **DATE** 20 - 21/08/2019

QFES PFAS DSIs - Toowoomba

LOCATION 201 Anzac Av, Harristown, 4350 **GROUND WATER ELEVATION** 632.58 m

- Continued from Previous Page -

PID (ppm)	Penetrometer (Kg/cm2)	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGL)	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH	WELL DIAGRAM
			190820				CLAY, red-brown, grey mottle, dry, stiff, low plasticity. *(Continued)*		
							Minor grey mottle, medium plasticity @ 10.0m bgs.		
			TW_BH04_11.0_ 190820		11.0				Bentonite
			TW_BH04_12.0_ 190820		12.0				
			TW_BH04_13.0_ 190820		13.0				
			TW_BH04_14.0_ 190820		14.0		Slightly moist @ 14.0m bgs.		Filter Sands
			TW_BH04_15.0_ 190820		15.0		Moist @ 15.0m bgs.		Screen
					16.0				
							Wet @ 16.5m bgs.		
					17.0				
					18.0			18.00	
							End of hole at target depth. Total Depth: 18.00 m		

TW_BORELOGS.GPJ 14/2/20

MONITORING WELL LOG TW_BH05/TW_MW05

PROJECT NUMBER 60609758
QFES PFAS DSIs - Toowoomba
LOCATION 201 Anzac Av, Harristown, 4350
DRILLING METHOD NDD, Hand Auger, Push Tube & SSA
SAMPLING METHOD Grab
SURFACE ELEVATION 644.676 m AHD
WELL HEAD/TOC
LOGGED BY C.McCosker
COMMENTS

DATE 20 - 21/08/2019
BLANK 0.0 - 12.0 m bgl
SCREEN 12.0 - 18.0 m bgl
GRAVEL PACK 11.5 - 18.0 m bgl
SANITARY SEAL/BENTONITE 10.5 - 11.5 m bgl

NORTHING 6949790.36
EASTING 393780.23

PID (ppm)	Penetrometer (Kg/cm2)	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGL)	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH	WELL DIAGRAM
			TW_BH05_0.2_190820	✳			FILL: CONCRETE	0.15	
			TW_BH05_0.5_190820				FILL: Sandy CLAY, brown-red, dry, stiff, no plasticity, coarse sand, with fine sub-rounded/sub-angular gravels.	0.50	
							DISTURBED NATURAL: Gravelly CLAY, red-brown, dry, very stiff, medium plasticity, fine sub-rounded and fine-medium angular gravels.	0.80	
			TW_BH05_1.0_190820	✳	1.0		CLAY, brown, dry, stiff, low-medium plasticity, trace of fine-medium sub-rounded gravels.		
			TW_BH05_1.5_190820				Trace of pale grey/pale blue clods @ 1.50m bgs.	1.60	
			TW_BH05_2.0_190821		2.0		CLAY, mottled pale grey/pale blue/brown, dry, very stiff, no plasticity.		
			TW_BH05_3.0_190821		3.0		Grey/brown, minor red/yellow mottle, low plasticity @ 2.90m bgs.		
			TW_BH05_4.0_190821		4.0				
			TW_BH05_5.0_190821		5.0				Grout
			TW_BH05_6.0_190820		6.0				Casing
								6.50	
							CLAY, red-brown, dry, stiff, low plasticity.	6.60	
			TW_BH05_7.0_190820		7.0		CLAY, mottled pale grey/pale blue, dry, stiff, low plasticity.		
								7.60	
							CLAY, red-brown, dry, stiff, low plasticity.		
			TW_BH05_8.0_190820		8.0				
			TW_BH05_9.0_190820		9.0				
			TW_BH05_10.0						

TW_BORELOGS.GPJ 14/2/20

MONITORING WELL LOG TW_BH05/TW_MW05

PROJECT NUMBER 60609758 **DATE** 20 - 21/08/2019

QFES PFAS DSIs - Toowoomba

LOCATION 201 Anzac Av, Harristown, 4350 **GROUND WATER ELEVATION** 633.68 m

- Continued from Previous Page -

PID (ppm)	Penetrometer (Kg/cm2)	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGL)	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	CONTACT DEPTH	WELL DIAGRAM
			190820				CLAY, red-brown, dry, stiff, low plasticity. *(Continued)*		
			TW_BH05_11.0_ 190820		11.0				Bentonite
			TW_BH05_12.0_ 190820		12.0				
			TW_BH05_13.0_ 190820		13.0		Medium plasticity @ 13.0m bgs.		
			TW_BH05_14.0_ 190820		14.0		Slightly moist @ 14.0m bgs.		Filter Sands
			TW_BH05_15.0_ 190820		15.0		Moist, high plasticity @ 15.0m bgs.		Screen
			TW_BH05_16.0_ 190820		16.0		Wet, yellow mottle @ 16.0m bgs.		
			TW_BH05_18.0_ 190820		17.0				
					18.0			18.00	
							End of hole at target depth. Total Depth: 18.00 m		

TW_BORELOGS.GPJ 14/2/20

AECOM

BOREHOLE LOG TW_SS1

PROJECT NUMBER 60609758 **DATE** 19 Aug 19
PROJECT NAME QFES PFAS DSIs - Toowoomba
LOCATION 201 Anzac Av, Harristown, 4350
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
						CL-ML	FILL: Silty CLAY loam, brown, dry, firm, no plasticity.	
0.1		TW_SS1_0.1_190819	✳				Stiff @ 0.15m bgs.	
							Hard @ 0.25m bgs.	
						CL-ML	DISTURBED NATURAL: Silty CLAY, red-brown, dry, very stiff, no plasticity.	0.40
0.0		TW_SS1_0.5_190819	✳					
							End of hole at target depth. Total Depth: 0.50 m	0.50

TW_BORELOGS.GPJ 14/2/20

BOREHOLE LOG TW_SS3

PROJECT NUMBER 60609758
PROJECT NAME QFES PFAS DSIs - Toowoomba
LOCATION 201 Anzac Av, Harristown, 4350
DRILLING METHOD Hand Auger
SAMPLING METHOD Grab

DATE 19 Aug 19

LOGGED BY C.McCosker
COMMENTS

PID (ppm)	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGS)	GRAPHIC LOG	USCS CLASS	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
						CL-ML	FILL: Silty CLAY, red-brown, dry, stiff, no plasticity, with fine-medium angular gravels.	
0.0		TW_SS3_0.1_190819	✳					
0.0		TW_SS3_0.5_190819	✳					
							End of hole at target depth. Total Depth: 0.50 m	0.50

TW_BORELOGS.GPJ 14/2/20

BOREHOLE LOG TW_SS4

PROJECT NUMBER 60609758
PROJECT NAME QFES PFAS DSIs - Toowoomba
LOCATION 201 Anzac Av, Harristown, 4350
DRILLING METHOD Hand Auger
SAMPLING METHOD Grab

DATE 19 Aug 19

LOGGED BY C.McCosker
COMMENTS

PID (ppm)	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGS)	GRAPHIC LOG	USCS CLASS	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
						CL-ML	FILL: Silty CLAY, red-brown, dry, stiff, no plasticity, with fine-medium angular gravels.	
0.0		TW_SS4_0.1_190819	✳					
0.0		TW_SS4_0.5_190819	✳					
							End of hole at target depth. Total Depth: 0.50 m	0.50

TW_BORELOGS.GPJ 14/2/20

Appendix E

Field sheets and Calibration Certificates

ANZ

FQM - NAPL and Groundwater Level Gauging Record

Project Name:	QFES	**Project Location:**	Toowoomba	**PM Name:**	James Peachey
Project Number:	60609758	**Client:**	QFES	**Fieldwork Staff Name:**	Nem Krco

Confirm NAPL and groundwater levels by repeat measurements. All columns must be completed. If NAPL is not present in a well write 'ND' (Not Detected) in the relevant column.

Field Data

Well ID	Date (dd/mm/yy)	Time (24hr:mm)	PID Reading (ppm)	Depth to LNAPL (mBTOC)	Depth to Groundwater (mBTOC)	LNAPL Thickness (m)	Depth to DNAPL (mBTOC)	Total Well Depth (mBTOC)	DNAPL Thickness (m)	Comments (well condition, odour, NAPL colour and viscosity)
MW05	29/8/19	15:00	–	–	10.997	–	–	17.908	–	
MW02	"	15:05	–	–	10.895	–	–	17.560	–	sediment
MW01	"	15:10	–	–	11.302	–	–	19.000	–	
MW03	"	15:15	–	–	11.680	–	–	16.031	–	
MW04	"	15:20	–	–	12.319	–	–	17.910	–	no sediment

Measurement Equipment

Make & Model:		**Supplier:**	
Serial No.:		**Calibration Report Provided?**	

Notes/Comments

(PID) - photo ionisation detector; (ppm) - parts per million; (LNAPL) - light non-aqueous phase liquids; (DNAPL) - dense light non-aqueous phase liquid; (mBTOC) - metres below top of casing

Approval and Distribution

Fieldwork Staff Signature Date

Project Manager Signature Date

Distribution: Project Central File

AECOM

ANZ

FQM - Groundwater Sampling and Purging Record

Q4AN(EV)-405-FM1

						Bore ID:	MW01
Project Name:	QFES	Project Number:	60609758	PM Name:	James Peachey	Sample Date:	30/8/19
Client:	QFES	Project Location:	Toowoomba	Fieldwork Staff:	Nem Krco	Well Development or Well Sampling Event? (circle)	

General Bore Information		Parameter Info.	Decontamination	Sampling Method	Hydrasleeve Info.	
Date of GW Level: 30/8/19	Bore Radius (mm): 200	Chem Kit Serial No.: 19101115	☑ Decontaminated	☐ Low Flow Pump rate: 4/11	Hydrasleeve Size: /	Monitoring sequence followed (number in order):
Depth to GW (m-pvc): 11.355	Screen Interval (m):	Chem Kit Model: YSI ProPlus	☐ Dedicated	30 PSI Intake depth: 18m	Hydrasleeve Type: /	
Bore Depth (m-pvc): 18.925	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
10:48	0	11.366	-	-	-	-	-	-	
10:50	1	11.455	4/11	2.37	230.3	5.60	221.7	20.5	Mod - High turb. red/brown.
10:53	2	11.490	3.0/12.0	2.36	2272	5.59	221.1	20.3	"
10:56	2.5	11.420	"	2.10	229.3	5.59	220.5	20.7	* Compressor was off.
10:59	3.0	11.440	"	2.27	229.0	5.60	219.6	20.7	"
11:02	3.5	11.440	"	2.20	227.8	5.59	219.6	20.7	"
11:05	4.0	11.440	"	2.25 ✓	227.9 ✓	5.59 ✓	219.2 ✓	20.6 ✓	"
		Sampled @ 11:10		@ 4 L.				(Sun)	
29/8 SW1	-	-	-	4.07	351.9	7.23	97.5	12.9	leaves & suspended particles
29/8 SW2	-	-	-	2.45	353.6	7.18	-39.5	13.2	" "
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

						Bore ID:	MW02
Project Name:	QFES	Project Number:	60609758	PM Name:	James Peachey	Sample Date:	30/8/19
Client:	QFES	Project Location:	Toowoomba	Fieldwork Staff:	Nem Krco	Well Development or Well Sampling Event? (circle)	

General Bore Information		Parameter Info.	Decontamination	Sampling Method	Hydrasleeve info.	
Date of GW Level: 30/9/18	Bore Radius (mm): 200	Chem Kit Serial No.: 9CL0115	☑ Decontaminated	☑ Low Flow Pump rate: 4/11	Hydrasleeve Size:	Monitoring sequence followed (number in order):
Depth to GW (m-pvc): 10.902	Screen Interval (m):	Chem Kit Model: YSI Pro plus	☐ Dedicated	3.5PSI Intake depth: 16.5	Hydrasleeve Type:	
Bore Depth (m-pvc): 17.560	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
9:50	0	11.020	4/11	—	—	—	—	—	low/med turb. Clear.
9:55	1	11.020	"	3.97	280.6	4.99	242.5	19.8	" Red
9:58	2	11.020	"	3.81	279.5	5.00	245.0	19.9	" "
10:01	2.75	11.020	"	3.80	274.7	4.97	249.6	19.8	" Red/brown
10:04	3.5	11.020	"	3.73	270.1	4.96	251.9	19.6	" "
10:07	4.0	11.020	"	3.72	267.9	4.95	254.2	19.7	
		—	Sampled @ 10:10 @ 4L					Sun	
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

AECOM

ANZ

FQM - Groundwater Sampling and Purging Record

Q4AN(EV)-405-FM1

						Bore ID:	MW03
Project Name:	QFES	**Project Number:**	60609758	**PM Name:**	James Peachey	**Sample Date:**	29/8/19
Client:	QFES	**Project Location:**	Toowoomba	**Fieldwork Staff:**	Nem Krco	**Well Development or Well Sampling Event? (circle)**	

General Bore Information		Parameter Info.	Decontamination	Sampling Method	Hydrasleeve info.	
Date of GW Level: 29/8/19	Bore Radius (mm): ~~150~~ 200	Chem Kit Serial No.: 19C101115	☑ Decontaminated	☐ Low Flow Pump rate: 2/13	Hydrasleeve Size:	Monitoring sequence followed (number in order):
Depth to GW (m-pvc): 11.683	Screen Interval (m): bottom 1.5m	Chem Kit Model: YSI Pro plus	☐ Dedicated	35PSI Intake depth: 15.0m	Hydrasleeve Type:	
Bore Depth (m-pvc): ~~Origin~~ 160	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
16:55	0	11.670	2/13	—	—	—	—	—	Inlet blocked
17:15	1.5	11.725	"	4.24	428.5	5.46	260.8	17.3	High turb, red/brown
17:18	2.0	11.760	"	3.91	451	5.56	256.2	18.5	"
17:21	2.5	11.760	"	3.41	4307	5.42	256.9	18.9	"
17:24	3.0	11.765	"	3.34	426.3	5.40	257.9	18.9	"
17:27	3.5	11.765	"	3.32	424.1	5.38	258.8	18.9	"
17:30	4.0	11.770	"	3.31	421.6	5.35	259.3	19.0	"
17:33	4.5	11.775	"	3.18	419.3	5.33	260.3	18.9	"
17:36	5.0	11.780	"	3.14	417.6	5.32	261.5	19.0	"
17:39	5.5	11.780	"	3.11	415.4	5.30	262.3	19.0	Low/mod turb.
	—	Sampled @		5.5L	@ 17:40				
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	

AECOM

ANZ

FQM - Groundwater Sampling and Purging Record

Q4AN(EV)-405-FM1

						Bore ID:	MW04
Project Name:	QFES	Project Number:	60609758	PM Name:	James Peachey	Sample Date:	30/8/19
Client:	QFES	Project Location:	Toowoomba	Fieldwork Staff:	Nem Krco	Well Development or Well Sampling Event? (circle)	

General Bore Information		Parameter Info.	Decontamination	Sampling Method	Hydrasleeve info.	
Date of GW Level: 30/8/19	Bore Radius (mm): 200	Chem Kit Serial No.: 19C101115	☑ Decontaminated	☐ Low Flow Pump rate: 2/13	Hydrasleeve Size:	Monitoring sequence followed (number in order):
Depth to GW (m-pvc): 12.318	Screen Interval (m):	Chem Kit Model: YSI Pro Plus	☐ Dedicated	35PSI Intake depth: 17.00	Hydrasleeve Type:	
Bore Depth (m-pvc): 17.900	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
6:50	0	12.320	2/13	-	-	5.53	-	-	
7:00	0.75	12.430	1.5/13	5.63	245.8	[illegible]	223.6	18.0	High turb, red/brown.
7:03	1.0	12.470	"	5.49	244.0	5.53	224.1	18.0	"
7:08	1.25	12.515	4/11 (30PSI)	5.24	247.6	5.53	225.6	18.2	"
7:13	1.75	12.575	2.5/12 (30)	5.12	246.8	5.51	227.8	18.1	" Reduce discharge
7:18	2.0	12.615	6/24 (30)	5.05	243.4	5.49	231.0	17.5	" Reduce 2 cpm.
7:23	2.50	12.645	4/26 (30)	4.91	244.1	5.49	232.0	17.6	" Reduce discharge
7:28	2.90	12.660	4/26	4.91	241.8	5.48	234.6	17.2	" Leaving @ this speed to get new water in pipe
7:33	3.0	12.670	" (25)	4.80	241.4	5.47	234.6	17.3	"
7:38	3.1	12.690	" (25)	4.70	242.8	5.48	235.2	17.8	Increased air pressure to 30 psi
7:43	3.5	12.710	" (30)	4.70	244.9	5.51	235.0	17.8	
7:48	4.0	12.740	" (30)	4.54	245.7	5.49	237.4	18.0	Purging Dry. 5 cpm 4/8
8:00	9L	13.25	4/8 (40)	4.89	259.4	5.50	234.8	18.9	
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		x 250 mL Plastic		

Approval and Distribution

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

Project Manager Signature _____ Date _____ Distribution: Project Central File

AECOM

ANZ

FQM - NAPL and Groundwater Level Gauging Record

MW04 30/8/19 Q4AN(EV)-414-FM1

Project Name:	CEXP Pinkenba GME	Project Location:	Marine Dr	PM Name:	Stephan Schayen
Project Number:	60592150_2.0	Client:	Viva Energy	Fieldwork Staff Name:	BH, NK

Confirm NAPL and groundwater levels by repeat measurements. All columns must be completed. If NAPL is not present in a well write 'ND' (Not Detected) in the relevant column.

Field Data

Well ID	Date (dd/mm/yy)	Time (24hr:mm)	PID Reading (ppm)	Depth to LNAPL (mBTOC)	Depth to Groundwater (mBTOC)	LNAPL Thickness (m)	Depth to DNAPL (mBTOC)	Total Well Depth (mBTOC)	DNAPL Thickness (m)	Comments (well condition, odour, NAPL colour and viscosity)
Time	Vol.	SWL	Pump	DO	EC	PH	Redox	Temp		
8:10	12	13.66	3/9 (40)	5.87	253.5	5.54	230.4	19.0		Low / med turb
8:35	18	14.25	"	6.85	253.3	5.54	223.3	18.8		~~Purge~~ Punctured Bladder.
8:45	22	14.70	4.5 / 105	6.78	263.5	5.62	225.4	19.0		
8:55	26	15.20	"	6.32	274.5	5.68	225.2	18.9		
9:05	34	15.87	"	6.12	255.8	5.58	225.4	18.9		
9:20	40	16.5	"	5.98	242.6	5.46	228.1	18.9		
9:30	44	16.5	Left	to	recharge.					
			Grab	Sample						
11:45	0.4L	14.150		4.05	231.2	5.31	203.2	19.8		High turb. Red / brown
11:50	0.5L	14.195		3.21	230.4	5.19	211.9	19.5		Brown
11:53	1L	14.220		3.06	228.9	5.19	215.5	19.4		
11:56	1.5	14.260		3.08	227.8	5.20	217.8	19.4		
			- Sampled @		12:00	@ 45.5L		(Purge + Low flow)		

Measurement Equipment

Make & Model:		Supplier:	
Serial No.:		Calibration Report Provided?	

Notes/Comments

(PID) - photo ionisation detector; (ppm) - parts per million; (LNAPL) - light non-aqueous phase liquids; (DNAPL) - dense light non-aqueous phase liquid; (mBTOC) - metres below top of casing

Approval and Distribution

Fieldwork Staff Signature Date

Project Manager Signature Date

Distribution: Project Central File

AECOM

ANZ

FQM - Groundwater Sampling and Purging Record

Q4AN(EV)-405-FM1

						Bore ID:	MW05
Project Name:	QFES	Project Number:	60609758	PM Name:	James Peachey	Sample Date:	29/8/19
Client:	QFES	Project Location:	Toowoomba	Fieldwork Staff:	Nem Krco	Well Development or Well Sampling Event? (circle)	

General Bore Information		Parameter Info.	Decontamination	Sampling Method	Hydrasleeve info.	
Date of GW Level: 29/8/19	Bore Radius (mm): 100	Chem Kit Serial No.: 19C101115	☑ Decontaminated	☑ Low Flow Pump rate: 2/13	Hydrasleeve Size:	Monitoring sequence followed (number in order):
Depth to GW (m-pvc): 11.061	Screen Interval (m): Bottom 1.5m	Chem Kit Model: 961 Duo plus.	☐ Dedicated	40PSI Intake depth: 17m	Hydrasleeve Type: /	
Bore Depth (m-pvc): 17.930	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
15:40	0	11.280	2/13	2.19	440.9	5.35	151.6	18.9	High turb.
15:47	1	11.280	"	↓	↓	↓	↓	↓	
15:52	2.5	11.230	2/13	1.74	428.2	5.29	184.4	18.7	" Red /brown fines.
15:55	3.0	11.220	"	1.68	424.8	5.27	193.5	18.7	" "
15:58	3.5	11.210	"	1.64	418.4	5.23	206.2	18.6	" "
16:01	4.0	11.230	"	1.68	419.7	5.21	210.3	18.8	
16:04	4.5	11.245	~~5/13~~	1.63	417.2	5.19	213.9	18.6	
16:07	5.0	11.245	2/13	1.61	414.3	5.16	218.8	18.4	35PSI High turb, brown/Red.
16:10	5.5	11.240	"	1.57	415.7	5.15	221.8	18.6	Low/medium turb, red/brown.
16:13	6.0	11.240	"	1.58	415.0	5.14	225.7	18.6	
16:16	6.5	11.240	"	1.54 ✓	414.7 ✓	5.13 ✓	228.1	Temp 18.7	clear
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)	QC #2 - 190829	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	#12 - 190829	

Approval and Distribution

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

Project Manager Signature _____ Date _____ Distribution: Project Central File

Oil / Water Interface Meter

airmet
Air-Met Scientific Pty Ltd
1300 137 067

Instrument **Interface Meter (60M)**
Serial No. **312450**

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: **12/08/2019**

Next calibration due: **11/10/2019**

PID Calibration Certificate

Instrument PhoCheck Tiger
Serial No. T-111089

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	✓	**Low**	**High**	**TWA**	**STEL**
	Settings	✓	50ppm	100ppm		
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	Calibration gas and concentration	Certified	Gas bottle No		Instrument Reading
PID Lamp		93ppm Isobutylene	NIST	1006197 C41		93ppm Isobutylene

Calibrated by: **Nikhil Mruthyunjayappa**

Calibration date: **12/08/2019**

Next calibration due: **11/09/2019**

Multi Parameter Water Meter

airmet

Air-Met Scientific Pty Ltd
1300 137 067

Instrument YSI Quatro Pro Plus
Serial No. 19C101115

Post Callibration Reading

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 7.0
2. pH 4.00		pH 4.00	**NIST**	320612	pH 4.0
3. mV		240mV	**NIST**	325420/325421	238mV
4. EC		2.49mS	**NIST**	322349	2.51mS
6. D.O		0 ppm	**NIST**	5928	0ppm
7. Temp		20.oC	**NIST**	MultiTherm 09000528	20.oC

Calibrated by: **Nikhil Mruthyunjayappa**

Calibration date: **12-Aug-19**

Next calibration due: **8-Feb-20**

Multi Parameter Water Meter

airmet

Air-Met Scientific Pty Ltd
1300 137 067

Instrument **YSI Quatro Pro Plus**
Serial No. **19C101115**

Post Callibration Reading

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 7.0
2. pH 4.00		pH 4.00	**NIST**	320612	pH 4.0
3. mV		240mV	**NIST**	325420/325421	238mV
4. EC		2.49mS	**NIST**	322349	2.51mS
6. D.O		0 ppm	**NIST**	5928	0ppm
7. Temp		20.oC	**NIST**	MultiTherm 09000528	20.oC

Calibrated by: **Nikhil Mruthyunjayappa**

Calibration date: **26-Aug-19**

Next calibration due: **22-Feb-20**

Oil / Water Interface Meter

airmet

Air-Met Scientific Pty Ltd
1300 137 067

Instrument Geotech Interface Meter (60m)
Serial No. 3956

Item	Test	Pass	Comments
Battery	Compartment	✓	
	Capacity	✓	9.0V
Probe	Cleaned/Decon.	✓	
	Operation	✓	
Connectors	Condition	✓	
Tape Check	Cleaned	✓	
Connectors	Checked for cuts	✓	
Instrument Test	At surface level	✓	

Certificate of Calibration

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

Calibrated by: **Nikhil Mruthyunjayappa**

Calibration date: **16-Aug-19**

Next calibration due: **15-Oct-19**

AECOM

ANZ

FQM - Water Quality Meter Calibration Record

Q4AN(EV)-410-FM1

Project Name:	QFES	**Project Number:**	60609758
Project Location:	Toowoomba	**Client:**	QFES
PM Name:	James Peachey	**Fieldwork Staff Name:**	Nem Krco

This calibration record is intended to prompt fieldwork staff to calibrate water quality meter (WQM) daily before the start of fieldworks.

INSTRUMENT DETAILS

Supplier:	Aquamet
Make and Model:	YSI ProPlus.
Serial Number:	19C101115

CALIBRATION

CALIBRATE WITH CALIBRATION SOLUTIONS

Date and Time:					
Parameter	Acidity		Conductivity	Dissolved Oxygen	
Units	pH	pH	µS/cm	ppm	~~ppm~~
Calibration Standard Concentration:	4.0	7.0			
Calibration Reading:	4.01	7.01			
Calibration Temperature:	8.5	8.7			

ONGOING CHECKS

BUMP TEST WITH CALIBRATION SOLUTION

Date and Time:	30/8/19				
Parameter	Acidity		Conductivity	Dissolved Oxygen	
Units	pH	pH	µS/cm	ppm	~~ppm~~
Calibration Standard Concentration:	4	7.0	1413	0	
Bump Test Reading:	3.81	7.14	1447	0.0	
Bump Test Temperature:	8.5	8.5	8.9 ✓		

Redox
250
253.8
9.1 ✓

COMMENTS

Detail any equipment faults, minor maintenance performed, change of batteries or technical support provided.

Approval and Distribution

☐ Each individual instrument has been inspected and calibrated daily and bump tested as required by fieldwork staff.

Fieldwork Staff Signature — **Date** 30/8/19

Distribution: Project Central File

Appendix F

Surveying Report

9824 Harristown (SES Depot)
30 August 2019

Datum: MGA94 Stn C1 (Nail in Conc)
C1 MGA94 Co-ordinate:
E 393778.08
N 6949796.91
H 644.68 AHD

Plane Co-ordinate System based on MGA Co_ords for C1

Well	Easting	Northing	Collar Level	Ground Level
MW01	393811.52	6949756.65	646.919	647.02
MW02	393787.49	6949769.98	644.997	645.13
MW03	393763.17	6949781.71	644.721	644.83
MW04	393744.62	6949758.99	644.895	644.95
MW05	393780.23	6949790.36	644.676	644.78

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

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 January and February 2019
- The data review information (site and environmental setting) presented in the PSI report (AECOM, 2019) including:
    - Quantitative site characterisation data including visual observations
    - Hydrogeological and hydrological data for each of the six sites 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 in 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 - up to approximately 20.0 metres below ground level (mbgl) based on the available data.

The temporal boundary of the study is the current conditions at the time of the fieldwork in August to September 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 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.

G1.6 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 presented in the PSI (AECOM, 2019) outlined 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.

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

The methodology is designed to meet the objectives described in **Section 1.3** 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 -0.7°C to 1.6°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	24	4	17	3	13
Water samples	5	1	20	1	20
Sediment samples	2	1	50	1	50

G3.4 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.

G3.4.1 Evaluation of Soil and Sediment RPDs

Evaluation of the soil and sediment datasets are presented in **Table G1** and **Table G2,** respectively. The RPD non-conformances for PFAS compounds summarised in the table below.

Summary of PFAS RPD non-conformances in the soil and sediment dataset

Primary Sample ID	QC sample ID	Type	RPD (%)							
			PFOS	PFOA	PFHxS	FOSA	PFDS	PFHpS	PFNA	ETFOSA
TW_SS1_0.1_190819	TW_QC100_190819	Soil	55	-	-	-	153	-	-	-
	TW_QC200_190819	Soil	103	90	93	68	-	83	93	-
TW_BH02_0.5_190819	TW_QC104_190820	Soil	99	-	-	138	-	-	-	-
	TW_QC204_190820	Soil	34	-	-	-	-	-	-	-
TW_SED01_190829	TW_QC111_190829	Sed	42	-	-	-	-	-	-	-
	TW_QC211_190829	Sed	-	-	41	-	-	-	-	130

The RPD non-conformances for soil and sediment samples may be attributed to heterogeneity within shallow fill soils and sediment. The use of different laboratory methods may also be a factor in the discrepancy between primary and secondary laboratories. 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.

G3.4.2 Evaluation of Water RPDs

Evaluation of the water dataset is presented in **Table G3.** No RPD non-conformances were reported for groundwater samples.

G3.4.3 Summary

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

G3.5 Rinsate Blank Samples

To assess the effectiveness of sampling procedures, five rinsate blank samples (QC301 to QC302 and QC304 to QC306) 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 G4**. All results for the rinsate samples collected from equipment were below the LOR.

G3.6 Sample of hydrant water used for pressure washer cleaning

QC303 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.). A detection of one PFAS compound (PFHxS) was reported at a concentration slightly higher (0.007 µg/L) compared to the LOR (0.002 µg/L).

A representative rinstate sample was also collected from the solid stem augers (QC304) after pressure washer cleaning using the on-site hydrant water and no detections of PFAS above LOR were reported indicating the cleaning / decontamination processes were adequate.

G4.0 Laboratory QA/QC

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

ALS – EB1922854, EB1921880, EB1922827, EB1923753.

NMI – RN1246205, RN1245339.

G4.1 Extraction and Analysis Holding Time

All samples were received and analysed within the specified holding times with the exception of moisture content for the rebatched sample TW_SS1_0.5 on laboratory report EB1922827. It is noted that this sample had previously been analysed for moisture content on laboratory report EB1921880 so the non-conformance is not considered to be of importance.

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, 41 primary and field quality control samples were analysed across six laboratory batches. Two of the laboratory batches identified in **Section G4.0** (EB1922827and EB1923753) were samples rebatched 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.

With one exception no non-conformances were identified for LCS recoveries. The single non-conformances was reported for one analyte in EB1921880, PFBA where recovery was less than the lower control limit. As advised by ALS a batch is accepted if at least 80% of the analytes return conforming LCS recoveries. As this criterion has been met this non-conformance is 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 was 1 in 10.

The RPDs for laboratory duplicate samples were within the limits for all analytes for all batches except for two samples on EB1922854 where the RPDs exceeded the DQO limit for PFOS in an anonymous soil sample and sum of PFAS in an anonymous water sample. This is potentially due to sample heterogeneity and results are not considered to impact the quality of data for interpretative use.

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 is presented in the table below.

These data demonstrate that matrix interference has occurred in two of the samples, in particular, the soil sample TW_BH04_0.2 where matrix spikes non-conformances are recorded for 22 analytes with 21 of these indicating recovery was lower than the data quality objective. The sediment sample TW_SS1_0.5 recorded matrix spike non-conformances for nine analytes with eight of these non-conformances indicating recovery was lower than the data quality objective.

The recovery of matrix spikes above and below the data quality objectives are considered to be due to heterogeneity of the samples. The results may indicate suppressed recovery of analytes in the two samples analysed with the potential for actual concentrations to be higher than measured. The non-determining of the MS recovery is potentially due to the matrix of the particular sample rather than the spike recovery. Overall the data are not considered to affect the quality of the data for interpretative use.

Summary of matrix spike recovery non-conformances

Batch	Analyte	Comments
EB1921880 (TW_BH04_0.2)	PFBS, PFHpS, PFDS, PFPeA, PFHxA, PFHpA, PFOA, PFNA, PFDA, PFUnDA, PFDoDA, PFTrDA, FOSA, MeFOSA, ETFOSA, MEFOSE, EtFOSE, MeFOSAA EtFOSAA, 8:2 FTS, 10:2 FTS	Recovery was less than the lower data quality objective. Likely due to sample heterogeneity within shallow soils and sediment samples.
	PFOS	MS recovery not determined, background level greater or equal to 4x spike level.
EB1921880 (TW_SS1_0.5)	PFBA, PFNA, PFDA, PFUnDA, PFTeDA, MEFOSE, EtFOSE, 10:2 FTS	Recovery was less than the lower data quality objective. Likely due to sample heterogeneity within shallow soils and sediment samples.
	PFOS	MS recovery not determined, background level greater or equal to 4x spike level.
EB1922854 Anonymous sample	PFBS, PFHxA, MeFOSA, EtFOSA, MEFOSE	Recovery was less than the lower data quality objective.
	PFHxS, PFOS	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.

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 the SS recovery non-conformances is presented in the table below.

Summary of surrogate spike recovery non-conformances

Analyte	Batch / sample	Comments
13C4-PFOS	EB1921880: TW_BH04_0.2, TW_SS7, TW_SS3_0.1, TW_BH05_0.2, TW_BH04_0.2	Recovery less than lower data quality objective.

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, they 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
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Lab Report Number			EB1921880	EB1921880		EB1921880	RN1245339		EB1921880	EB1921880		EB1921880	RN1245339		EB1921880	EB1921880		EB1921880	EB1921880		EB1921880	RN1245339	
Field ID			TW_SS1_0.1_190819	TW_QC100_190819	**RPD**	TW_SS1_0.1_190819	QC200_190819	**RPD**	TW_BH02_0.5_190820	TW_QC104_190820	**RPD**	TW_BH02_0.5_190820	QC204_190820	**RPD**	TW_BH03_16.0_190820	TW_QC106_190820	**RPD**	TW_BH04_0.5_190820	TW_QC108_190820	**RPD**	TW_BH03_16.0_190820	QC206_190820	**RPD**
Sampled Date			19/08/2019	19/08/2019		19/08/2019	19/08/2019		20/08/2019	20/08/2019		20/08/2019	20/08/2019		20/08/2019	20/08/2019		20/08/2019	20/08/2019		20/08/2019	20/08/2019	
PFAS	**Units**	**LOR**																					
PFBS	mg/kg	0.0002 : 0.001 (Interlab)	0.001	0.0006	50	0.001	0.0014	33	<0.0002	<0.0002	0	<0.0002	<0.001	0	<0.0002	<0.0002	0	0.0022	0.0022	0	<0.0002	<0.001	0
PFPeS	mg/kg	0.0002 : 0.001 (Interlab)	0.0007	<0.0005	33	0.0007	0.0012	53	<0.0002	<0.0002	0	<0.0002	<0.001	0	<0.0002	<0.0002	0	0.0021	0.0018	15	<0.0002	<0.001	0
PFHxS	mg/kg	0.0002 : 0.001 (Interlab)	0.0088	0.0076	15	**0.0088**	**0.024**	**93**	0.0004	0.0002	67	0.0004	<0.001	0	0.0009	0.0013	36	0.0187	0.018	4	0.0009	0.0015	50
PFHpS	mg/kg	0.0002 : 0.001 (Interlab)	0.0007	<0.0005	33	**0.0007**	**0.0017**	**83**	<0.0002	<0.0002	0	<0.0002	<0.001	0	<0.0002	<0.0002	0	0.001	0.0008	22	<0.0002	<0.001	0
PFOS	mg/kg	0.0002 : 0.002 (Interlab)	**0.263**	**0.15**	**55**	**0.263**	**0.82**	**103**	**0.0065**	**0.0022**	**99**	**0.0065**	**0.0046**	**34**	0.001	0.001	0	0.0151	0.0153	1	0.001	<0.002	0
PFDS	mg/kg	0.0002	**0.0038**	**<0.0005**	**153**	0.0038	0.0054	35	0.0004	<0.0002	67	0.0004	<0.001	0	<0.0002	<0.0002	0	<0.0002	<0.0002	0	<0.0002	<0.001	0
PFBA	mg/kg	0.001	0.001	<0.002	0	0.001	0.003	100	<0.001	<0.001	0	<0.001	<0.002	0	<0.001	<0.001	0	<0.001	<0.001	0	<0.001	<0.002	0
PFPeA	mg/kg	0.0002 : 0.002 (Interlab)	0.0041	0.0035	16	0.0041	0.0053	26	<0.0002	<0.0002	0	<0.0002	<0.002	0	<0.0002	<0.0002	0	0.0033	0.0033	0	<0.0002	<0.002	0
PFHxA	mg/kg	0.0002 : 0.001 (Interlab)	0.0032	0.0028	13	0.0032	0.0037	14	<0.0002	<0.0002	0	<0.0002	<0.001	0	<0.0002	<0.0002	0	0.0077	0.0074	4	<0.0002	<0.001	0
PFHpA	mg/kg	0.0002 : 0.001 (Interlab)	0.0015	0.0013	14	0.0015	0.0022	38	<0.0002	<0.0002	0	<0.0002	<0.001	0	<0.0002	<0.0002	0	0.0026	0.0022	17	<0.0002	<0.001	0
PFOA	mg/kg	0.0002 : 0.001 (Interlab)	0.0008	0.0006	29	**0.0008**	**0.0021**	**90**	<0.0002	<0.0002	0	<0.0002	<0.001	0	<0.0002	<0.0002	0	0.0016	0.0012	29	<0.0002	<0.001	0
PFNA	mg/kg	0.0002 : 0.001 (Interlab)	0.0004	<0.0005	0	**0.0004**	**0.0011**	**93**	<0.0002	<0.0002	0	<0.0002	<0.001	0	<0.0002	<0.0002	0	<0.0002	<0.0002	0	<0.0002	<0.001	0
PFDA	mg/kg	0.0002 : 0.001 (Interlab)	<0.0002	<0.0005	0	<0.0002	<0.001	0	<0.0002	<0.0002	0	<0.0002	<0.001	0	<0.0002	<0.0002	0	<0.0002	<0.0002	0	<0.0002	<0.001	0
PFUnDA	mg/kg	0.0002 : 0.002 (Interlab)	<0.0002	<0.0005	0	<0.0002	<0.002	0	<0.0002	<0.0002	0	<0.0002	<0.002	0	<0.0002	<0.0002	0	<0.0002	<0.0002	0	<0.0002	<0.002	0
PFDoDA	mg/kg	0.0002 : 0.002 (Interlab)	<0.0002	<0.0005	0	<0.0002	<0.002	0	<0.0002	<0.0002	0	<0.0002	<0.002	0	<0.0002	<0.0002	0	<0.0002	<0.0002	0	<0.0002	<0.002	0
PFTrDA	mg/kg	0.0002 : 0.002 (Interlab)	<0.0002	<0.0005	0	<0.0002	<0.002	0	<0.0002	<0.0002	0	<0.0002	<0.002	0	<0.0002	<0.0002	0	<0.0002	<0.0002	0	<0.0002	<0.002	0
PFTeDA	mg/kg	0.0005 : 0.002 (Interlab)	<0.0005	<0.0012	0	<0.0005	<0.002	0	<0.0005	<0.0005	0	<0.0005	<0.002	0	<0.0005	<0.0005	0	<0.0005	<0.0005	0	<0.0005	<0.002	0
FOSA	mg/kg	0.0002 : 0.001 (Interlab)	0.0025	0.0018	33	**0.0025**	**0.0051**	**68**	**0.0011**	**0.0002**	**138**	0.0011	<0.001	10	<0.0002	<0.0002	0	<0.0002	<0.0002	0	<0.0002	<0.001	0
MeFOSE	mg/kg	0.0005 : 0.005 (Interlab)	<0.0005	<0.0012	0	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0
EtFOSE	mg/kg	0.0005 : 0.005 (Interlab)	<0.0005	<0.0012	0	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0
MeFOSA	mg/kg	0.0005 : 0.002 (Interlab)	<0.0005	<0.0012	0	<0.0005	<0.002	0	<0.0005	<0.0005	0	<0.0005	<0.002	0	<0.0005	<0.0005	0	<0.0005	<0.0005	0	<0.0005	<0.002	0
EtFOSA	mg/kg	0.0005 : 0.002 (Interlab)	<0.0005	<0.0012	0	<0.0005	<0.002	0	<0.0005	<0.0005	0	<0.0005	<0.002	0	<0.0005	<0.0005	0	<0.0005	<0.0005	0	<0.0005	<0.002	0
MeFOSAA	mg/kg	0.0002 : 0.002 (Interlab)	<0.0002	<0.0005	0	<0.0002	<0.002	0	<0.0002	<0.0002	0	<0.0002	<0.002	0	<0.0002	<0.0002	0	<0.0002	<0.0002	0	<0.0002	<0.002	0
EtFOSAA	mg/kg	0.0002 : 0.002 (Interlab)	<0.0002	<0.0005	0	<0.0002	<0.002	0	<0.0002	<0.0002	0	<0.0002	<0.002	0	<0.0002	<0.0002	0	<0.0002	<0.0002	0	<0.0002	<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	<0.0005	<0.0005	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	<0.0005	<0.0005	0	<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	<0.0005	<0.0005	0	<0.0005	<0.001	0	<0.0005	<0.0005	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	<0.0005	<0.0005	0	<0.0005	<0.0005	0	<0.0005	<0.002	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

Table G2 Sediment Duplicate and Triplicate Analytical Results
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	Lab Report Number	EB1922854	EB1922854	RPD	EB1922854	RN1246205	RPD
	Field ID	TW_SED01_190829	TW_QC111_190829		TW_SED01_190829	TW_QC211_190829	
	Sampled Date	29/08/2019	29/08/2019		29/08/2019	29/08/2019	
PFAS	**Units**	**LOR**					
PFBS	mg/kg	0.0002 : 0.001 (Interlab)	0.0007	0.0007	0	0.0007	<0.001	0
PFPeS	mg/kg	0.0002 : 0.001 (Interlab)	0.0006	0.0006	0	0.0006	<0.001	0
PFHxS	mg/kg	0.0002 : 0.001 (Interlab)	0.0111	0.0093	18	**0.0111**	**0.0073**	**41**
PFHpS	mg/kg	0.0002 : 0.001 (Interlab)	0.0008	<0.0005	46	0.0008	<0.001	0
PFOS	mg/kg	0.0002 : 0.002 (Interlab)	**0.0633**	**0.0415**	**42**	0.0633	0.048	27
PFDS	mg/kg	0.0002	<0.0005	<0.0005	0	<0.0005	<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)	<0.0005	<0.0005	0	<0.0005	<0.002	0
PFHxA	mg/kg	0.0002 : 0.001 (Interlab)	0.0005	0.0005	0	0.0005	<0.001	0
PFHpA	mg/kg	0.0002 : 0.001 (Interlab)	<0.0005	<0.0005	0	<0.0005	<0.001	0
PFOA	mg/kg	0.0002 : 0.001 (Interlab)	<0.0005	<0.0005	0	<0.0005	<0.001	0
PFDA	mg/kg	0.0002 : 0.001 (Interlab)	<0.0005	<0.0005	0	<0.0005	<0.001	0
PFNA	mg/kg	0.0002 : 0.001 (Interlab)	<0.0005	<0.0005	0	<0.0005	<0.001	0
PFUnDA	mg/kg	0.0002 : 0.002 (Interlab)	<0.0005	<0.0005	0	<0.0005	<0.002	0
PFDoDA	mg/kg	0.0002 : 0.002 (Interlab)	<0.0005	<0.0005	0	<0.0005	<0.002	0
PFTrDA	mg/kg	0.0002 : 0.002 (Interlab)	<0.0005	<0.0005	0	<0.0005	<0.002	0
PFTeDA	mg/kg	0.0005 : 0.002 (Interlab)	<0.0012	<0.0012	0	<0.0012	<0.002	0
FOSA	mg/kg	0.0002 : 0.001 (Interlab)	<0.0005	<0.0005	0	<0.0005	<0.001	0
MeFOSE	mg/kg	0.0005 : 0.005 (Interlab)	<0.0012	<0.0012	0	<0.0012	<0.005	0
EtFOSE	mg/kg	0.0005 : 0.005 (Interlab)	<0.0065	<0.004	0	<0.0065	<0.005	0
MeFOSA	mg/kg	0.0005 : 0.002 (Interlab)	<0.0012	<0.0012	0	<0.0012	<0.002	0
EtFOSA	mg/kg	0.0005 : 0.002 (Interlab)	0.0094	0.0071	28	**0.0094**	**<0.002**	**130**
MeFOSAA	mg/kg	0.0002 : 0.002 (Interlab)	<0.0005	<0.0005	0	<0.0005	<0.002	0
EtFOSAA	mg/kg	0.0002 : 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)	0.0008	0.0012	40	0.0008	<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

*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

Table G3 Water Duplicate and Triplicate Analytical Results
PFAS DSI
QFES - Toowoomba Fire Station

Lab Report Number	EB1922854	EB1922854	RPD	EB1922854	RN1246205	RPD
Field ID	TW_GW05_190829	TW_QC112_190829		TW_GW05_190829	TW_QC212_190829	
Sampled Date	29/08/2019	29/08/2019		29/08/2019	29/08/2019	
PFAS	**Units**	**LOR**					
PFBS	µg/L	0.002	0.588	0.614	4	0.588	0.650	10
PFPeS	µg/L	0.002	0.568	0.543	5	0.568	0.580	2
PFHxS	µg/L	0.002	3.380	3.210	5	3.380	3.800	12
PFHpS	µg/L	0.002	0.163	0.159	2	0.163	0.180	10
PFOS	µg/L	0.002	3.330	3.160	5	3.330	3.400	2
PFDS	µg/L	0.002	<0.002	<0.002	0	<0.002	<0.001	0
PFBA	µg/L	0.01	0.040	0.040	0	0.040	0.053	28
PFPeA	µg/L	0.002	0.086	0.088	2	0.086	0.110	24
PFHxA	µg/L	0.002	0.525	0.540	3	0.525	0.560	6
PFHpA	µg/L	0.002	0.116	0.120	3	0.116	0.120	3
PFOA	µg/L	0.002	0.205	0.215	5	0.205	0.200	2
PFNA	µg/L	0.002	<0.002	<0.002	0	<0.002	<0.001	0
PFDA	µg/L	0.002	<0.002	<0.002	0	<0.002	<0.001	0
PFUnDA	µg/L	0.002	<0.002	<0.002	0	<0.002	<0.001	0
PFDoDA	µg/L	0.002	<0.002	<0.002	0	<0.002	<0.001	0
PFTrDA	µg/L	0.002	<0.002	<0.002	0	<0.002	<0.002	0
PFTeDA	µg/L	0.005	<0.005	<0.005	0	<0.005	<0.002	0
4:2 FTS	µg/L	0.005	<0.005	<0.005	0	<0.005	<0.001	0
6:2 FTS	µg/L	0.005	0.024	0.047	65	0.024	0.023	4
8:2 FTS	µg/L	0.005	<0.005	<0.005	0	<0.005	<0.001	0
10:2 FTS	µg/L	0.005	<0.005	<0.005	0	<0.005	<0.001	0
MeFOSAA	µg/L	0.002	<0.002	<0.002	0	<0.002	<0.002	0
EtFOSAA	µg/L	0.002	<0.002	<0.002	0	<0.002	<0.002	0
FOSA	µg/L	0.002	0.005	0.005	0	0.005	0.005	2
EtFOSA	µg/L	0.005	<0.005	<0.005	0	<0.005	<0.002	0
MeFOSA	µg/L	0.005	<0.005	<0.005	0	<0.005	<0.002	0
EtFOSE	µg/L	0.005	<0.005	<0.005	0	<0.005	<0.005	0
MeFOSE	µg/L	0.005	<0.005	<0.005	0	<0.005	<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

Table G4 Rinsate Analytical Results
PFAS DSI
QFES - Toowoomba Fire Station

AECOM Imagine it. Delivered.

Lab Report Number	EB1921880	EB1921880	EB1921880	EB1921880	EB1922854	EB1922854
Field ID	TW_QC300_190819	TW_QC302_190820	TW_QC303_190820	TW_QC304_190821	TW_QC305_190829	TW_QC306_190830
Sampled Date	19/08/2019	20/08/2019	20/08/2019	21/08/2019	29/08/2019	30/08/2019
Sample Type	Rinsate	Rinsate	Hydrant water	Rinsate	Rinsate	Rinsate

PFAS	Units	LOR						
PFBS	µg/L	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
PFPeS	µg/L	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
PFHxS	µg/L	0.002	<0.002	<0.002	**0.007**	<0.002	<0.002	<0.002
PFHpS	µg/L	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
PFOS	µg/L	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
PFDS	µg/L	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
PFBA	µg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
PFPeA	µg/L	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
PFHxA	µg/L	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
PFHpA	µg/L	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
PFOA	µg/L	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
PFDA	µg/L	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
PFNA	µg/L	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
PFUnDA	µg/L	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
PFDoDA	µg/L	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
PFTrDA	µg/L	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
PFTeDA	µg/L	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
FOSA	µg/L	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
MeFOSE	µg/L	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
EtFOSE	µg/L	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
MeFOSA	µg/L	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
EtFOSA	µg/L	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
MeFOSAA	µg/L	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
EtFOSAA	µg/L	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
4:2 FTS	µg/L	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
6:2 FTS	µg/L	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
8:2 FTS	µg/L	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
10:2 FTS	µg/L	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005

Appendix H

Analytical Laboratory Reports

ALSCompass
SAMPLING Intelligence

2016

Environmental Division
Brisbane
Work Order Reference
EB1921880

Telephone : +61-7-3243 7222

Custody Document for Submissions via ALS Compass App

Project: 606909758 **Client:** AECOM Pty Ltd **Project Manager:** James Peachey
Phone: (0425 206 362

ALS Compass COC Reference: 2987 **# Samples:** ~~12~~ 121 **Sampler:** Camden McCosker
Phone: (0499 990 214

Turnaround Requirements: Standard 5 Day Urgent

Special Instructions:

Custody:

Relinquished by:	Received by:	Relinquished by:	Received by:
Camden	Liam C		
Date / Time:	**Date / Time:**	**Date / Time:**	**Date / Time:**
21/8/19	21/8/19 1500		

CHAIN OF CUSTODY

ALS COC#: 2987 *ALS Laboratory:* EB Brisbane

CLIENT: AECOMAU - AECOM Australia Pty Ltd

PROJECT: 60609758

SITE: TW

ORDER NO: 60609758 2.0

PROJECT MANAGER: Camden Mccosker CONTACT PH: 0499 990 214 SAMPLER MOBILE: 0499 990 214

PRIMARY SAMPLER: Camden Mccosker QUOTE NO: BN/112/19 / EB2019AECOMAU0002

EMAIL REPORTS TO: camden.mccosker@aecom.com, james.peachey@aecom.com

EMAIL INVOICES TO: james.peachey@aecom.com, camden.mccosker@aecom.com

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

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

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE DETAILS							ANALYSIS REQUIRED				
SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Analysis NOT REQUIRED	Table 1 Soil Analysis SOIL	Table 2 Water WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	TW_SS1_0.1_190819		19/08/2019 12:55 PM	Soil	ALS: 1 Non ALS: 0	No		X			
002	TW_SS1_0.5_190819		19/08/2019 12:55 PM	Water	ALS: 1 Non ALS: 0	No		X			
003	TW_BH01_0.2_190819		19/08/2019 02:39 PM	Water	ALS: 1 Non ALS: 0	No		X			
004	TW_BH01_1.0_190819		19/08/2019 02:40 PM	Water	ALS: 1 Non ALS: 0	No		X			
005	TW_BH01_1.5_190819		19/08/2019 02:40 PM	Soil	ALS: 1 Non ALS: 0	Yes			-		
006	TW_BH01_2.0_190819		19/08/2019 02:41 PM	Water	ALS: 1 Non ALS: 0	Yes	-				
007	TW_BH01_3.0_190819		19/08/2019 02:41 PM	Water	ALS: 1 Non ALS: 0	Yes	-				
008	TW_BH01_4.0_190819		19/08/2019 02:42 PM	Water	ALS: 1 Non ALS: 0	Yes	-				
009	TW_BH01_5.0_190819		19/08/2019 02:42 PM	Water	ALS: 1 Non ALS: 0	Yes	-				

CHAIN OF CUSTODY

(ALS) COC#: **2987** *ALS Laboratory:* EB Brisbane

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

CLIENT: AECOMAU - AECOM Australia Pty Ltd

PROJECT: 60609758

SITE: TW

ORDER NO: 60609758 2.0

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

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

Random Sample Temperature on Receipt: °C

Other comments:

PROJECT MANAGER: Camden Mccosker CONTACT PH: 0499 990 214 SAMPLER MOBILE: 0499 990 214

PRIMARY SAMPLER: Camden Mccosker QUOTE NO: BN/112/19 / EB2019AECOMAU0002

EMAIL REPORTS TO: camden.mccosker@aecom.com, james.peachey@aecom.com

EMAIL INVOICES TO: james.peachey@aecom.com, camden.mccosker@aecom.com

SAMPLE DETAILS							ANALYSIS REQUIRED				
SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Analysis NOT REQUIRED	Table 1 Soil Analysis SOIL	Table 2 Water WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
010	TW_BH01_6.0_190819		19/08/2019 02:43 PM	Water	ALS: 1 Non ALS: 0	Yes	-				
011	TW_BH01_7.0_190819		19/08/2019 02:43 PM	Soil	ALS: 1 Non ALS: 0	Yes	-				
012	TW_BH01_8.0_190819		19/08/2019 02:44 PM	Soil	ALS: 1 Non ALS: 0	Yes	-				
013	TW_BH01_9.0_190819		19/08/2019 02:45 PM	Water	ALS: 1 Non ALS: 0	Yes	-				
014	TW_BH01_10.0_190819		19/08/2019 02:45 PM	Water	ALS: 1 Non ALS: 0	Yes	-				
015	TW_BH01_11.0_190819		19/08/2019 02:46 PM	Water	ALS: 1 Non ALS: 0	Yes	-				
016	TW_BH01_12.0_190819		19/08/2019 02:46 PM	Water	ALS: 1 Non ALS: 0	Yes	-				
017	TW_BH01_13.0_190819		19/08/2019 02:47 PM	Water	ALS: 1 Non ALS: 0	Yes	-				
018	TW_BH01_14.0_190819		19/08/2019 02:48 PM	Soil	ALS: 1 Non ALS: 0	Yes	-				

CHAIN OF CUSTODY

(ALS) COC#: **2987** *ALS Laboratory:* EB Brisbane

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

CLIENT: AECOMAU - AECOM Australia Pty Ltd

PROJECT: 60609758

SITE: TW

ORDER NO: 60609758 2.0

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

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

Random Sample Temperature on Receipt: °C

Other comments:

PROJECT MANAGER: Camden Mccosker CONTACT PH: 0499 990 214 SAMPLER MOBILE: 0499 990 214

PRIMARY SAMPLER: Camden Mccosker QUOTE NO: BN/112/19 / EB2019AECOMAU0002

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EMAIL INVOICES TO: james.peachey@aecom.com, camden.mccosker@aecom.com

SAMPLE DETAILS							ANALYSIS REQUIRED				
SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Analysis NOT REQUIRED	Table 1 Soil Analysis SOIL	Table 2 Water WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
019	TW_BH01_15.0_190819		19/08/2019 02:48 PM	Water	ALS: 1 Non ALS: 0	Yes	-				
020	TW_BH01_16.0_190819		19/08/2019 02:49 PM	Water	ALS: 1 Non ALS: 0	Yes	-				
021	TW_BH01_17.0_190819		19/08/2019 03:01 PM	Soil	ALS: 1 Non ALS: 0	Yes	-				
022	TW_BH01_18.0_190819		19/08/2019 03:03 PM	Water	ALS: 1 Non ALS: 0	No		X			
023	TW_BH01_19.0_190819		19/08/2019 03:06 PM	Water	ALS: 1 Non ALS: 0	Yes	-				
024	TW_SS2_0.1_190819		19/08/2019 03:34 PM	Soil	ALS: 1 Non ALS: 0	No		X			
025	TW_SS5_0.1_190819		19/08/2019 03:35 PM	Water	ALS: 1 Non ALS: 0	No		X			
026	TW_SS6_0.1_190819		19/08/2019 03:35 PM	Water	ALS: 1 Non ALS: 0	No		X			
027	TW_SS7_190818		19/08/2019 03:36 PM	Water	ALS: 1 Non ALS: 0	No		X			

CHAIN OF CUSTODY

(ALS) COC#: **2987** *ALS Laboratory:* EB Brisbane

CLIENT: AECOMAU - AECOM Australia Pty Ltd

PROJECT: 60609758

SITE: TW

ORDER NO: 60609758 2.0

PROJECT MANAGER: Camden Mccosker

PRIMARY SAMPLER: Camden Mccosker

CONTACT PH: 0499 990 214

SAMPLER MOBILE: 0499 990 214

QUOTE NO: BN/112/19

/ EB2019AECOMAU0002

EMAIL REPORTS TO: camden.mccosker@aecom.com, james.peachey@aecom.com

EMAIL INVOICES TO: james.peachey@aecom.com, camden.mccosker@aecom.com

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

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

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE DETAILS							ANALYSIS REQUIRED				
SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Analysis NOT REQUIRED	Table 1 Soil Analysis SOIL	Table 2 Water WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
028	TW_SS3_0.1_190819-1		19/08/2019 03:54 PM	Water	ALS: 1 Non ALS: 0	No		X			
029	TW_SS3_0.5_190819-1		19/08/2019 03:55 PM	Water	ALS: 1 Non ALS: 0	No		X			
030	TW_SS4_0.1_190819		19/08/2019 04:13 PM	Soil	ALS: 1 Non ALS: 0	No		X			
031	TW_SS4_0.5_190819		19/08/2019 04:12 PM	Soil	ALS: 1 Non ALS: 0	No		X			
032	TW_BH02_0.2_190820		20/08/2019 08:27 AM	Water	ALS: 1 Non ALS: 0	No		X			
033	TW_BH02_0.5_190820		20/08/2019 08:27 AM	Water	ALS: 1 Non ALS: 0	No		X			
034	TW_BH02_1.0_190820		20/08/2019 08:28 AM	Water	ALS: 1 Non ALS: 0	Yes	-				
035	TW_BH02_1.5_190820		20/08/2019 08:28 AM	Water	ALS: 1 Non ALS: 0	Yes	-				
036	TW_BH02_2.0_190820		20/08/2019 09:34 AM	Water	ALS: 1 Non ALS: 0	Yes	-				

CHAIN OF CUSTODY

(ALS) COC#: **2987** *ALS Laboratory:* EB Brisbane

CLIENT: AECOMAU - AECOM Australia Pty Ltd

PROJECT: 60609758

SITE: TW

ORDER NO: 60609758 2.0

PROJECT MANAGER: Camden Mccosker CONTACT PH: 0499 990 214 SAMPLER MOBILE: 0499 990 214

PRIMARY SAMPLER: Camden Mccosker QUOTE NO: BN/112/19 / EB2019AECOMAU0002

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EMAIL INVOICES TO: james.peachey@aecom.com, camden.mccosker@aecom.com

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

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

Random Sample Temperature on Receipt: 'C

Other comments:

SAMPLE DETAILS							ANALYSIS REQUIRED				
SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Analysis NOT REQUIRED	Table 1 Soil Analysis SOIL	Table 2 Water WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
037	TW_BH02_3.0_190820		20/08/2019 09:34 AM	Water	ALS: 1 Non ALS: 0	Yes	-				
038	TW_BH02_4.0_190820		20/08/2019 09:35 AM	Water	ALS: 1 Non ALS: 0	Yes	-				
039	TW_BH02_5.0_190820		20/08/2019 09:37 AM	Water	ALS: 1 Non ALS: 0	Yes	-				
040	TW_BH02_6.0_190820		20/08/2019 09:37 AM	Water	ALS: 1 Non ALS: 0	Yes	-				
041	TW_BH02_7.0_190820		20/08/2019 09:43 AM	Water	ALS: 1 Non ALS: 0	Yes	-				
042	TW_BH02_8.0_190820		20/08/2019 09:43 AM	Water	ALS: 1 Non ALS: 0	Yes	-				
043	TW_BH02_9.0_190820		20/08/2019 09:44 AM	Water	ALS: 1 Non ALS: 0	Yes	-				
044	TW_BH02_10.0_190820		20/08/2019 09:44 AM	Water	ALS: 1 Non ALS: 0	Yes	-				
045	TW_BH02_11.0_190820		20/08/2019 09:45 AM	Water	ALS: 1 Non ALS: 0	Yes	-				

CHAIN OF CUSTODY

(ALS) COC#: **2987** *ALS Laboratory:* EB Brisbane

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

CLIENT: AECOMAU - AECOM Australia Pty Ltd

PROJECT: 60609758

SITE: TW

ORDER NO: 60609758 2.0

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

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

Random Sample Temperature on Receipt: °C

Other comments:

PROJECT MANAGER: Camden Mccosker CONTACT PH: 0499 990 214 SAMPLER MOBILE: 0499 990 214

PRIMARY SAMPLER: Camden Mccosker QUOTE NO: BN/112/19 / EB2019AECOMAU0002

EMAIL REPORTS TO: camden.mccosker@aecom.com, james.peachey@aecom.com

EMAIL INVOICES TO: james.peachey@aecom.com, camden.mccosker@aecom.com

SAMPLE DETAILS							ANALYSIS REQUIRED				
SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Analysis NOT REQUIRED	Table 1 Soil Analysis SOIL	Table 2 Water WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
046	TW_BH02_12.0_190820		20/08/2019 09:45 AM	Water	ALS: 1 Non ALS: 0	Yes	-				
047	TW_BH02_13.0_190820		20/08/2019 09:46 AM	Water	ALS: 1 Non ALS: 0	Yes	-				
048	TW_BH02_14.0_190820		20/08/2019 09:46 AM	Water	ALS: 1 Non ALS: 0	Yes	-				
049	TW_BH02_15.0_190820		20/08/2019 09:47 AM	Water	ALS: 1 Non ALS: 0	Yes	-				
050	TW_BH02_17.0_1908207		20/08/2019 09:47 AM	Soil	ALS: 1 Non ALS: 0	No		X			
051	TW_BH03_0.2_190820		20/08/2019 11:16 AM	Water	ALS: 1 Non ALS: 0	No		X			
052	TW_BH03_0.5_190820		20/08/2019 11:17 AM	Water	ALS: 1 Non ALS: 0	No		X			
053	TW_BH03_1.0_190820		20/08/2019 11:17 AM	Water	ALS: 1 Non ALS: 0	Yes	-				
054	TW_BH03_1.5_190820		20/08/2019 11:18 AM	Water	ALS: 1 Non ALS: 0	Yes	-				

CHAIN OF CUSTODY

(ALS) COC#: **2987** *ALS Laboratory:* EB Brisbane

CLIENT: AECOMAU - AECOM Australia Pty Ltd

PROJECT: 60609758

SITE: TW

ORDER NO: 60609758 2.0

PROJECT MANAGER: Camden Mccosker

PRIMARY SAMPLER: Camden Mccosker

CONTACT PH: 0499 990 214

QUOTE NO: BN/112/19

SAMPLER MOBILE: 0499 990 214 / EB2019AECOMAU0002

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EMAIL INVOICES TO: james.peachey@aecom.com, camden.mccosker@aecom.com

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

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

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE DETAILS							ANALYSIS REQUIRED				
SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Analysis NOT REQUIRED	Table 1 Soil Analysis SOIL	Table 2 Water WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
055	TW_BH03_2.0_190820		20/08/2019 12:25 PM	Soil	ALS: 1 Non ALS: 0	Yes	-				
056	TW_BH03_3.0_190820		20/08/2019 12:28 PM	Water	ALS: 1 Non ALS: 0	Yes	-				
057	TW_BH03_4.0_190820		20/08/2019 12:28 PM	Water	ALS: 1 Non ALS: 0	Yes	-				
058	TW_BH03_5.0_190820		20/08/2019 12:28 PM	Water	ALS: 1 Non ALS: 0	Yes	-				
059	TW_BH03_6.0_190820		20/08/2019 12:29 PM	Water	ALS: 1 Non ALS: 0	Yes	-				
060	TW_BH03_7.0_190820		20/08/2019 12:29 PM	Water	ALS: 1 Non ALS: 0	Yes	-				
061	TW_BH03_8.0_190820		20/08/2019 12:30 PM	Water	ALS: 1 Non ALS: 0	Yes	-				
062	TW_BH03_9.0_190820		20/08/2019 12:30 PM	Water	ALS: 1 Non ALS: 0	Yes	-				
063	TW_BH03_10.0_190820		20/08/2019 12:31 PM	Water	ALS: 1 Non ALS: 0	Yes	-				

CHAIN OF CUSTODY

ALS COC#: 2987 *ALS Laboratory:* EB Brisbane

CLIENT: AECOMAU - AECOM Australia Pty Ltd

PROJECT: 60609758

SITE: TW

ORDER NO: 60609758 2.0

PROJECT MANAGER: Camden Mccosker CONTACT PH: 0499 990 214 SAMPLER MOBILE: 0499 990 214

PRIMARY SAMPLER: Camden Mccosker QUOTE NO: BN/112/19 / EB2019AECOMAU0002

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RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

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

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE DETAILS							ANALYSIS REQUIRED				
SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Analysis NOT REQUIRED	Table 1 Soil Analysis SOIL	Table 2 Water WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
064	TW_BH03_11.0_190820		20/08/2019 12:31 PM	Soil	ALS: 1 Non ALS: 0	Yes	-				
065	TW_BH03_12.0_190820		20/08/2019 12:32 PM	Water	ALS: 1 Non ALS: 0	Yes	-				
066	TW_BH03_13.0_190820		20/08/2019 12:32 PM	Soil	ALS: 1 Non ALS: 0	Yes	-				
067	TW_BH03_14.0_190820		20/08/2019 12:32 PM	Water	ALS: 1 Non ALS: 0	Yes	-				
068	TW_BH03_16.0_190820		20/08/2019 12:33 PM	Water	ALS: 1 Non ALS: 0	No		X			
069	TW_BH05_0.2_190820		20/08/2019 02:52 PM	Soil	ALS: 1 Non ALS: 0	No		X			
070	TW_BH05_0.5_190820		20/08/2019 02:53 PM	Soil	ALS: 1 Non ALS: 0	Yes		-			
071	TW_BH05_1.0_190820		20/08/2019 02:53 PM	Soil	ALS: 1 Non ALS: 0	No		X			
072	TW_BH05_1.5_190820		20/08/2019 02:54 PM	Water	ALS: 1 Non ALS: 0	Yes	-				

CHAIN OF CUSTODY

(ALS) COC#: **2987** *ALS Laboratory:* EB Brisbane

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

CLIENT: AECOMAU - AECOM Australia Pty Ltd

PROJECT: 60609758

SITE: TW

ORDER NO: 60609758 2.0

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

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

Random Sample Temperature on Receipt: °C

Other comments:

PROJECT MANAGER: Camden Mccosker CONTACT PH: 0499 990 214 SAMPLER MOBILE: 0499 990 214

PRIMARY SAMPLER: Camden Mccosker QUOTE NO: BN/112/19 / EB2019AECOMAU0002

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EMAIL INVOICES TO: james.peachey@aecom.com, camden.mccosker@aecom.com

SAMPLE DETAILS							ANALYSIS REQUIRED				
SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Analysis NOT REQUIRED	Table 1 Soil Analysis SOIL	Table 2 Water WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
073	TW_BH04_0.2_190820		20/08/2019 03:40 PM	Water	ALS: 1 Non ALS: 0	No		X			
074	TW_BH04_0.5_190820		20/08/2019 03:40 PM	Soil	ALS: 1 Non ALS: 0	No		X			
075	TW_BH04_1.0_190820		20/08/2019 03:41 PM	Water	ALS: 1 Non ALS: 0	Yes	-				
076	TW_BH04_1.5_190820		20/08/2019 03:42 PM	Water	ALS: 1 Non ALS: 0	Yes	-				
077	TW_BH04_2.0_190820		20/08/2019 04:02 PM	Soil	ALS: 1 Non ALS: 0	Yes	-				
078	TW_BH04_3.0_190820		20/08/2019 04:02 PM	Water	ALS: 1 Non ALS: 0	Yes	-				
079	TW_BH04_3.7-3.9_190820		20/08/2019 04:02 PM	Water	ALS: 1 Non ALS: 0	Yes	-				
080	TW_BH04_5.0_190821		21/08/2019 08:32 AM	Soil	ALS: 1 Non ALS: 0	Yes	-				
081	TW_BH04_6.0_190821		21/08/2019 08:33 AM	Water	ALS: 1 Non ALS: 0	Yes	-				

CHAIN OF CUSTODY

(ALS) COC#: **2987** *ALS Laboratory:* EB Brisbane

CLIENT: AECOMAU - AECOM Australia Pty Ltd

PROJECT: 60609758

SITE: TW

ORDER NO: 60609758 2.0

PROJECT MANAGER: Camden Mccosker CONTACT PH: 0499 990 214 SAMPLER MOBILE: 0499 990 214

PRIMARY SAMPLER: Camden Mccosker QUOTE NO: BN/112/19 / EB2019AECOMAU0002

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RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

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

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE DETAILS							ANALYSIS REQUIRED				
SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Analysis NOT REQUIRED	Table 1 Soil Analysis SOIL	Table 2 Water WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
082	TW_BH04_7.0_190821		21/08/2019 08:33 AM	Water	ALS: 1 Non ALS: 0	Yes	-				
083	TW_BH04_8.0_190821		21/08/2019 08:34 AM	Soil	ALS: 1 Non ALS: 0	Yes	-				
084	TW_BH04_9.0_190821		21/08/2019 08:35 AM	Water	ALS: 1 Non ALS: 0	Yes	-				
085	TW_BH04_10.0_190821		21/08/2019 08:35 AM	Water	ALS: 1 Non ALS: 0	Yes	-				
086	TW_BH04_11.0_190821		21/08/2019 08:35 AM	Water	ALS: 1 Non ALS: 0	Yes	-				
087	TW_BH04_12.0_190821		21/08/2019 08:36 AM	Water	ALS: 1 Non ALS: 0	Yes	-				
088	TW_BH04_13.0_190821		21/08/2019 08:36 AM	Water	ALS: 1 Non ALS: 0	Yes	-				
089	TW_BH04_14.0_190821		21/08/2019 08:37 AM	Water	ALS: 1 Non ALS: 0	Yes	-				
090	TW_BH04_15.0_190821		21/08/2019 08:37 AM	Water	ALS: 1 Non ALS: 0	Yes	-				

CHAIN OF CUSTODY

COC#: **2987** *ALS Laboratory:* EB Brisbane

CLIENT: AECOMAU - AECOM Australia Pty Ltd

PROJECT: 60609758

SITE: TW

ORDER NO: 60609758 2.0

PROJECT MANAGER: Camden Mccosker CONTACT PH: 0499 990 214 SAMPLER MOBILE: 0499 990 214

PRIMARY SAMPLER: Camden Mccosker QUOTE NO: BN/112/19 / EB2019AECOMAU0002

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RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

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

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE DETAILS							ANALYSIS REQUIRED				
SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Analysis NOT REQUIRED	Table 1 Soil Analysis SOIL	Table 2 Water WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
091	TW_BH05_2.0_190821		21/08/2019 09:05 AM	Water	ALS: 1 Non ALS: 0	Yes	-				
092	TW_BH05_3.0_190821		21/08/2019 09:44 AM	Water	ALS: 1 Non ALS: 0	Yes	-				
093	TW_BH05_4.0_190821		21/08/2019 09:44 AM	Water	ALS: 1 Non ALS: 0	Yes	-				
094	TW_BH05_5.0_190821		21/08/2019 09:45 AM	Water	ALS: 1 Non ALS: 0	Yes	-				
095	TW_BH05_6.0_190821		21/08/2019 09:46 AM	Water	ALS: 1 Non ALS: 0	Yes	-				
096	TW_BH05_7.0_190821		21/08/2019 09:46 AM	Water	ALS: 1 Non ALS: 0	Yes	-				
097	TW_BH05_8.0_190821		21/08/2019 09:47 AM	Water	ALS: 1 Non ALS: 0	Yes	-				
098	TW_BH05_9.0_190821		21/08/2019 09:47 AM	Water	ALS: 1 Non ALS: 0	Yes	-				
099	TW_BH05_10.0_190821		21/08/2019 09:47 AM	Water	ALS: 1 Non ALS: 0	Yes	-				

CHAIN OF CUSTODY

(ALS) COC#: **2987** *ALS Laboratory:* EB Brisbane

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

CLIENT: AECOMAU - AECOM Australia Pty Ltd

PROJECT: 60609758

SITE: TW

ORDER NO: 60609758 2.0

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

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

Random Sample Temperature on Receipt: °C

Other comments:

PROJECT MANAGER: Camden Mccosker CONTACT PH: 0499 990 214 SAMPLER MOBILE: 0499 990 214

PRIMARY SAMPLER: Camden Mccosker QUOTE NO: BN/112/19 / EB2019AECOMAU0002

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SAMPLE DETAILS							ANALYSIS REQUIRED				
SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Analysis NOT REQUIRED	Table 1 Soil Analysis SOIL	Table 2 Water WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
100	TW_BH05_11.0_190821		21/08/2019 09:48 AM	Water	ALS: 1 Non ALS: 0	Yes	-				
101	TW_QC300_190819		19/08/2019 11:33 AM	Water	ALS: 1 Non ALS: 0	No			Partial 1/2		
102	TW_QC100_190819		19/08/2019 12:57 PM	Water	ALS: 1 Non ALS: 0	No		X			
103	TW_QC101_190819		19/08/2019 01:37 PM	Water	ALS: 1 Non ALS: 0	Yes	-				
104	TW_QC102_190819		19/08/2019 02:38 PM	Water	ALS: 1 Non ALS: 0	Yes	-				
105	TW_QC103_190819		19/08/2019 03:56 PM	Soil	ALS: 1 Non ALS: 0	Yes	-				
106	TW_QC302_190820		20/08/2019 07:26 AM	Water	ALS: 1 Non ALS: 0	No			Partial 1/2		
107	TW_QC104_190820		20/08/2019 08:24 AM	Water	ALS: 1 Non ALS: 0	No		X			
108	TW_QC303_190820		20/08/2019 11:15 AM	Water	ALS: 1 Non ALS: 0	No			Partial 1/2		

CHAIN OF CUSTODY

(ALS) COC#: **2987** *ALS Laboratory:* EB Brisbane

CLIENT: AECOMAU - AECOM Australia Pty Ltd

PROJECT: 60609758

SITE: TW

ORDER NO: 60609758 2.0

PROJECT MANAGER: Camden Mccosker CONTACT PH: 0499 990 214 SAMPLER MOBILE: 0499 990 214

PRIMARY SAMPLER: Camden Mccosker QUOTE NO: BN/112/19 / EB2019AECOMAU0002

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RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

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

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE DETAILS							ANALYSIS REQUIRED				
SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Analysis NOT REQUIRED	Table 1 Soil Analysis SOIL	Table 2 Water WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
109	TW_QC106_190820		20/08/2019 12:21 PM	Water	ALS: 1 Non ALS: 0	No		X			
110	TW_QC107_190820		20/08/2019 02:50 PM	Water	ALS: 1 Non ALS: 0	Yes	-				
111	TW_QC108_190820		20/08/2019 03:39 PM	Water	ALS: 1 Non ALS: 0	Yes	-				
112	TW_QC304_190821		21/08/2019 07:14 AM	Water	ALS: 1 Non ALS: 0	No			Partial 1/2		
113	TW_QC105_190820		20/08/2019 11:14 AM	Soil	ALS: 1 Non ALS: 0	Yes	-				
114	TW_QC109_190821		21/08/2019 09:28 AM	Water	ALS: 1 Non ALS: 0	Yes	-				
115	TW_QC110_190821		21/08/2019 10:05 AM	Soil	ALS: 1 Non ALS: 0	Yes	-				
116	TW_BH05_12.0_190821		21/08/2019 09:48 AM	Water	ALS: 1 Non ALS: 0	Yes	-				
117	TW_BH05_13.0_190821		21/08/2019 09:49 AM	Water	ALS: 1 Non ALS: 0	Yes	-				

CHAIN OF CUSTODY

(ALS) COC#: **2987** *ALS Laboratory:* EB Brisbane

CLIENT: AECOMAU - AECOM Australia Pty Ltd

PROJECT: 60609758

SITE: TW

ORDER NO: 60609758 2.0

PROJECT MANAGER: Camden Mccosker CONTACT PH: 0499 990 214 SAMPLER MOBILE: 0499 990 214

PRIMARY SAMPLER: Camden Mccosker QUOTE NO: BN/112/19 / EB2019AECOMAU0002

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RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

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

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE DETAILS							ANALYSIS REQUIRED				
SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Analysis NOT REQUIRED	Table 1 Soil Analysis SOIL	Table 2 Water WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
118	TW_BH05_14.0_190821		21/08/2019 09:49 AM	Water	ALS: 1 Non ALS: 0	Yes	-				
119	TW_BH05_15.0_190821		21/08/2019 09:50 AM	Water	ALS: 1 Non ALS: 0	Yes	-				
120	TW_BH05_16.0_190821		21/08/2019 10:06 AM	Soil	ALS: 1 Non ALS: 0	No		X			
121	TW_BH05_18.0_190821		21/08/2019 10:07 AM	Water	ALS: 1 Non ALS: 0	Yes	-				

CHAIN OF CUSTODY

(ALS) *COC#:* **2987** *ALS Laboratory:* EB Brisbane

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

CLIENT: AECOMAU - AECOM Australia Pty Ltd

PROJECT: 60609758

SITE: TW

ORDER NO: 60609758 2.0

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

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

Random Sample Temperature on Receipt: °C

Other comments:

PROJECT MANAGER: Camden Mccosker CONTACT PH: 0499 990 214 SAMPLER MOBILE: 0499 990 214

PRIMARY SAMPLER: Camden Mccosker QUOTE NO: BN/112/19 / EB2019AECOMAU0002

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SAMPLE	SAMPLE NAME	PARTIAL ANALYSIS GROUP NAME	MATRIX	SELECTED ANALYSIS NAME
101	TW_QC300_190819	Table 2 Water WATER	Water	- EP231X-LL (EB) PFAS - Full Suite Low Level (28 analytes)
106	TW_QC302_190820	Table 2 Water WATER	Water	- EP231X-LL (EB) PFAS - Full Suite Low Level (28 analytes)
108	TW_QC303_190820	Table 2 Water WATER	Water	- EP231X-LL (EB) PFAS - Full Suite Low Level (28 analytes)
112	TW_QC304_190821	Table 2 Water WATER	Water	- EP231X-LL (EB) PFAS - Full Suite Low Level (28 analytes)

CHAIN OF CUSTODY

(ALS) COC#: **2987** *ALS Laboratory:* EB Brisbane

CLIENT: AECOMAU - AECOM Australia Pty Ltd

PROJECT: 60609758

SITE: TW

ORDER NO: 60609758 2.0

PROJECT MANAGER: Camden Mccosker CONTACT PH: 0499 990 214 SAMPLER MOBILE: 0499 990 214

PRIMARY SAMPLER: Camden Mccosker QUOTE NO: BN/112/19 / EB2019AECOMAU0002

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RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

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

Random Sample Temperature on Receipt: °C

Other comments:

027	TW_SS7_190818	HDPE Soil Jar	200 mL	00620219006500	Grey	No	
028	TW_SS3_0.1_190819-1	HDPE Soil Jar	200 mL	00620219006480	Grey	No	
029	TW_SS3_0.5_190819-1	HDPE Soil Jar	200 mL	00620219006476	Grey	No	
030	TW_SS4_0.1_190819	HDPE Soil Jar	200 mL	00620219006402	Grey	No	
031	TW_SS4_0.5_190819	HDPE Soil Jar	200 mL	00620219006493	Grey	No	
032	TW_BH02_0.2_190820	HDPE Soil Jar	200 mL	00620219006502	Grey	No	
033	TW_BH02_0.5_190820	HDPE Soil Jar	200 mL	00620219006487	Grey	No	
034	TW_BH02_1.0_190820	HDPE Soil Jar	200 mL	00620219006486	Grey	No	
035	TW_BH02_1.5_190820	HDPE Soil Jar	200 mL	00620219006396	Grey	No	
036	TW_BH02_2.0_190820	HDPE Soil Jar	200 mL	00620219006401	Grey	No	
037	TW_BH02_3.0_190820	HDPE Soil Jar	200 mL	00620219006459	Grey	No	
038	TW_BH02_4.0_190820	HDPE Soil Jar	200 mL	00620219006381	Grey	No	
039	TW_BH02_5.0_190820	HDPE Soil Jar	200 mL	00620219006433	Grey	No	
040	TW_BH02_6.0_190820	HDPE Soil Jar	200 mL	00620219006466	Grey	No	
041	TW_BH02_7.0_190820	HDPE Soil Jar	200 mL	00620219006414	Grey	No	
042	TW_BH02_8.0_190820	HDPE Soil Jar	200 mL	00620219006426	Grey	No	
043	TW_BH02_9.0_190820	HDPE Soil Jar	200 mL	00620219006431	Grey	No	
044	TW_BH02_10.0_190820	HDPE Soil Jar	200 mL	00620219006436	Grey	No	
045	TW_BH02_11.0_190820	HDPE Soil Jar	200 mL	00620219006456	Grey	No	
046	TW_BH02_12.0_190820	HDPE Soil Jar	200 mL	00620219006378	Grey	No	
047	TW_BH02_13.0_190820	HDPE Soil Jar	200 mL	00620219006441	Grey	No	
048	TW_BH02_14.0_190820	HDPE Soil Jar	200 mL	00620219006403	Grey	No	
049	TW_BH02_15.0_190820	HDPE Soil Jar	200 mL	00620219006474	Grey	No	
050	TW_BH02_17.0_1908207	HDPE Soil Jar	200 mL	00620219006478	Grey	No	
051	TW_BH03_0.2_190820	HDPE Soil Jar	200 mL	00620219006477	Grey	No	
052	TW_BH03_0.5_190820	HDPE Soil Jar	200 mL	00620219006471	Grey	No	
053	TW_BH03_1.0_190820	HDPE Soil Jar	200 mL	00620219006498	Grey	No	

CHAIN OF CUSTODY

(ALS) COC#: **2987** *ALS Laboratory:* EB Brisbane

CLIENT: AECOMAU - AECOM Australia Pty Ltd

PROJECT: 60609758

SITE: TW

ORDER NO: 60609758 2.0

PROJECT MANAGER: Camden Mccosker CONTACT PH: 0499 990 214 SAMPLER MOBILE: 0499 990 214

PRIMARY SAMPLER: Camden Mccosker QUOTE NO: BN/112/19 / EB2019AECOMAU0002

EMAIL REPORTS TO: camden.mccosker@aecom.com, james.peachey@aecom.com

EMAIL INVOICES TO: james.peachey@aecom.com, camden.mccosker@aecom.com

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

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

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE	SAMPLE NAME	BOTTLE NAME	VOLUME	BARCODE	TYPE	FILTERED	REASON
001	TW_SS1_0.1_190819	HDPE Soil Jar	200 mL	00620219006484	Grey	No	
002	TW_SS1_0.5_190819	HDPE Soil Jar	200 mL	00620219006482	Grey	No	
003	TW_BH01_0.2_190819	HDPE Soil Jar	200 mL	00620219006467	Grey	No	
004	TW_BH01_1.0_190819	HDPE Soil Jar	200 mL	00620219006507	Grey	No	
005	TW_BH01_1.5_190819	HDPE Soil Jar	200 mL	00620219006501	Grey	No	
006	TW_BH01_2.0_190819	HDPE Soil Jar	200 mL	00620219006488	Grey	No	
007	TW_BH01_3.0_190819	HDPE Soil Jar	200 mL	00620219006479	Grey	No	
008	TW_BH01_4.0_190819	HDPE Soil Jar	200 mL	00620219006473	Grey	No	
009	TW_BH01_5.0_190819	HDPE Soil Jar	200 mL	00620219006505	Grey	No	
010	TW_BH01_6.0_190819	HDPE Soil Jar	200 mL	00620219006483	Grey	No	
011	TW_BH01_7.0_190819	HDPE Soil Jar	200 mL	00620219006446	Grey	No	
012	TW_BH01_8.0_190819	HDPE Soil Jar	200 mL	00620219006508	Grey	No	
013	TW_BH01_9.0_190819	HDPE Soil Jar	200 mL	00620219006438	Grey	No	
014	TW_BH01_10.0_190819	HDPE Soil Jar	200 mL	00620219006496	Grey	No	
015	TW_BH01_11.0_190819	HDPE Soil Jar	200 mL	00620219006504	Grey	No	
016	TW_BH01_12.0_190819	HDPE Soil Jar	200 mL	00620219006492	Grey	No	
017	TW_BH01_13.0_190819	HDPE Soil Jar	200 mL	00620219006415	Grey	No	
018	TW_BH01_14.0_190819	HDPE Soil Jar	200 mL	00620219006468	Grey	No	
019	TW_BH01_15.0_190819	HDPE Soil Jar	200 mL	00620219006458	Grey	No	
020	TW_BH01_16.0_190819	HDPE Soil Jar	200 mL	00620219006424	Grey	No	
021	TW_BH01_17.0_190819	HDPE Soil Jar	200 mL	00620219006461	Grey	No	
022	TW_BH01_18.0_190819	HDPE Soil Jar	200 mL	00620219006453	Grey	No	
023	TW_BH01_19.0_190819	HDPE Soil Jar	200 mL	00620219006419	Grey	No	
024	TW_SS2_0.1_190819	HDPE Soil Jar	200 mL	00620219006470	Grey	No	
025	TW_SS5_0.1_190819	HDPE Soil Jar	200 mL	00620219006413	Grey	No	
026	TW_SS6_0.1_190819	HDPE Soil Jar	200 mL	00620219006497	Grey	No	

CHAIN OF CUSTODY

ALS COC#: 2987 *ALS Laboratory:* EB Brisbane

CLIENT: AECOMAU - AECOM Australia Pty Ltd

PROJECT: 60609758

SITE: TW

ORDER NO: 60609758 2.0

PROJECT MANAGER: Camden Mccosker CONTACT PH: 0499 990 214 SAMPLER MOBILE: 0499 990 214

PRIMARY SAMPLER: Camden Mccosker QUOTE NO: BN/112/19 / EB2019AECOMAU0002

EMAIL REPORTS TO: camden.mccosker@aecom.com, james.peachey@aecom.com

EMAIL INVOICES TO: james.peachey@aecom.com, camden.mccosker@aecom.com

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

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

Random Sample Temperature on Receipt: °C

Other comments:

054	TW_BH03_1.5_190820	HDPE Soil Jar	200 mL	00620219006404	Grey	No	
055	TW_BH03_2.0_190820	HDPE Soil Jar	200 mL	00620219006491	Grey	No	
056	TW_BH03_3.0_190820	HDPE Soil Jar	200 mL	00620219006373	Grey	No	
057	TW_BH03_4.0_190820	HDPE Soil Jar	200 mL	00620219006391	Grey	No	
058	TW_BH03_5.0_190820	HDPE Soil Jar	200 mL	00620219006377	Grey	No	
059	TW_BH03_6.0_190820	HDPE Soil Jar	200 mL	00620219006454	Grey	No	
060	TW_BH03_7.0_190820	HDPE Soil Jar	200 mL	00620219006432	Grey	No	
061	TW_BH03_8.0_190820	HDPE Soil Jar	200 mL	00620219006489	Grey	No	
062	TW_BH03_9.0_190820	HDPE Soil Jar	200 mL	00620219006462	Grey	No	
063	TW_BH03_10.0_190820	HDPE Soil Jar	200 mL	00620219006481	Grey	No	
064	TW_BH03_11.0_190820	HDPE Soil Jar	200 mL	00620219006448	Grey	No	
065	TW_BH03_12.0_190820	HDPE Soil Jar	200 mL	00620219006469	Grey	No	
066	TW_BH03_13.0_190820	HDPE Soil Jar	200 mL	00620219006361	Grey	No	
067	TW_BH03_14.0_190820	HDPE Soil Jar	200 mL	00620219006422	Grey	No	
068	TW_BH03_16.0_190820	HDPE Soil Jar	200 mL	00620219006457	Grey	No	
069	TW_BH05_0.2_190820	HDPE Soil Jar	200 mL	00620219006455	Grey	No	
070	TW_BH05_0.5_190820	HDPE Soil Jar	200 mL	00620219006375	Grey	No	
071	TW_BH05_1.0_190820	HDPE Soil Jar	200 mL	00620219006439	Grey	No	
072	TW_BH05_1.5_190820	HDPE Soil Jar	200 mL	00620219006465	Grey	No	
073	TW_BH04_0.2_190820	HDPE Soil Jar	200 mL	00620219006394	Grey	No	
074	TW_BH04_0.5_190820	HDPE Soil Jar	200 mL	00620219006490	Grey	No	
075	TW_BH04_1.0_190820	HDPE Soil Jar	200 mL	00620219006421	Grey	No	
076	TW_BH04_1.5_190820	HDPE Soil Jar	200 mL	00620219006365	Grey	No	
077	TW_BH04_2.0_190820	HDPE Soil Jar	200 mL	00620219006397	Grey	No	
078	TW_BH04_3.0_190820	HDPE Soil Jar	200 mL	00620219006430	Grey	No	
079	TW_BH04_3.7-3.9_190820	HDPE Soil Jar	200 mL	00620219006417	Grey	No	
080	TW_BH04_5.0_190821	HDPE Soil Jar	200 mL	00620219006369	Grey	No	

CHAIN OF CUSTODY

(ALS) COC#: 2987 *ALS Laboratory:* EB Brisbane

CLIENT: AECOMAU - AECOM Australia Pty Ltd

PROJECT: 60609758

SITE: TW

ORDER NO: 60609758 2.0

PROJECT MANAGER: Camden Mccosker CONTACT PH: 0499 990 214 SAMPLER MOBILE: 0499 990 214

PRIMARY SAMPLER: Camden Mccosker QUOTE NO: BN/112/19 / EB2019AECOMAU0002

EMAIL REPORTS TO: camden.mccosker@aecom.com, james.peachey@aecom.com

EMAIL INVOICES TO: james.peachey@aecom.com, camden.mccosker@aecom.com

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

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

Random Sample Temperature on Receipt: °C

Other comments:

081	TW_BH04_6.0_190821	HDPE Soil Jar	200 mL	00620219006503	Grey	No	
082	TW_BH04_7.0_190821	HDPE Soil Jar	200 mL	00620219006449	Grey	No	
083	TW_BH04_8.0_190821	HDPE Soil Jar	200 mL	00620219006407	Grey	No	
084	TW_BH04_9.0_190821	HDPE Soil Jar	200 mL	00620219006450	Grey	No	
085	TW_BH04_10.0_190821	HDPE Soil Jar	200 mL	00620219006437	Grey	No	
086	TW_BH04_11.0_190821	HDPE Soil Jar	200 mL	00620219006366	Grey	No	
087	TW_BH04_12.0_190821	HDPE Soil Jar	200 mL	00620219006370	Grey	No	
088	TW_BH04_13.0_190821	HDPE Soil Jar	200 mL	00620219006399	Grey	No	
089	TW_BH04_14.0_190821	HDPE Soil Jar	200 mL	00620219006444	Grey	No	
090	TW_BH04_15.0_190821	HDPE Soil Jar	200 mL	00620219006420	Grey	No	
091	TW_BH05_2.0_190821	HDPE Soil Jar	200 mL	00620219006382	Grey	No	
092	TW_BH05_3.0_190821	HDPE Soil Jar	200 mL	00620219006429	Grey	No	
093	TW_BH05_4.0_190821	HDPE Soil Jar	200 mL	00620219006428	Grey	No	
094	TW_BH05_5.0_190821	HDPE Soil Jar	200 mL	00620219006442	Grey	No	
095	TW_BH05_6.0_190821	HDPE Soil Jar	200 mL	00620219006409	Grey	No	
096	TW_BH05_7.0_190821	HDPE Soil Jar	200 mL	00620219006427	Grey	No	
097	TW_BH05_8.0_190821	HDPE Soil Jar	200 mL	00620219006398	Grey	No	
098	TW_BH05_9.0_190821	HDPE Soil Jar	200 mL	00620219006445	Grey	No	
099	TW_BH05_10.0_190821	HDPE Soil Jar	200 mL	00620219006360	Grey	No	
100	TW_BH05_11.0_190821	HDPE Soil Jar	200 mL	00620219006400	Grey	No	
101	TW_QC300_190819	HDPE (no PTFE)	250 mL	00350219040694	Grey	No	
102	TW_QC100_190819	HDPE Soil Jar	200 mL	00620219006506	Grey	No	
103	TW_QC101_190819	HDPE Soil Jar	200 mL	00620219006494	Grey	No	
104	TW_QC102_190819	HDPE Soil Jar	200 mL	00620219006499	Grey	No	
105	TW_QC103_190819	HDPE Soil Jar	200 mL	00620219006405	Grey	No	
106	TW_QC302_190820	HDPE (no PTFE)	250 mL	00350219040657	Grey	No	
107	TW_QC104_190820	HDPE Soil Jar	200 mL	00620219006463	Grey	No	

CHAIN OF CUSTODY

(ALS) COC#: **2987** *ALS Laboratory:* EB Brisbane

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

CLIENT: AECOMAU - AECOM Australia Pty Ltd

PROJECT: 60609758

SITE: TW

ORDER NO: 60609758 2.0

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

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

Random Sample Temperature on Receipt: °C

Other comments:

PROJECT MANAGER: Camden Mccosker CONTACT PH: 0499 990 214 SAMPLER MOBILE: 0499 990 214

PRIMARY SAMPLER: Camden Mccosker QUOTE NO: BN/112/19 / EB2019AECOMAU0002

EMAIL REPORTS TO: camden.mccosker@aecom.com, james.peachey@aecom.com

EMAIL INVOICES TO: james.peachey@aecom.com, camden.mccosker@aecom.com

108	TW_QC303_190820	HDPE (no PTFE)	250 mL	00350219040661	Grey	No	
109	TW_QC106_190820	HDPE Soil Jar	200 mL	00620219006447	Grey	No	
110	TW_QC107_190820	HDPE Soil Jar	200 mL	00620219006485	Grey	No	
111	TW_QC108_190820	HDPE Soil Jar	200 mL	00620219006389	Grey	No	
112	TW_QC304_190821	HDPE (no PTFE)	250 mL	00350219040682	Grey	No	
113	TW_QC105_190820	HDPE Soil Jar	200 mL	00620219006387	Grey	No	
114	TW_QC109_190821	HDPE Soil Jar	200 mL	00620219006374	Grey	No	
115	TW_QC110_190821	HDPE Soil Jar	200 mL	00620219006380	Grey	No	
116	TW_BH05_12.0_190821	HDPE Soil Jar	200 mL	00620219006435	Grey	No	
117	TW_BH05_13.0_190821	HDPE Soil Jar	200 mL	00620219006393	Grey	No	
118	TW_BH05_14.0_190821	HDPE Soil Jar	200 mL	00620219006364	Grey	No	
119	TW_BH05_15.0_190821	HDPE Soil Jar	200 mL	00620219006384	Grey	No	
120	TW_BH05_16.0_190821	HDPE Soil Jar	200 mL	00620219006385	Grey	No	
121	TW_BH05_18.0_190821	HDPE Soil Jar	200 mL	00620219006434	Grey	No	

Total Bottle Count: ALS: 121, Non ALS: 0

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order	: **EB1921880**		
Amendment	: **1**		
Client	: **AECOM Australia Pty Ltd**	Laboratory	: Environmental Division Brisbane
Contact	: CAMDEN McCOSKER	Contact	: Carsten Emrich
Address	: PO BOX 1307 FORTITUDE VALLEY QLD, AUSTRALIA 4006	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	Page	: 1 of 5
Order number	: 60609758 2.0	Quote number	: EB2019AECOMAU0002 (BN/112/19)
C-O-C number	: 2987	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: TW		
Sampler	: CAMDEN McCOSKER		

Dates

Date Samples Received	: 21-Aug-2019 15:00	Issue Date	: 08-Nov-2019
Client Requested Due Date	: 28-Aug-2019	Scheduled Reporting Date	: **28-Aug-2019**

Delivery Details

Mode of Delivery	: Client Drop Off	Security Seal	: Not Available
No. of coolers/boxes	: 4	Temperature	: -1.6/0.7/1.0/4.0°C - Ice present
Receipt Detail	: MEDIUM HARD ESKY	No. of samples received / analysed	: 122 / 32

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, an extra sample labelled QC301 was received that was not on the provide chain of custody. This sample has been placed on hold. If this sample requires analysis please contact client services at ALSEnviro.Brisbane@alsglobal.com**
- ***22/08/2019*: SRN has been resent to acknowledge updates made to sample IDs as per client directive received from Camden McCosker on 22/08/2019. For any further information regarding these adjustments 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.
- 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.**
- **Sample QC samples have been forwarded to NMI, as requested. Please note that this will incur a freight forwarding fee.**
- 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.**

Any sample identifications that cannot be displayed entirely in the analysis summary table will be listed below.

EB1921880-050 : 20-Aug-2019 09:47 : TW_BH02_17.0_1908207
EB1921880-079 : 20-Aug-2019 16:02 : TW_BH04_3.7-3.9_190820

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)
EB1921880-001	19-Aug-2019 12:55	TW_SS1_0.1_190819		✓	✓
EB1921880-002	19-Aug-2019 12:55	TW_SS1_0.5_190819		✓	✓
EB1921880-003	19-Aug-2019 14:39	TW_BH01_0.2_190819		✓	✓
EB1921880-004	19-Aug-2019 14:40	TW_BH01_1.0_190819		✓	✓
EB1921880-005	19-Aug-2019 14:40	TW_BH01_1.5_190819	✓		
EB1921880-006	19-Aug-2019 14:41	TW_BH01_2.0_190819	✓		
EB1921880-007	19-Aug-2019 14:41	TW_BH01_3.0_190819	✓		
EB1921880-008	19-Aug-2019 14:42	TW_BH01_4.0_190819	✓		
EB1921880-009	19-Aug-2019 14:42	TW_BH01_5.0_190819	✓		
EB1921880-010	19-Aug-2019 14:43	TW_BH01_6.0_190819	✓		
EB1921880-011	19-Aug-2019 14:43	TW_BH01_7.0_190819	✓		
EB1921880-012	19-Aug-2019 14:44	TW_BH01_8.0_190819	✓		
EB1921880-013	19-Aug-2019 14:45	TW_BH01_9.0_190819	✓		
EB1921880-014	19-Aug-2019 14:45	TW_BH01_10.0_190819	✓		
EB1921880-015	19-Aug-2019 14:46	TW_BH01_11.0_190819	✓		
EB1921880-016	19-Aug-2019 14:46	TW_BH01_12.0_190819	✓		
EB1921880-017	19-Aug-2019 14:47	TW_BH01_13.0_190819	✓		
EB1921880-018	19-Aug-2019 14:48	TW_BH01_14.0_190819	✓		
EB1921880-019	19-Aug-2019 14:48	TW_BH01_15.0_190819	✓		
EB1921880-020	19-Aug-2019 14:49	TW_BH01_16.0_190819	✓		
EB1921880-021	19-Aug-2019 15:01	TW_BH01_17.0_190819	✓		
EB1921880-022	19-Aug-2019 15:03	TW_BH01_18.0_190819		✓	✓
EB1921880-023	19-Aug-2019 15:06	TW_BH01_19.0_190819	✓		
EB1921880-024	19-Aug-2019 15:34	TW_SS2_0.1_190819		✓	✓
EB1921880-025	19-Aug-2019 15:35	TW_SS5_0.1_190819		✓	✓
EB1921880-026	19-Aug-2019 15:35	TW_SS6_0.1_190819		✓	✓
EB1921880-027	19-Aug-2019 15:36	TW_SS7_190818		✓	✓
EB1921880-028	19-Aug-2019 15:54	TW_SS3_0.1_190819-1		✓	✓
EB1921880-029	19-Aug-2019 15:55	TW_SS3_0.5_190819-1		✓	✓
EB1921880-030	19-Aug-2019 16:13	TW_SS4_0.1_190819		✓	✓
EB1921880-031	19-Aug-2019 16:12	TW_SS4_0.5_190819		✓	✓
EB1921880-032	20-Aug-2019 08:27	TW_BH02_0.2_190820		✓	✓

			(On Hold) SOIL No analysis requested	SOIL - EA055-103 Moisture Content	SOIL - EP231X (solids) PFAS - Full Suite (28 analytes)
EB1921880-033	20-Aug-2019 08:27	TW_BH02_0.5_190820		✓	✓
EB1921880-034	20-Aug-2019 08:28	TW_BH02_1.0_190820	✓		
EB1921880-035	20-Aug-2019 08:28	TW_BH02_1.5_190820	✓		
EB1921880-036	20-Aug-2019 09:34	TW_BH02_2.0_190820	✓		
EB1921880-037	20-Aug-2019 09:34	TW_BH02_3.0_190820	✓		
EB1921880-038	20-Aug-2019 09:35	TW_BH02_4.0_190820	✓		
EB1921880-039	20-Aug-2019 09:37	TW_BH02_5.0_190820	✓		
EB1921880-040	20-Aug-2019 09:37	TW_BH02_6.0_190820	✓		
EB1921880-041	20-Aug-2019 09:43	TW_BH02_7.0_190820	✓		
EB1921880-042	20-Aug-2019 09:43	TW_BH02_8.0_190820	✓		
EB1921880-043	20-Aug-2019 09:44	TW_BH02_9.0_190820	✓		
EB1921880-044	20-Aug-2019 09:44	TW_BH02_10.0_190820	✓		
EB1921880-045	20-Aug-2019 09:45	TW_BH02_11.0_190820	✓		
EB1921880-046	20-Aug-2019 09:45	TW_BH02_12.0_190820	✓		
EB1921880-047	20-Aug-2019 09:46	TW_BH02_13.0_190820	✓		
EB1921880-048	20-Aug-2019 09:46	TW_BH02_14.0_190820	✓		
EB1921880-049	20-Aug-2019 09:47	TW_BH02_15.0_190820	✓		
EB1921880-050	20-Aug-2019 09:47	TW_BH02_17.0_1908207		✓	✓
EB1921880-051	20-Aug-2019 11:16	TW_BH03_0.2_190820		✓	✓
EB1921880-052	20-Aug-2019 11:17	TW_BH03_0.5_190820		✓	✓
EB1921880-053	20-Aug-2019 11:17	TW_BH03_1.0_190820	✓		
EB1921880-054	20-Aug-2019 11:18	TW_BH03_1.5_190820	✓		
EB1921880-055	20-Aug-2019 12:25	TW_BH03_2.0_190820	✓		
EB1921880-056	20-Aug-2019 12:28	TW_BH03_3.0_190820	✓		
EB1921880-057	20-Aug-2019 12:28	TW_BH03_4.0_190820	✓		
EB1921880-058	20-Aug-2019 12:28	TW_BH03_5.0_190820	✓		
EB1921880-059	20-Aug-2019 12:29	TW_BH03_6.0_190820	✓		
EB1921880-060	20-Aug-2019 12:29	TW_BH03_7.0_190820	✓		
EB1921880-061	20-Aug-2019 12:30	TW_BH03_8.0_190820	✓		
EB1921880-062	20-Aug-2019 12:30	TW_BH03_9.0_190820	✓		
EB1921880-063	20-Aug-2019 12:31	TW_BH03_10.0_190820	✓		
EB1921880-064	20-Aug-2019 12:31	TW_BH03_11.0_190820	✓		
EB1921880-065	20-Aug-2019 12:32	TW_BH03_12.0_190820	✓		
EB1921880-066	20-Aug-2019 12:32	TW_BH03_13.0_190820	✓		
EB1921880-067	20-Aug-2019 12:32	TW_BH03_14.0_190820	✓		
EB1921880-068	20-Aug-2019 12:33	TW_BH03_16.0_190820		✓	✓
EB1921880-069	20-Aug-2019 14:52	TW_BH05_0.2_190820		✓	✓
EB1921880-070	20-Aug-2019 14:53	TW_BH05_0.5_190820	✓		
EB1921880-071	20-Aug-2019 14:53	TW_BH05_1.0_190820		✓	✓
EB1921880-072	20-Aug-2019 14:54	TW_BH05_1.5_190820	✓		
EB1921880-073	20-Aug-2019 15:40	TW_BH04_0.2_190820		✓	✓

			(On Hold) SOIL No analysis requested	SOIL - EA055-103 Moisture Content	SOIL - EP231X (solids) PFAS - Full Suite (28 analytes)
EB1921880-074	20-Aug-2019 15:40	TW_BH04_0.5_190820		✓	✓
EB1921880-075	20-Aug-2019 15:41	TW_BH04_1.0_190820	✓		
EB1921880-076	20-Aug-2019 15:42	TW_BH04_1.5_190820	✓		
EB1921880-077	20-Aug-2019 16:02	TW_BH04_2.0_190820	✓		
EB1921880-078	20-Aug-2019 16:02	TW_BH04_3.0_190820	✓		
EB1921880-079	20-Aug-2019 16:02	TW_BH04_3.7-3.9_1908...	✓		
EB1921880-080	21-Aug-2019 08:32	TW_BH04_5.0_190821	✓		
EB1921880-081	21-Aug-2019 08:33	TW_BH04_6.0_190821	✓		
EB1921880-082	21-Aug-2019 08:33	TW_BH04_7.0_190821	✓		
EB1921880-083	21-Aug-2019 08:34	TW_BH04_8.0_190821	✓		
EB1921880-084	21-Aug-2019 08:35	TW_BH04_9.0_190821	✓		
EB1921880-085	21-Aug-2019 08:35	TW_BH04_10.0_190821	✓		
EB1921880-086	21-Aug-2019 08:35	TW_BH04_11.0_190821	✓		
EB1921880-087	21-Aug-2019 08:36	TW_BH04_12.0_190821	✓		
EB1921880-088	21-Aug-2019 08:36	TW_BH04_13.0_190821	✓		
EB1921880-089	21-Aug-2019 08:37	TW_BH04_14.0_190821	✓		
EB1921880-090	21-Aug-2019 08:37	TW_BH04_15.0_190821	✓		
EB1921880-091	21-Aug-2019 09:05	TW_BH05_2.0_190821	✓		
EB1921880-092	21-Aug-2019 09:44	TW_BH05_3.0_190821	✓		
EB1921880-093	21-Aug-2019 09:44	TW_BH05_4.0_190821	✓		
EB1921880-094	21-Aug-2019 09:45	TW_BH05_5.0_190821	✓		
EB1921880-095	21-Aug-2019 09:46	TW_BH05_6.0_190821	✓		
EB1921880-096	21-Aug-2019 09:46	TW_BH05_7.0_190821	✓		
EB1921880-097	21-Aug-2019 09:47	TW_BH05_8.0_190821	✓		
EB1921880-098	21-Aug-2019 09:47	TW_BH05_9.0_190821	✓		
EB1921880-099	21-Aug-2019 09:47	TW_BH05_10.0_190821	✓		
EB1921880-100	21-Aug-2019 09:48	TW_BH05_11.0_190821	✓		
EB1921880-102	19-Aug-2019 12:57	TW_QC100_190819		✓	✓
EB1921880-103	19-Aug-2019 13:37	TW_QC101_190819	✓		
EB1921880-104	19-Aug-2019 14:38	TW_QC102_190819	✓		
EB1921880-105	19-Aug-2019 15:56	TW_QC103_190819	✓		
EB1921880-107	20-Aug-2019 08:24	TW_QC104_190820		✓	✓
EB1921880-109	20-Aug-2019 12:21	TW_QC106_190820		✓	✓
EB1921880-110	20-Aug-2019 14:50	TW_QC107_190820	✓		
EB1921880-111	20-Aug-2019 15:39	TW_QC108_190820		✓	✓
EB1921880-113	20-Aug-2019 11:14	TW_QC105_190820	✓		
EB1921880-114	21-Aug-2019 09:28	TW_QC109_190821	✓		
EB1921880-115	21-Aug-2019 10:05	TW_QC110_190821	✓		
EB1921880-116	21-Aug-2019 09:48	TW_BH05_12.0_190821	✓		
EB1921880-117	21-Aug-2019 09:49	TW_BH05_13.0_190821	✓		
EB1921880-118	21-Aug-2019 09:49	TW_BH05_14.0_190821	✓		

			(On Hold) SOIL No analysis requested	SOIL - EA055-103 Moisture Content	SOIL - EP231X (solids) PFAS - Full Suite (28 analytes)
EB1921880-119	21-Aug-2019 09:50	TW_BH05_15.0_190821	✓		
EB1921880-120	21-Aug-2019 10:06	TW_BH05_16.0_190821		✓	✓
EB1921880-121	21-Aug-2019 10:07	TW_BH05_18.0_190821	✓		
EB1921880-122	21-Aug-2019 10:05	TW_QC301_180920	✓		

Matrix: **WATER**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	WATER - EP231X-LL (EB) PFAS - Full Suite Low Level (28 analytes)
EB1921880-101	19-Aug-2019 11:33	TW_QC300_190819	✓
EB1921880-106	20-Aug-2019 07:26	TW_QC302_190820	✓
EB1921880-108	20-Aug-2019 11:15	TW_QC303_190820	✓
EB1921880-112	21-Aug-2019 07:14	TW_QC304_190821	✓

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

James McIntyre

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

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB1921880**	Page	: 1 of 17
Client	: **AECOM Australia Pty Ltd**	Laboratory	: Environmental Division Brisbane
Contact	: CAMDEN McCOSKER	Contact	: Carsten Emrich
Address	: PO BOX 1307 FORTITUDE VALLEY QLD, AUSTRALIA 4006	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: ----	Telephone	: +61 7 3552 8616
Project	: 60609758	Date Samples Received	: 21-Aug-2019 15:00
Order number	: 60609758 2.0	Date Analysis Commenced	: 21-Aug-2019
C-O-C number	: 2987	Issue Date	: 28-Aug-2019 12:46
Sampler	: CAMDEN McCOSKER		
Site	: TW		
Quote number	: BN/112/19		
No. of samples received	: 122		
No. of samples analysed	: 32		

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.

- EP231X: The LOR for 'TW_QC100_190819' has been raised due to matrix interference.
- EP231X: Sample 'TW_QC100_190819' required dilution prior to analysis due to matrix interferences. LOR values have been adjusted accordingly.
- EP231X: Particular samples show poor surrogate recovery due to matrix interference. Confirmed by re-extraction and re-analysis.
- EP231X: Samples 'TW_SS1_0.5_190819' and 'TW_BH04_0.2_190820' show poor matrix spike recovery due to matrix interference. Confirmed by re-extraction and re-analysis.

Analytical Results

Sub-Matrix: **SOIL**
(Matrix: **SOIL**)

Compound	CAS Number	LOR	Unit	Client sample ID	TW_SS1_0.1_190819	TW_SS1_0.5_190819	TW_BH01_0.2_190819	TW_BH01_1.0_190819	TW_BH01_18.0_190819
				Client sampling date / time	19-Aug-2019 12:55	19-Aug-2019 12:55	19-Aug-2019 14:39	19-Aug-2019 14:40	19-Aug-2019 15:03
					EB1921880-001	EB1921880-002	EB1921880-003	EB1921880-004	EB1921880-022
					Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	0.1	%		**16.5**	**15.2**	**10.3**	**24.7**	**49.6**
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg		**0.0010**	**0.0004**	<0.0002	<0.0002	**0.0002**
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg		**0.0007**	**0.0004**	<0.0002	<0.0002	**0.0002**
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg		**0.0088**	**0.0087**	<0.0002	<0.0002	**0.0013**
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg		**0.0007**	**0.0014**	<0.0002	<0.0002	<0.0002
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg		**0.263**	**0.535**	**0.0008**	**0.0016**	**0.0108**
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg		**0.0038**	**0.0044**	**0.0006**	<0.0002	<0.0002
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg		**0.001**	<0.001	<0.001	<0.001	<0.001
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg		**0.0041**	**0.0038**	<0.0002	<0.0002	<0.0002
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg		**0.0032**	**0.0018**	<0.0002	<0.0002	**0.0010**
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg		**0.0015**	**0.0011**	<0.0002	<0.0002	**0.0003**
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg		**0.0008**	**0.0017**	<0.0002	<0.0002	**0.0006**
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg		**0.0004**	**0.0004**	<0.0002	<0.0002	<0.0002
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
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		**0.0025**	**0.0042**	<0.0002	<0.0002	<0.0002
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TW_SS1_0.1_190819	TW_SS1_0.5_190819	TW_BH01_0.2_190819	TW_BH01_1.0_190819	TW_BH01_18.0_190819
				Client sampling date / time	19-Aug-2019 12:55	19-Aug-2019 12:55	19-Aug-2019 14:39	19-Aug-2019 14:40	19-Aug-2019 15:03
Compound	CAS Number	LOR	Unit		EB1921880-001	EB1921880-002	EB1921880-003	EB1921880-004	EB1921880-022
					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	**0.0023**	<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		**0.292**	**0.566**	**0.0014**	**0.0016**	**0.0144**
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg		**0.272**	**0.544**	**0.0008**	**0.0016**	**0.0121**
Sum of PFAS (WA DER List)	----	0.0002	mg/kg		**0.283**	**0.555**	**0.0008**	**0.0016**	**0.0142**
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.0002	%		**80.5**	**96.0**	**112**	**97.0**	**107**
13C8-PFOA	----	0.0002	%		**87.5**	**75.5**	**108**	**105**	**114**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TW_SS2_0.1_190819	TW_SS5_0.1_190819	TW_SS6_0.1_190819	TW_SS7_190818	TW_SS3_0.1_190819-1
				Client sampling date / time	19-Aug-2019 15:34	19-Aug-2019 15:35	19-Aug-2019 15:35	19-Aug-2019 15:36	19-Aug-2019 15:54
Compound	CAS Number	LOR	Unit		EB1921880-024	EB1921880-025	EB1921880-026	EB1921880-027	EB1921880-028
					Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	0.1	%		**9.3**	**17.1**	**12.3**	**8.0**	**12.4**
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg		<0.0002	**0.0013**	<0.0002	<0.0002	<0.0002
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg		<0.0002	**0.0022**	<0.0002	<0.0002	<0.0002
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg		**0.0009**	**0.0191**	**0.0032**	**0.0003**	**0.0012**
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg		<0.0002	**0.0010**	**0.0002**	<0.0002	<0.0002
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg		**0.0101**	**0.0803**	**0.0127**	**0.0060**	**0.0168**
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg		**0.0003**	**0.0040**	**0.0005**	<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		**0.0005**	**0.0007**	**0.0010**	**0.0006**	<0.0002
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg		**0.0004**	**0.0018**	**0.0014**	**0.0003**	**0.0006**
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg		<0.0002	**0.0004**	**0.0004**	<0.0002	**0.0002**
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg		**0.0004**	**0.0010**	**0.0007**	**0.0003**	**0.0005**
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg		<0.0002	<0.0002	**0.0003**	**0.0002**	<0.0002
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg		<0.0002	**0.0003**	**0.0003**	<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	**0.0009**	<0.0002	<0.0002	<0.0002
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TW_SS2_0.1_190819	TW_SS5_0.1_190819	TW_SS6_0.1_190819	TW_SS7_190818	TW_SS3_0.1_190819-1
				Client sampling date / time	19-Aug-2019 15:34	19-Aug-2019 15:35	19-Aug-2019 15:35	19-Aug-2019 15:36	19-Aug-2019 15:54
Compound	CAS Number	LOR	Unit		EB1921880-024	EB1921880-025	EB1921880-026	EB1921880-027	EB1921880-028
					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		**0.0126**	**0.113**	**0.0207**	**0.0077**	**0.0193**
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg		**0.0110**	**0.0994**	**0.0159**	**0.0063**	**0.0180**
Sum of PFAS (WA DER List)	----	0.0002	mg/kg		**0.0123**	**0.105**	**0.0194**	**0.0075**	**0.0193**
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.0002	%		**72.0**	**86.5**	**75.5**	**39.0**	**55.0**
13C8-PFOA	----	0.0002	%		**90.0**	**96.5**	**88.0**	**76.5**	**85.5**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TW_SS3_0.5_190819-1	TW_SS4_0.1_190819	TW_SS4_0.5_190819	TW_BH02_0.2_190820	TW_BH02_0.5_190820
				Client sampling date / time	19-Aug-2019 15:55	19-Aug-2019 16:13	19-Aug-2019 16:12	20-Aug-2019 08:27	20-Aug-2019 08:27
Compound	CAS Number	LOR	Unit		EB1921880-029	EB1921880-030	EB1921880-031	EB1921880-032	EB1921880-033
					Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	0.1	%		**19.0**	**12.6**	**14.7**	**16.9**	**26.0**
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		**0.0003**	**0.0056**	**0.0056**	**0.0002**	**0.0004**
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg		<0.0002	**0.0005**	**0.0013**	<0.0002	<0.0002
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg		**0.0036**	**0.0420**	**0.0362**	**0.0022**	**0.0065**
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	**0.0011**	**0.0004**
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg		<0.001	<0.001	<0.001	<0.001	<0.001
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg		<0.0002	**0.0005**	**0.0007**	<0.0002	<0.0002
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg		**0.0004**	**0.0015**	**0.0028**	<0.0002	<0.0002
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg		<0.0002	<0.0002	**0.0003**	<0.0002	<0.0002
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg		<0.0002	**0.0005**	**0.0005**	<0.0002	<0.0002
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
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	**0.0012**	**0.0011**
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	TW_SS3_0.5_190819-1	TW_SS4_0.1_190819	TW_SS4_0.5_190819	TW_BH02_0.2_190820	TW_BH02_0.5_190820
				Client sampling date / time	19-Aug-2019 15:55	19-Aug-2019 16:13	19-Aug-2019 16:12	20-Aug-2019 08:27	20-Aug-2019 08:27
Compound	CAS Number	LOR	Unit		EB1921880-029	EB1921880-030	EB1921880-031	EB1921880-032	EB1921880-033
					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		**0.0043**	**0.0506**	**0.0474**	**0.0047**	**0.0084**
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg		**0.0039**	**0.0476**	**0.0418**	**0.0024**	**0.0069**
Sum of PFAS (WA DER List)	----	0.0002	mg/kg		**0.0043**	**0.0501**	**0.0461**	**0.0024**	**0.0069**
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.0002	%		**81.5**	**72.5**	**97.5**	**78.0**	**94.5**
13C8-PFOA	----	0.0002	%		**100**	**80.5**	**92.5**	**92.5**	**92.5**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	TW_BH02_17.0_190820 7	TW_BH03_0.2_190820	TW_BH03_0.5_190820	TW_BH03_16.0_190820	TW_BH05_0.2_190820
			Client sampling date / time	20-Aug-2019 09:47	20-Aug-2019 11:16	20-Aug-2019 11:17	20-Aug-2019 12:33	20-Aug-2019 14:52
Compound	CAS Number	LOR	Unit	EB1921880-050	EB1921880-051	EB1921880-052	EB1921880-068	EB1921880-069
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	**46.4**	**9.1**	**24.9**	**46.6**	**18.1**
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	**0.0004**	<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	**0.0034**	<0.0002	<0.0002	**0.0009**	**0.0002**
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	**0.0023**	**0.0020**	**0.0034**	**0.0010**	**0.0028**
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	**0.0016**
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	<0.001	<0.001	<0.001
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	**0.0005**	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<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	**0.0044**
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	TW_BH02_17.0_190820 7	TW_BH03_0.2_190820	TW_BH03_0.5_190820	TW_BH03_16.0_190820	TW_BH05_0.2_190820
				Client sampling date / time	20-Aug-2019 09:47	20-Aug-2019 11:16	20-Aug-2019 11:17	20-Aug-2019 12:33	20-Aug-2019 14:52
Compound	CAS Number	LOR	Unit		EB1921880-050	EB1921880-051	EB1921880-052	EB1921880-068	EB1921880-069
					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	**0.0018**	<0.0005	<0.0005	**0.0007**
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		**0.0069**	**0.0038**	**0.0034**	**0.0019**	**0.0097**
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg		**0.0057**	**0.0020**	**0.0034**	**0.0019**	**0.0030**
Sum of PFAS (WA DER List)	----	0.0002	mg/kg		**0.0066**	**0.0038**	**0.0034**	**0.0019**	**0.0037**
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.0002	%		**95.5**	**83.0**	**86.0**	**90.5**	**58.5**
13C8-PFOA	----	0.0002	%		**102**	**88.0**	**87.5**	**84.5**	**81.0**

Analytical Results

Sub-Matrix: **SOIL**
(Matrix: **SOIL**)

Compound	CAS Number	LOR	Unit	Client sample ID	TW_BH05_1.0_190820	TW_BH04_0.2_190820	TW_BH04_0.5_190820	TW_QC100_190819	TW_QC104_190820
				Client sampling date / time	20-Aug-2019 14:53	20-Aug-2019 15:40	20-Aug-2019 15:40	19-Aug-2019 12:57	20-Aug-2019 08:24
					EB1921880-071	EB1921880-073	EB1921880-074	EB1921880-102	EB1921880-107
					Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	0.1	%		**23.8**	**14.1**	**20.6**	**15.8**	**24.4**
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg		<0.0002	**0.0007**	**0.0022**	**0.0006**	<0.0002
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg		<0.0002	**0.0005**	**0.0021**	<0.0005	<0.0002
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg		**0.0007**	**0.0031**	**0.0187**	**0.0076**	**0.0002**
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg		<0.0002	**0.0002**	**0.0010**	<0.0005	<0.0002
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg		**0.0376**	**0.0154**	**0.0151**	**0.150**	**0.0022**
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0005	<0.0002
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg		<0.001	<0.001	<0.001	<0.002	<0.001
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg		**0.0003**	**0.0008**	**0.0033**	**0.0035**	<0.0002
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg		**0.0004**	**0.0024**	**0.0077**	**0.0028**	<0.0002
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg		<0.0002	**0.0009**	**0.0026**	**0.0013**	<0.0002
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg		**0.0002**	**0.0014**	**0.0016**	**0.0006**	<0.0002
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg		<0.0002	**0.0002**	<0.0002	<0.0005	<0.0002
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0005	<0.0002
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0005	<0.0002
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0005	<0.0002
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0005	<0.0002
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0012	<0.0005
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg		**0.0006**	<0.0002	<0.0002	**0.0018**	**0.0002**
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0012	<0.0005

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TW_BH05_1.0_190820	TW_BH04_0.2_190820	TW_BH04_0.5_190820	TW_QC100_190819	TW_QC104_190820
				Client sampling date / time	20-Aug-2019 14:53	20-Aug-2019 15:40	20-Aug-2019 15:40	19-Aug-2019 12:57	20-Aug-2019 08:24
Compound	CAS Number	LOR	Unit		EB1921880-071	EB1921880-073	EB1921880-074	EB1921880-102	EB1921880-107
					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	<0.0012	<0.0005
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0012	<0.0005
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0012	<0.0005
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0005	<0.0002
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0005	<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		**0.0020**	<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		**0.0418**	**0.0256**	**0.0543**	**0.169**	**0.0026**
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg		**0.0383**	**0.0185**	**0.0338**	**0.158**	**0.0024**
Sum of PFAS (WA DER List)	----	0.0002	mg/kg		**0.0412**	**0.0247**	**0.0512**	**0.167**	**0.0024**
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.0002	%		**108**	**36.0**	**80.5**	**90.0**	**85.5**
13C8-PFOA	----	0.0002	%		**110**	**61.5**	**87.5**	**95.0**	**88.0**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TW_QC106_190820	TW_QC108_190820	TW_BH05_16.0_190821	----	----
				Client sampling date / time	20-Aug-2019 12:21	20-Aug-2019 15:39	21-Aug-2019 10:06	----	----
Compound	CAS Number	LOR	Unit		EB1921880-109	EB1921880-111	EB1921880-120	--------	--------
					Result	Result	Result	----	----
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	0.1	%		**47.6**	**20.0**	**46.0**	**----**	**----**
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg		<0.0002	**0.0022**	<0.0002	**----**	**----**
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg		<0.0002	**0.0018**	<0.0002	**----**	**----**
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg		**0.0013**	**0.0180**	**0.0009**	**----**	**----**
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg		<0.0002	**0.0008**	<0.0002	**----**	**----**
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg		**0.0010**	**0.0153**	**0.0004**	**----**	**----**
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	**----**	**----**
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg		<0.001	<0.001	<0.001	**----**	**----**
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg		<0.0002	**0.0033**	<0.0002	**----**	**----**
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg		<0.0002	**0.0074**	<0.0002	**----**	**----**
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg		<0.0002	**0.0022**	<0.0002	**----**	**----**
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg		<0.0002	**0.0012**	<0.0002	**----**	**----**
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	**----**	**----**
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	**----**	**----**
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	**----**	**----**
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	**----**	**----**
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	**----**	**----**
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	**----**	**----**
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	**----**	**----**
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	**----**	**----**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TW_QC106_190820	TW_QC108_190820	TW_BH05_16.0_190821	----	----
				Client sampling date / time	20-Aug-2019 12:21	20-Aug-2019 15:39	21-Aug-2019 10:06	----	----
Compound	CAS Number	LOR	Unit		EB1921880-109	EB1921880-111	EB1921880-120	--------	--------
					Result	Result	Result	----	----
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	----	----
EP231P: PFAS Sums									
Sum of PFAS	----	0.0002	mg/kg		**0.0023**	**0.0522**	**0.0013**	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg		**0.0023**	**0.0333**	**0.0013**	----	----
Sum of PFAS (WA DER List)	----	0.0002	mg/kg		**0.0023**	**0.0496**	**0.0013**	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.0002	%		**78.0**	**94.5**	**87.5**	----	----
13C8-PFOA	----	0.0002	%		**82.0**	**100**	**83.5**	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	TW_QC300_190819	TW_QC302_190820	TW_QC303_190820	TW_QC304_190821	----
				Client sampling date / time	19-Aug-2019 11:33	20-Aug-2019 07:26	20-Aug-2019 11:15	21-Aug-2019 07:14	----
Compound	CAS Number	LOR	Unit		EB1921880-101	EB1921880-106	EB1921880-108	EB1921880-112	--------
					Result	Result	Result	Result	----
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.002	µg/L		<0.002	<0.002	<0.002	<0.002	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.002	µg/L		<0.002	<0.002	<0.002	<0.002	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.002	µg/L		<0.002	<0.002	**0.007**	<0.002	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.002	µg/L		<0.002	<0.002	<0.002	<0.002	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.002	µg/L		<0.002	<0.002	<0.002	<0.002	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.002	µg/L		<0.002	<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	<0.01	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.002	µg/L		<0.002	<0.002	<0.002	<0.002	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.002	µg/L		<0.002	<0.002	<0.002	<0.002	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.002	µg/L		<0.002	<0.002	<0.002	<0.002	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.002	µg/L		<0.002	<0.002	<0.002	<0.002	----
Perfluorononanoic acid (PFNA)	375-95-1	0.002	µg/L		<0.002	<0.002	<0.002	<0.002	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.002	µg/L		<0.002	<0.002	<0.002	<0.002	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.002	µg/L		<0.002	<0.002	<0.002	<0.002	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.002	µg/L		<0.002	<0.002	<0.002	<0.002	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.002	µg/L		<0.002	<0.002	<0.002	<0.002	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.005	µg/L		<0.005	<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	<0.002	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.005	µg/L		<0.005	<0.005	<0.005	<0.005	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.005	µg/L		<0.005	<0.005	<0.005	<0.005	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	TW_QC300_190819	TW_QC302_190820	TW_QC303_190820	TW_QC304_190821	----
				Client sampling date / time	19-Aug-2019 11:33	20-Aug-2019 07:26	20-Aug-2019 11:15	21-Aug-2019 07:14	----
Compound	CAS Number	LOR	Unit		EB1921880-101	EB1921880-106	EB1921880-108	EB1921880-112	--------
					Result	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	<0.005	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.005	µg/L		<0.005	<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	<0.002	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.002	µg/L		<0.002	<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	<0.005	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.005	µg/L		<0.005	<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	<0.005	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.005	µg/L		<0.005	<0.005	<0.005	<0.005	----
EP231P: PFAS Sums									
Sum of PFAS	----	0.002	µg/L		<0.002	<0.002	**0.007**	<0.002	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.002	µg/L		<0.002	<0.002	**0.007**	<0.002	----
Sum of PFAS (WA DER List)	----	0.002	µg/L		<0.002	<0.002	**0.007**	<0.002	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.002	%		**83.6**	**80.0**	**74.6**	**99.8**	----
13C8-PFOA	----	0.002	%		**89.7**	**113**	**87.7**	**118**	----

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	: **EB1921880**	Page	: 1 of 13
Client	: **AECOM Australia Pty Ltd**	Laboratory	: Environmental Division Brisbane
Contact	: CAMDEN McCOSKER	Contact	: Carsten Emrich
Address	: PO BOX 1307 FORTITUDE VALLEY QLD, AUSTRALIA 4006	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: ----	Telephone	: +61 7 3552 8616
Project	: 60609758	Date Samples Received	: 21-Aug-2019
Order number	: 60609758 2.0	Date Analysis Commenced	: 21-Aug-2019
C-O-C number	: 2987	Issue Date	: 28-Aug-2019
Sampler	: CAMDEN McCOSKER		
Site	: TW		
Quote number	: BN/112/19		
No. of samples received	: 122		
No. of samples analysed	: 32		

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

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

This 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: 2538200)									
EB1921880-001	TW_SS1_0.1_190819	EA055: Moisture Content	----	0.1	%	16.5	16.4	0.660	0% - 20%
EB1921880-029	TW_SS3_0.5_190819-1	EA055: Moisture Content	----	0.1	%	19.0	18.7	1.77	0% - 20%
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 2538218)									
EB1921880-071	TW_BH05_1.0_190820	EA055: Moisture Content	----	0.1	%	23.8	24.6	3.42	0% - 20%
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 2538195)									
EB1921880-001	TW_SS1_0.1_190819	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	0.0010	0.0009	12.8	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	0.0007	0.0006	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	0.0088	0.0084	3.87	0% - 20%
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	0.0007	0.0007	0.00	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	0.263	0.234	11.8	0% - 20%
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	0.0038	0.0033	14.6	0% - 50%
EB1921880-029	TW_SS3_0.5_190819-1	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	0.0003	0.0003	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	0.0036	0.0033	7.86	0% - 50%
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 2538199)									
EB1921880-071	TW_BH05_1.0_190820	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	0.0007	0.0007	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	0.0376	0.0309	19.4	0% - 20%
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	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: 2538195)									
EB1921880-001	TW_SS1_0.1_190819	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	0.0041	0.0041	0.00	0% - 20%
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	0.0032	0.0030	7.25	0% - 50%
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	0.0015	0.0015	0.00	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	0.0008	0.0008	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	0.0004	0.0004	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
EB1921880-029	TW_SS3_0.5_190819-1	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	0.0004	0.0003	30.9	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.00	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 2538199)									
EB1921880-071	TW_BH05_1.0_190820	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	0.0003	0.0002	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	0.0004	0.0003	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.00	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 2538195)									
EB1921880-001	TW_SS1_0.1_190819	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	0.0025	0.0023	8.70	0% - 50%
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit

Sub-Matrix: **SOIL**

				Laboratory 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: 2538195) - continued									
EB1921880-001	TW_SS1_0.1_190819	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
EB1921880-029	TW_SS3_0.5_190819-1	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: 2538199)									
EB1921880-071	TW_BH05_1.0_190820	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	0.0006	0.0004	24.2	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: 2538195)									
EB1921880-001	TW_SS1_0.1_190819	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

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 (%)
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 2538195) - continued									
EB1921880-001	TW_SS1_0.1_190819	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
EB1921880-029	TW_SS3_0.5_190819-1	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: 2538199)									
EB1921880-071	TW_BH05_1.0_190820	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	0.0020	0.0017	18.2	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 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: 2539655)									
EB1921880-101	TW_QC300_190819	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
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 2539655)									
EB1921880-101	TW_QC300_190819	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

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: 2539655) - continued									
EB1921880-101	TW_QC300_190819	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: 2539655)									
EB1921880-101	TW_QC300_190819	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
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 2539655)									
EB1921880-101	TW_QC300_190819	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: 2539655)									
EB1921880-101	TW_QC300_190819	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: 2538195)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	0.0011 mg/kg	106	57	121
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	0.00117 mg/kg	104	55	125
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	0.00118 mg/kg	78.4	52	126
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	0.00119 mg/kg	97.9	54	123
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	0.00116 mg/kg	86.6	55	127
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	0.0012 mg/kg	92.5	54	125
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 2538199)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	0.0011 mg/kg	100	57	121
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	0.00117 mg/kg	105	55	125
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	0.00118 mg/kg	97.0	52	126
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	0.00119 mg/kg	102	54	123
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	0.00116 mg/kg	92.2	55	127
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	0.0012 mg/kg	80.8	54	125
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 2538195)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	0.00625 mg/kg	61.1	52	128
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	82.8	54	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	95.2	58	127
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	87.6	57	128
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	87.2	60	134
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	86.4	63	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	0.00125 mg/kg	76.8	55	130
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	107	62	130
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	89.2	53	134
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	63.2	49	129
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	66.0	59	129
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 2538199)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	0.00625 mg/kg	# 48.4	52	128
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	84.0	54	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	99.6	58	127
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	84.4	57	128
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	89.2	60	134
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	88.0	63	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	0.00125 mg/kg	82.4	55	130
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	93.2	62	130

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 2538199) - continued								
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	86.8	53	134
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	69.6	49	129
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	72.9	59	129
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 2538195)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	88.4	52	132
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	0.00312 mg/kg	96.0	65	126
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	76.4	64	126
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	69.2	63	124
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	76.3	58	125
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	90.8	61	130
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	78.4	55	130
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 2538199)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	94.4	52	132
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	0.00312 mg/kg	72.1	65	126
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	76.6	64	126
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	77.9	63	124
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	79.2	58	125
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	86.8	61	130
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	89.6	55	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 2538195)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	0.00116 mg/kg	84.0	54	130
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	0.00118 mg/kg	86.9	61	130
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	0.00119 mg/kg	99.6	62	130
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	0.0012 mg/kg	88.3	60	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 2538199)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	0.00116 mg/kg	87.5	54	130
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	0.00118 mg/kg	124	61	130
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	0.00119 mg/kg	95.4	62	130
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	0.0012 mg/kg	98.8	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: 2539655)								
EP231X-LL: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.002	µg/L	<0.002	0.0442 µg/L	124	50	130
EP231X-LL: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.002	µg/L	<0.002	0.0469 µg/L	105	50	130
EP231X-LL: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.002	µg/L	<0.002	0.0473 µg/L	93.9	50	130
EP231X-LL: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.002	µg/L	<0.002	0.0476 µg/L	114	50	130
EP231X-LL: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.002	µg/L	<0.002	0.0464 µg/L	90.3	50	130
EP231X-LL: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.002	µg/L	<0.002	0.0482 µg/L	90.2	40	130
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 2539655)								
EP231X-LL: Perfluorobutanoic acid (PFBA)	375-22-4	0.01	µg/L	<0.01	0.25 µg/L	91.4	50	130
EP231X-LL: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.002	µg/L	<0.002	0.05 µg/L	99.8	50	130
EP231X-LL: Perfluorohexanoic acid (PFHxA)	307-24-4	0.002	µg/L	<0.002	0.05 µg/L	104	50	130
EP231X-LL: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.002	µg/L	<0.002	0.05 µg/L	103	50	130
EP231X-LL: Perfluorooctanoic acid (PFOA)	335-67-1	0.002	µg/L	<0.002	0.05 µg/L	102	50	130
EP231X-LL: Perfluorononanoic acid (PFNA)	375-95-1	0.002	µg/L	<0.002	0.05 µg/L	89.6	50	130
EP231X-LL: Perfluorodecanoic acid (PFDA)	335-76-2	0.002	µg/L	<0.002	0.05 µg/L	75.8	50	130
EP231X-LL: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.002	µg/L	<0.002	0.05 µg/L	109	40	130
EP231X-LL: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.002	µg/L	<0.002	0.05 µg/L	73.6	40	130
EP231X-LL: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.002	µg/L	<0.002	0.05 µg/L	73.6	40	130
EP231X-LL: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.005	µg/L	<0.005	0.125 µg/L	81.6	40	130
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 2539655)								
EP231X-LL: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.002	µg/L	<0.002	0.05 µg/L	97.0	40	130
EP231X-LL: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.005	µg/L	<0.005	0.125 µg/L	106	40	130
EP231X-LL: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.005	µg/L	<0.005	0.125 µg/L	91.2	40	130
EP231X-LL: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.005	µg/L	<0.005	0.125 µg/L	77.9	50	130
EP231X-LL: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.005	µg/L	<0.005	0.125 µg/L	85.0	40	130
EP231X-LL: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.002	µg/L	<0.002	0.05 µg/L	73.6	50	130
EP231X-LL: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.002	µg/L	<0.002	0.05 µg/L	69.6	40	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 2539655)								
EP231X-LL: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.005	µg/L	<0.005	0.0467 µg/L	115	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	118	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	100	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	68.0	50	130
EP231P: PFAS Sums (QCLot: 2539655)								
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: 2539655) - 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: 2538195)							
EB1921880-002	TW_SS1_0.5_190819	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0025 mg/kg	66.0	57	121
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0025 mg/kg	66.4	55	125
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0025 mg/kg	69.4	52	126
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0025 mg/kg	72.0	54	123
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0025 mg/kg	# Not Determined	55	127
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0025 mg/kg	85.4	54	125
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 2538199)							
EB1921880-073	TW_BH04_0.2_190820	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.00125 mg/kg	# 36.7	57	121
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.00125 mg/kg	# Not Determined	55	125
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.00125 mg/kg	# Not Determined	52	126
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.00125 mg/kg	# 22.4	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	# 20.0	54	125
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 2538195)							
EB1921880-002	TW_SS1_0.5_190819	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.0125 mg/kg	# 24.8	52	128
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0025 mg/kg	63.8	54	129
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0025 mg/kg	59.0	58	127
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0025 mg/kg	67.8	57	128
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0025 mg/kg	72.4	60	134
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0025 mg/kg	# 62.0	63	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0025 mg/kg	# 50.2	55	130
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0025 mg/kg	# 61.4	62	130
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0025 mg/kg	57.2	53	134

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: 2538195) - continued							
EB1921880-002	TW_SS1_0.5_190819	EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0025 mg/kg	52.4	49	129
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.00625 mg/kg	# 51.9	59	129
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 2538199)							
EB1921880-073	TW_BH04_0.2_190820	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.00625 mg/kg	# 29.0	52	128
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.00125 mg/kg	# 52.2	54	129
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.00125 mg/kg	# 30.7	58	127
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.00125 mg/kg	# 31.7	57	128
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.00125 mg/kg	# 0.873	60	134
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.00125 mg/kg	# 26.8	63	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.00125 mg/kg	# 29.9	55	130
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.00125 mg/kg	# 32.7	62	130
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.00125 mg/kg	# 32.0	53	134
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.00125 mg/kg	# 26.0	49	129
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.00312 mg/kg	# 27.6	59	129
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 2538195)							
EB1921880-002	TW_SS1_0.5_190819	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0025 mg/kg	87.0	52	132
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.00625 mg/kg	68.2	65	126
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.00625 mg/kg	71.0	64	126
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.00625 mg/kg	# 55.4	63	124
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.00625 mg/kg	# 56.1	58	125
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0025 mg/kg	72.2	61	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0025 mg/kg	69.8	55	130
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 2538199)							
EB1921880-073	TW_BH04_0.2_190820	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.00125 mg/kg	# 29.5	52	132
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.00312 mg/kg	# 26.2	65	126
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.00312 mg/kg	# 31.7	64	126
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.00312 mg/kg	# 37.3	63	124
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.00312 mg/kg	# 36.0	58	125
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.00125 mg/kg	# 46.0	61	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
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 2538199) - continued							
EB1921880-073	TW_BH04_0.2_190820	EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.00125 mg/kg	# 43.9	55	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 2538195)							
EB1921880-002	TW_SS1_0.5_190819	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0025 mg/kg	63.4	54	130
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0025 mg/kg	73.2	61	130
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0025 mg/kg	68.4	62	130
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0025 mg/kg	# 56.2	60	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 2538199)							
EB1921880-073	TW_BH04_0.2_190820	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.00125 mg/kg	65.6	54	130
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.00125 mg/kg	68.4	61	130
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.00125 mg/kg	# 35.8	62	130
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.00125 mg/kg	# 55.6	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: 2539655)							
EB1921880-106	TW_QC302_190820	EP231X-LL: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.05 µg/L	109	50	130
		EP231X-LL: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.05 µg/L	99.6	50	130
		EP231X-LL: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.05 µg/L	93.0	50	130
		EP231X-LL: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.05 µg/L	113	50	130
		EP231X-LL: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.05 µg/L	76.8	50	130
		EP231X-LL: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.05 µg/L	77.4	40	130
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 2539655)							
EB1921880-106	TW_QC302_190820	EP231X-LL: Perfluorobutanoic acid (PFBA)	375-22-4	0.25 µg/L	87.4	50	130
		EP231X-LL: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.05 µg/L	99.8	50	130
		EP231X-LL: Perfluorohexanoic acid (PFHxA)	307-24-4	0.05 µg/L	105	50	130
		EP231X-LL: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.05 µg/L	104	50	130
		EP231X-LL: Perfluorooctanoic acid (PFOA)	335-67-1	0.05 µg/L	103	50	130
		EP231X-LL: Perfluorononanoic acid (PFNA)	375-95-1	0.05 µg/L	92.8	50	130
		EP231X-LL: Perfluorodecanoic acid (PFDA)	335-76-2	0.05 µg/L	75.6	50	130
		EP231X-LL: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.05 µg/L	105	40	130
		EP231X-LL: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.05 µg/L	74.8	40	130
		EP231X-LL: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.05 µg/L	81.2	40	130
		EP231X-LL: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.125 µg/L	86.5	40	130
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 2539655)							
EB1921880-106	TW_QC302_190820	EP231X-LL: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.05 µg/L	97.2	40	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: 2539655) - continued							
EB1921880-106	TW_QC302_190820	EP231X-LL: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.125 µg/L	93.4	40	130
		EP231X-LL: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.125 µg/L	85.0	40	130
		EP231X-LL: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.125 µg/L	75.8	50	130
		EP231X-LL: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.125 µg/L	87.7	40	130
		EP231X-LL: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.05 µg/L	80.0	50	130
		EP231X-LL: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.05 µg/L	71.2	40	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 2539655)							
EB1921880-106	TW_QC302_190820	EP231X-LL: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05 µg/L	108	50	130
		EP231X-LL: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05 µg/L	110	50	130
		EP231X-LL: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05 µg/L	104	50	130
		EP231X-LL: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05 µg/L	77.2	50	130

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EB1921880**	Page	: 1 of 10
Client	: **AECOM Australia Pty Ltd**	Laboratory	: Environmental Division Brisbane
Contact	: CAMDEN McCOSKER	Telephone	: +61 7 3552 8616
Project	: 60609758	Date Samples Received	: 21-Aug-2019
Site	: TW	Issue Date	: 28-Aug-2019
Sampler	: CAMDEN McCOSKER	No. of samples received	: 122
Order number	: 60609758 2.0	No. of samples analysed	: 32

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.**
- **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
Laboratory Control Spike (LCS) Recoveries							
EP231B: Perfluoroalkyl Carboxylic Acids	QC-2538199-002	----	**Perfluorobutanoic acid (PFBA)**	375-22-4	48.4 %	52-128%	**Recovery less than lower control limit**
Matrix Spike (MS) Recoveries							
EP231A: Perfluoroalkyl Sulfonic Acids	EB1921880--073	TW_BH04_0.2_190820	**Perfluorobutane sulfonic acid (PFBS)**	375-73-5	36.7 %	57-121%	**Recovery less than lower data quality objective**
EP231A: Perfluoroalkyl Sulfonic Acids	EB1921880--073	TW_BH04_0.2_190820	**Perfluoroheptane sulfonic acid (PFHpS)**	375-92-8	22.4 %	54-123%	**Recovery less than lower data quality objective**
EP231A: Perfluoroalkyl Sulfonic Acids	EB1921880--002	TW_SS1_0.5_190819	**Perfluorooctane sulfonic acid (PFOS)**	1763-23-1	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EP231A: Perfluoroalkyl Sulfonic Acids	EB1921880--073	TW_BH04_0.2_190820	**Perfluorooctane sulfonic acid (PFOS)**	1763-23-1	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EP231A: Perfluoroalkyl Sulfonic Acids	EB1921880--073	TW_BH04_0.2_190820	**Perfluorodecane sulfonic acid (PFDS)**	335-77-3	20.0 %	54-125%	**Recovery less than lower data quality objective**
EP231B: Perfluoroalkyl Carboxylic Acids	EB1921880--002	TW_SS1_0.5_190819	**Perfluorobutanoic acid (PFBA)**	375-22-4	24.8 %	52-128%	**Recovery less than lower data quality objective**
EP231B: Perfluoroalkyl Carboxylic Acids	EB1921880--073	TW_BH04_0.2_190820	**Perfluorobutanoic acid (PFBA)**	375-22-4	29.0 %	52-128%	**Recovery less than lower data quality objective**
EP231B: Perfluoroalkyl Carboxylic Acids	EB1921880--073	TW_BH04_0.2_190820	**Perfluoropentanoic acid (PFPeA)**	2706-90-3	52.2 %	54-129%	**Recovery less than lower data quality objective**
EP231B: Perfluoroalkyl Carboxylic Acids	EB1921880--073	TW_BH04_0.2_190820	**Perfluorohexanoic acid (PFHxA)**	307-24-4	30.7 %	58-127%	**Recovery less than lower data quality objective**
EP231B: Perfluoroalkyl Carboxylic Acids	EB1921880--073	TW_BH04_0.2_190820	**Perfluoroheptanoic acid (PFHpA)**	375-85-9	31.7 %	57-128%	**Recovery less than lower data quality objective**
EP231B: Perfluoroalkyl Carboxylic Acids	EB1921880--073	TW_BH04_0.2_190820	**Perfluorooctanoic acid (PFOA)**	335-67-1	0.873 %	60-134%	**Recovery less than lower data quality objective**
EP231B: Perfluoroalkyl Carboxylic Acids	EB1921880--002	TW_SS1_0.5_190819	**Perfluorononanoic acid (PFNA)**	375-95-1	62.0 %	63-130%	**Recovery less than lower data quality objective**
EP231B: Perfluoroalkyl Carboxylic Acids	EB1921880--073	TW_BH04_0.2_190820	**Perfluorononanoic acid (PFNA)**	375-95-1	26.8 %	63-130%	**Recovery less than lower data quality objective**
EP231B: Perfluoroalkyl Carboxylic Acids	EB1921880--002	TW_SS1_0.5_190819	**Perfluorodecanoic acid (PFDA)**	335-76-2	50.2 %	55-130%	**Recovery less than lower data quality objective**
EP231B: Perfluoroalkyl Carboxylic Acids	EB1921880--073	TW_BH04_0.2_190820	**Perfluorodecanoic acid (PFDA)**	335-76-2	29.9 %	55-130%	**Recovery less than lower data quality objective**
EP231B: Perfluoroalkyl Carboxylic Acids	EB1921880--002	TW_SS1_0.5_190819	**Perfluoroundecanoic acid (PFUnDA)**	2058-94-8	61.4 %	62-130%	**Recovery less than lower data quality objective**
EP231B: Perfluoroalkyl Carboxylic Acids	EB1921880--073	TW_BH04_0.2_190820	**Perfluoroundecanoic acid (PFUnDA)**	2058-94-8	32.7 %	62-130%	**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							
EP231B: Perfluoroalkyl Carboxylic Acids	EB1921880--073	TW_BH04_0.2_190820	**Perfluorododecanoic acid (PFDoDA)**	307-55-1	32.0 %	53-134%	**Recovery less than lower data quality objective**
EP231B: Perfluoroalkyl Carboxylic Acids	EB1921880--073	TW_BH04_0.2_190820	**Perfluorotridecanoic acid (PFTrDA)**	72629-94-8	26.0 %	49-129%	**Recovery less than lower data quality objective**
EP231B: Perfluoroalkyl Carboxylic Acids	EB1921880--002	TW_SS1_0.5_190819	**Perfluorotetradecanoic acid (PFTeDA)**	376-06-7	51.9 %	59-129%	**Recovery less than lower data quality objective**
EP231B: Perfluoroalkyl Carboxylic Acids	EB1921880--073	TW_BH04_0.2_190820	**Perfluorotetradecanoic acid (PFTeDA)**	376-06-7	27.6 %	59-129%	**Recovery less than lower data quality objective**
EP231C: Perfluoroalkyl Sulfonamides	EB1921880--073	TW_BH04_0.2_190820	**Perfluorooctane sulfonamide (FOSA)**	754-91-6	29.5 %	52-132%	**Recovery less than lower data quality objective**
EP231C: Perfluoroalkyl Sulfonamides	EB1921880--073	TW_BH04_0.2_190820	**N-Methyl perfluorooctane sulfonamide (MeFOSA)**	31506-32-8	26.2 %	65-126%	**Recovery less than lower data quality objective**
EP231C: Perfluoroalkyl Sulfonamides	EB1921880--073	TW_BH04_0.2_190820	**N-Ethyl perfluorooctane sulfonamide (EtFOSA)**	4151-50-2	31.7 %	64-126%	**Recovery less than lower data quality objective**
EP231C: Perfluoroalkyl Sulfonamides	EB1921880--002	TW_SS1_0.5_190819	**N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)**	24448-09-7	55.4 %	63-124%	**Recovery less than lower data quality objective**
EP231C: Perfluoroalkyl Sulfonamides	EB1921880--073	TW_BH04_0.2_190820	**N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)**	24448-09-7	37.3 %	63-124%	**Recovery less than lower data quality objective**
EP231C: Perfluoroalkyl Sulfonamides	EB1921880--002	TW_SS1_0.5_190819	**N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)**	1691-99-2	56.1 %	58-125%	**Recovery less than lower data quality objective**
EP231C: Perfluoroalkyl Sulfonamides	EB1921880--073	TW_BH04_0.2_190820	**N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)**	1691-99-2	36.0 %	58-125%	**Recovery less than lower data quality objective**
EP231C: Perfluoroalkyl Sulfonamides	EB1921880--073	TW_BH04_0.2_190820	**N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)**	2355-31-9	46.0 %	61-130%	**Recovery less than lower data quality objective**
EP231C: Perfluoroalkyl Sulfonamides	EB1921880--073	TW_BH04_0.2_190820	**N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)**	2991-50-6	43.9 %	55-130%	**Recovery less than lower data quality objective**
EP231D: (n:2) Fluorotelomer Sulfonic Acids	EB1921880--073	TW_BH04_0.2_190820	**8:2 Fluorotelomer sulfonic acid (8:2 FTS)**	39108-34-4	35.8 %	62-130%	**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							
EP231D: (n:2) Fluorotelomer Sulfonic Acids	EB1921880--002	TW_SS1_0.5_190819	**10:2 Fluorotelomer sulfonic acid (10:2 FTS)**	120226-60-0	56.2 %	60-130%	**Recovery less than lower data quality objective**
EP231D: (n:2) Fluorotelomer Sulfonic Acids	EB1921880--073	TW_BH04_0.2_190820	**10:2 Fluorotelomer sulfonic acid (10:2 FTS)**	120226-60-0	55.6 %	60-130%	**Recovery less than lower 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	EB1921880-073	TW_BH04_0.2_190820	**13C4-PFOS**	----	36.0 %	70-130 %	**Recovery less than lower data quality objective**
EP231S: PFAS Surrogate	EB1921880-027	TW_SS7_190818	**13C4-PFOS**	----	39.0 %	70-130 %	**Recovery less than lower data quality objective**
EP231S: PFAS Surrogate	EB1921880-028	TW_SS3_0.1_190819-1	**13C4-PFOS**	----	55.0 %	70-130 %	**Recovery less than lower data quality objective**
EP231S: PFAS Surrogate	EB1921880-069	TW_BH05_0.2_190820	**13C4-PFOS**	----	58.5 %	70-130 %	**Recovery less than lower data quality objective**
EP231S: PFAS Surrogate	EB1921880-073	TW_BH04_0.2_190820	**13C8-PFOA**	----	61.5 %	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*

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)							
TW_SS1_0.1_190819, TW_SS1_0.5_190819, TW_BH01_0.2_190819, TW_BH01_1.0_190819, TW_BH01_18.0_190819, TW_SS2_0.1_190819, TW_SS5_0.1_190819, TW_SS6_0.1_190819, TW_SS7_190818, TW_SS3_0.1_190819-1, TW_SS3_0.5_190819-1, TW_SS4_0.1_190819, TW_SS4_0.5_190819, TW_QC100_190819	**19-Aug-2019**	**----**	----	----	**21-Aug-2019**	02-Sep-2019	✓
HDPE Soil Jar (EA055)							
TW_BH02_0.2_190820, TW_BH02_0.5_190820, TW_BH02_17.0_1908207, TW_BH03_0.2_190820, TW_BH03_0.5_190820, TW_BH03_16.0_190820, TW_BH05_0.2_190820, TW_BH05_1.0_190820, TW_BH04_0.2_190820, TW_BH04_0.5_190820, TW_QC104_190820, TW_QC106_190820, TW_QC108_190820	**20-Aug-2019**	**----**	----	----	**21-Aug-2019**	03-Sep-2019	✓
HDPE Soil Jar (EA055)							
TW_BH05_16.0_190821	**21-Aug-2019**	**----**	----	----	**21-Aug-2019**	04-Sep-2019	✓
EP231A: Perfluoroalkyl Sulfonic Acids							
HDPE Soil Jar (EP231X)							
TW_QC100_190819	**19-Aug-2019**	**21-Aug-2019**	15-Feb-2020	✓	**22-Aug-2019**	30-Sep-2019	✓
HDPE Soil Jar (EP231X)							
TW_SS1_0.1_190819, TW_SS1_0.5_190819, TW_BH01_0.2_190819, TW_BH01_1.0_190819, TW_BH01_18.0_190819, TW_SS2_0.1_190819, TW_SS5_0.1_190819, TW_SS6_0.1_190819, TW_SS7_190818, TW_SS3_0.1_190819-1, TW_SS3_0.5_190819-1, TW_SS4_0.1_190819, TW_SS4_0.5_190819	**19-Aug-2019**	**22-Aug-2019**	15-Feb-2020	✓	**23-Aug-2019**	01-Oct-2019	✓
HDPE Soil Jar (EP231X)							
TW_BH05_1.0_190820, TW_BH04_0.2_190820, TW_BH04_0.5_190820, TW_QC104_190820, TW_QC106_190820, TW_QC108_190820	**20-Aug-2019**	**21-Aug-2019**	16-Feb-2020	✓	**22-Aug-2019**	30-Sep-2019	✓
HDPE Soil Jar (EP231X)							
TW_BH02_0.2_190820, TW_BH02_0.5_190820, TW_BH02_17.0_1908207, TW_BH03_0.2_190820, TW_BH03_0.5_190820, TW_BH03_16.0_190820, TW_BH05_0.2_190820	**20-Aug-2019**	**22-Aug-2019**	16-Feb-2020	✓	**23-Aug-2019**	01-Oct-2019	✓
HDPE Soil Jar (EP231X)							
TW_BH05_16.0_190821	**21-Aug-2019**	**21-Aug-2019**	17-Feb-2020	✓	**22-Aug-2019**	30-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
EP231B: Perfluoroalkyl Carboxylic Acids							
HDPE Soil Jar (EP231X) TW_QC100_190819	**19-Aug-2019**	**21-Aug-2019**	15-Feb-2020	✓	**22-Aug-2019**	30-Sep-2019	✓
HDPE Soil Jar (EP231X) TW_SS1_0.1_190819, TW_SS1_0.5_190819, TW_BH01_0.2_190819, TW_BH01_1.0_190819, TW_BH01_18.0_190819, TW_SS2_0.1_190819, TW_SS5_0.1_190819, TW_SS6_0.1_190819, TW_SS7_190818, TW_SS3_0.1_190819-1, TW_SS3_0.5_190819-1, TW_SS4_0.1_190819, TW_SS4_0.5_190819	**19-Aug-2019**	**22-Aug-2019**	15-Feb-2020	✓	**23-Aug-2019**	01-Oct-2019	✓
HDPE Soil Jar (EP231X) TW_BH05_1.0_190820, TW_BH04_0.2_190820, TW_BH04_0.5_190820, TW_QC104_190820, TW_QC106_190820, TW_QC108_190820	**20-Aug-2019**	**21-Aug-2019**	16-Feb-2020	✓	**22-Aug-2019**	30-Sep-2019	✓
HDPE Soil Jar (EP231X) TW_BH02_0.2_190820, TW_BH02_0.5_190820, TW_BH02_17.0_1908207, TW_BH03_0.2_190820, TW_BH03_0.5_190820, TW_BH03_16.0_190820, TW_BH05_0.2_190820	**20-Aug-2019**	**22-Aug-2019**	16-Feb-2020	✓	**23-Aug-2019**	01-Oct-2019	✓
HDPE Soil Jar (EP231X) TW_BH05_16.0_190821	**21-Aug-2019**	**21-Aug-2019**	17-Feb-2020	✓	**22-Aug-2019**	30-Sep-2019	✓
EP231C: Perfluoroalkyl Sulfonamides							
HDPE Soil Jar (EP231X) TW_QC100_190819	**19-Aug-2019**	**21-Aug-2019**	15-Feb-2020	✓	**22-Aug-2019**	30-Sep-2019	✓
HDPE Soil Jar (EP231X) TW_SS1_0.1_190819, TW_SS1_0.5_190819, TW_BH01_0.2_190819, TW_BH01_1.0_190819, TW_BH01_18.0_190819, TW_SS2_0.1_190819, TW_SS5_0.1_190819, TW_SS6_0.1_190819, TW_SS7_190818, TW_SS3_0.1_190819-1, TW_SS3_0.5_190819-1, TW_SS4_0.1_190819, TW_SS4_0.5_190819	**19-Aug-2019**	**22-Aug-2019**	15-Feb-2020	✓	**23-Aug-2019**	01-Oct-2019	✓
HDPE Soil Jar (EP231X) TW_BH05_1.0_190820, TW_BH04_0.2_190820, TW_BH04_0.5_190820, TW_QC104_190820, TW_QC106_190820, TW_QC108_190820	**20-Aug-2019**	**21-Aug-2019**	16-Feb-2020	✓	**22-Aug-2019**	30-Sep-2019	✓
HDPE Soil Jar (EP231X) TW_BH02_0.2_190820, TW_BH02_0.5_190820, TW_BH02_17.0_1908207, TW_BH03_0.2_190820, TW_BH03_0.5_190820, TW_BH03_16.0_190820, TW_BH05_0.2_190820	**20-Aug-2019**	**22-Aug-2019**	16-Feb-2020	✓	**23-Aug-2019**	01-Oct-2019	✓
HDPE Soil Jar (EP231X) TW_BH05_16.0_190821	**21-Aug-2019**	**21-Aug-2019**	17-Feb-2020	✓	**22-Aug-2019**	30-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)							
TW_QC100_190819	**19-Aug-2019**	**21-Aug-2019**	15-Feb-2020	✓	**22-Aug-2019**	30-Sep-2019	✓
HDPE Soil Jar (EP231X)							
TW_SS1_0.1_190819, TW_SS1_0.5_190819, TW_BH01_0.2_190819, TW_BH01_1.0_190819, TW_BH01_18.0_190819, TW_SS2_0.1_190819, TW_SS5_0.1_190819, TW_SS6_0.1_190819, TW_SS7_190818, TW_SS3_0.1_190819-1, TW_SS3_0.5_190819-1, TW_SS4_0.1_190819, TW_SS4_0.5_190819	**19-Aug-2019**	**22-Aug-2019**	15-Feb-2020	✓	**23-Aug-2019**	01-Oct-2019	✓
HDPE Soil Jar (EP231X)							
TW_BH05_1.0_190820, TW_BH04_0.2_190820, TW_BH04_0.5_190820, TW_QC104_190820, TW_QC106_190820, TW_QC108_190820	**20-Aug-2019**	**21-Aug-2019**	16-Feb-2020	✓	**22-Aug-2019**	30-Sep-2019	✓
HDPE Soil Jar (EP231X)							
TW_BH02_0.2_190820, TW_BH02_0.5_190820, TW_BH02_17.0_1908207, TW_BH03_0.2_190820, TW_BH03_0.5_190820, TW_BH03_16.0_190820, TW_BH05_0.2_190820	**20-Aug-2019**	**22-Aug-2019**	16-Feb-2020	✓	**23-Aug-2019**	01-Oct-2019	✓
HDPE Soil Jar (EP231X)							
TW_BH05_16.0_190821	**21-Aug-2019**	**21-Aug-2019**	17-Feb-2020	✓	**22-Aug-2019**	30-Sep-2019	✓
EP231P: PFAS Sums							
HDPE Soil Jar (EP231X)							
TW_QC100_190819	**19-Aug-2019**	**21-Aug-2019**	15-Feb-2020	✓	**22-Aug-2019**	30-Sep-2019	✓
HDPE Soil Jar (EP231X)							
TW_SS1_0.1_190819, TW_SS1_0.5_190819, TW_BH01_0.2_190819, TW_BH01_1.0_190819, TW_BH01_18.0_190819, TW_SS2_0.1_190819, TW_SS5_0.1_190819, TW_SS6_0.1_190819, TW_SS7_190818, TW_SS3_0.1_190819-1, TW_SS3_0.5_190819-1, TW_SS4_0.1_190819, TW_SS4_0.5_190819	**19-Aug-2019**	**22-Aug-2019**	15-Feb-2020	✓	**23-Aug-2019**	01-Oct-2019	✓
HDPE Soil Jar (EP231X)							
TW_BH05_1.0_190820, TW_BH04_0.2_190820, TW_BH04_0.5_190820, TW_QC104_190820, TW_QC106_190820, TW_QC108_190820	**20-Aug-2019**	**21-Aug-2019**	16-Feb-2020	✓	**22-Aug-2019**	30-Sep-2019	✓
HDPE Soil Jar (EP231X)							
TW_BH02_0.2_190820, TW_BH02_0.5_190820, TW_BH02_17.0_1908207, TW_BH03_0.2_190820, TW_BH03_0.5_190820, TW_BH03_16.0_190820, TW_BH05_0.2_190820	**20-Aug-2019**	**22-Aug-2019**	16-Feb-2020	✓	**23-Aug-2019**	01-Oct-2019	✓
HDPE Soil Jar (EP231X)							
TW_BH05_16.0_190821	**21-Aug-2019**	**21-Aug-2019**	17-Feb-2020	✓	**22-Aug-2019**	30-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) TW_QC300_190819	**19-Aug-2019**	**22-Aug-2019**	15-Feb-2020	✓	**22-Aug-2019**	15-Feb-2020	✓
HDPE (no PTFE) (EP231X-LL) TW_QC302_190820, TW_QC303_190820	**20-Aug-2019**	**22-Aug-2019**	16-Feb-2020	✓	**22-Aug-2019**	16-Feb-2020	✓
HDPE (no PTFE) (EP231X-LL) TW_QC304_190821	**21-Aug-2019**	**22-Aug-2019**	17-Feb-2020	✓	**22-Aug-2019**	17-Feb-2020	✓
EP231B: Perfluoroalkyl Carboxylic Acids							
HDPE (no PTFE) (EP231X-LL) TW_QC300_190819	**19-Aug-2019**	**22-Aug-2019**	15-Feb-2020	✓	**22-Aug-2019**	15-Feb-2020	✓
HDPE (no PTFE) (EP231X-LL) TW_QC302_190820, TW_QC303_190820	**20-Aug-2019**	**22-Aug-2019**	16-Feb-2020	✓	**22-Aug-2019**	16-Feb-2020	✓
HDPE (no PTFE) (EP231X-LL) TW_QC304_190821	**21-Aug-2019**	**22-Aug-2019**	17-Feb-2020	✓	**22-Aug-2019**	17-Feb-2020	✓
EP231C: Perfluoroalkyl Sulfonamides							
HDPE (no PTFE) (EP231X-LL) TW_QC300_190819	**19-Aug-2019**	**22-Aug-2019**	15-Feb-2020	✓	**22-Aug-2019**	15-Feb-2020	✓
HDPE (no PTFE) (EP231X-LL) TW_QC302_190820, TW_QC303_190820	**20-Aug-2019**	**22-Aug-2019**	16-Feb-2020	✓	**22-Aug-2019**	16-Feb-2020	✓
HDPE (no PTFE) (EP231X-LL) TW_QC304_190821	**21-Aug-2019**	**22-Aug-2019**	17-Feb-2020	✓	**22-Aug-2019**	17-Feb-2020	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE (no PTFE) (EP231X-LL) TW_QC300_190819	**19-Aug-2019**	**22-Aug-2019**	15-Feb-2020	✓	**22-Aug-2019**	15-Feb-2020	✓
HDPE (no PTFE) (EP231X-LL) TW_QC302_190820, TW_QC303_190820	**20-Aug-2019**	**22-Aug-2019**	16-Feb-2020	✓	**22-Aug-2019**	16-Feb-2020	✓
HDPE (no PTFE) (EP231X-LL) TW_QC304_190821	**21-Aug-2019**	**22-Aug-2019**	17-Feb-2020	✓	**22-Aug-2019**	17-Feb-2020	✓
EP231P: PFAS Sums							
HDPE (no PTFE) (EP231X-LL) TW_QC300_190819	**19-Aug-2019**	**22-Aug-2019**	15-Feb-2020	✓	**22-Aug-2019**	15-Feb-2020	✓
HDPE (no PTFE) (EP231X-LL) TW_QC302_190820, TW_QC303_190820	**20-Aug-2019**	**22-Aug-2019**	16-Feb-2020	✓	**22-Aug-2019**	16-Feb-2020	✓
HDPE (no PTFE) (EP231X-LL) TW_QC304_190821	**21-Aug-2019**	**22-Aug-2019**	17-Feb-2020	✓	**22-Aug-2019**	17-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	3	28	**10.71**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	3	28	**10.71**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	28	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	28	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	28	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

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	1	4	**25.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Per- and Polyfluoroalkyl Substances (PFAS by LCMSMS	EP231X-LL	1	4	**25.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Per- and Polyfluoroalkyl Substances (PFAS by LCMSMS	EP231X-LL	1	4	**25.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Per- and Polyfluoroalkyl Substances (PFAS by LCMSMS	EP231X-LL	1	4	**25.00**	**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

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

AECOG6/190823 Due 30/8/19

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 may be longer for some tests e.g. Ultra Trace Organics)	☑ Standard TAT (List due date): 5 Day	FOR LABORATORY USE ONLY (Circle)
OFFICE: Brisbane		☐ Non Standard or urgent TAT (List due date):	Custody Seal Intact? Yes No N/A
PROJECT: 60609758 2.0	ALS QUOTE NO.: BN/112/19	COC SEQUENCE NUMBER (Circle)	Free ice / frozen ice bricks present upon receipt? Yes No N/A
ORDER NUMBER:		COC: 0 2 3 4 5 6 7	Random Sample Temperature on Receipt: °C
PROJECT MANAGER: James Peachey	CONTACT PH: 0426 206 362	OF: 1 2 3 4 5 6 7	Other comment:
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):			

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Camden	Lkalm C	16:00	
DATE/TIME: 21/8/19	DATE/TIME: 22/8/19 1500	DATE/TIME: 22/8/19	DATE/TIME:

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL: Please forward to NM1 with this 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.
	QC200-190819	19/8/19	S	IP	1				N19/021334				For reference only
	QC201-190819	19/8/19	S	IP	1				N19/021335				"
	QC202-190819	"	"	"	1				N19/021336				"
	QC203-190819	"	"	"	1				N19/021337				"
	QC204-190820	20/8/19	"	"	1				N19/021338				"
	QC205-190820	"	"	"	1				N19/021339				"
	QC206-190820	"	"	"	1				N19/021340				"
	QC207-190820	"	"	"	1				N19/021341				"
	QC208-190820	"	"	"	1				N19/021342				"
	QC209-190821	21/8/19	"	"	1								" N19/021343
	QC210-190821	"	"	"	1								" N19/021344
				TOTAL									

RECEIVED 23 AUG 2019 BY: Ann 14:10

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.

LAB 0000 87585

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: **AECO06/190823**

Total No. of Samples: **11**

LRNs	Customer Sample ID	Lab Sample Description
N19/021334	QC200_190819	SOIL 19/8/19
N19/021335	QC201_190819	SOIL 19/8/19
N19/021336	QC202_190819	SOIL 19/8/19
N19/021337	QC203_190819	SOIL 19/8/19
N19/021338	QC204_190820	SOIL 20/8/19
N19/021339	QC205_190820	SOIL 20/8/19
N19/021340	QC206_190820	SOIL 20/8/19
N19/021341	QC207_190820	SOIL 20/8/19
N19/021342	QC208_190820	SOIL 20/8/19
N19/021343	QC209_190821	SOIL 21/8/19
N19/021344	QC210_190821	SOIL 21/8/19

SAMPLE RECEIVED CONDITION

Date samples received:	23-AUG-2019
Sample received in good order:	Yes
NMI Quotation no. provided:	
Client purchase order number:	60609758_2_0
Temperature of samples:	Chilled
Comments:	ALL OK
Estimated report date:	30-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. RN1245339

Client	: AECOM AUSTRALIA PTY LTD	**Job No.**	: AECO06/190823
	LEVEL 8	**Quote No.**	: QT-02018
	540 WICKHAM STREET	**Order No.**	: 60609758_2_0
		Date Received	: 23-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
N19/021334	QC200_190819	SOIL 19/8/19
N19/021338	QC204_190820	SOIL 20/8/19
N19/021340	QC206_190820	SOIL 20/8/19

Lab Reg No.		N19/021334	N19/021338	N19/021340		
Date Sampled		19-AUG-2019	20-AUG-2019	20-AUG-2019		
	Units					Method
PFAS (per-and poly-fluoroalkyl substances)						
PFBA (375-22-4)	mg/kg	0.0030	<0.002	<0.002		NR70
PFPeA (2706-90-3)	mg/kg	0.0053	<0.002	<0.002		NR70
PFHxA (307-24-4)	mg/kg	0.0037	<0.001	<0.001		NR70
PFHpA (375-85-9)	mg/kg	0.0022	<0.001	<0.001		NR70
PFOA (335-67-1)	mg/kg	0.0021	<0.001	<0.001		NR70
PFNA (375-95-1)	mg/kg	0.0011	<0.001	<0.001		NR70
PFDA (335-76-2)	mg/kg	<0.001	<0.001	<0.001		NR70
PFUdA (2058-94-8)	mg/kg	<0.002	<0.002	<0.002		NR70
PFDoA (307-55-1)	mg/kg	<0.002	<0.002	<0.002		NR70
PFTrDA (72629-94-8)	mg/kg	<0.002	<0.002	<0.002		NR70
PFTeDA (376-06-7)	mg/kg	<0.002	<0.002	<0.002		NR70
PFHxDA (67905-19-5)	mg/kg	<0.002	<0.002	<0.002		NR70
PFODA (16517-11-6)	mg/kg	<0.005	<0.005	<0.005		NR70
FOUEA (70887-84-2)	mg/kg	<0.001	<0.001	<0.001		NR70
PFBS (375-73-5)	mg/kg	0.0014	<0.001	<0.001		NR70
PFPeS (2706-91-4)	mg/kg	0.0012	<0.001	<0.001		NR70
PFHxS (355-46-4)	mg/kg	0.024	<0.001	0.0015		NR70
PFHpS (375-92-8)	mg/kg	0.0017	<0.001	<0.001		NR70
PFOS (1763-23-1)	mg/kg	0.82	0.0046	<0.002		NR70
PFNS (68259-12-1)	mg/kg	0.0044	<0.001	<0.001		NR70
PFDS (335-77-3)	mg/kg	0.0054	<0.001	<0.001		NR70
PFOSA (754-91-6)	mg/kg	0.0051	<0.001	<0.001		NR70
N-MeFOSA (31506-32-8)	mg/kg	<0.002	<0.002	<0.002		NR70
N-EtFOSA (4151-50-2)	mg/kg	<0.002	<0.002	<0.002		NR70
N-MeFOSAA (2355-31-9)	mg/kg	<0.002	<0.002	<0.002		NR70
N-EtFOSAA(2991-50-6)	mg/kg	<0.002	<0.002	<0.002		NR70
N-MeFOSE (24448-09-7)	mg/kg	<0.005	<0.005	<0.005		NR70

REPORT OF ANALYSIS

Lab Reg No.		N19/021334	N19/021338	N19/021340		
Date Sampled		19-AUG-2019	20-AUG-2019	20-AUG-2019		
	Units					Method
PFAS (per-and poly-fluoroalkyl substances)						
N-EtFOSE (1691-99-2)	mg/kg	<0.005	<0.005	<0.005		NR70
4:2 FTS (757124-72-4)	mg/kg	<0.001	<0.001	<0.001		NR70
6:2 FTS (27619-97-2)	mg/kg	<0.001	<0.001	<0.001		NR70
8:2 FTS (39108-34-4)	mg/kg	<0.001	<0.001	<0.001		NR70
10:2 FTS (120226-60-0)	mg/kg	<0.002	<0.002	<0.002		NR70
8:2 diPAP (678-41-1)	mg/kg	<0.002	<0.002	<0.002		NR70
PFBA (Surrogate Recovery)	%	95	102	105		NR70
PFPeA (Surrogate Recovery)	%	109	105	116		NR70
PFHxA (Surrogate Recovery)	%	106	105	108		NR70
PFHpA (Surrogate Recovery)	%	106	114	110		NR70
PFOA (Surrogate Recovery)	%	99	112	110		NR70
PFNA (Surrogate Recovery)	%	82	118	124		NR70
PFDA (Surrogate Recovery)	%	97	110	126		NR70
PFUdA (Surrogate Recovery)	%	83	114	106		NR70
PFDoA (Surrogate Recovery)	%	89	120	134		NR70
PFTeDA (Surrogate Recovery)	%	102	115	122		NR70
PFHxDA (Surrogate Recovery)	%	105	118	120		NR70
FOUEA (Surrogate Recovery)	%	41	68	82		NR70
PFBS (Surrogate Recovery)	%	89	88	92		NR70
PFHxS (Surrogate Recovery)	%	101	111	106		NR70
PFOS (Surrogate Recovery)	%	111	112	112		NR70
PFOSA (Surrogate Recovery)	%	89	106	116		NR70
N-MeFOSA (Surrogate Recovery)	%	123	118	102		NR70
N-EtFOSA (Surrogate Recovery)	%	109	105	98		NR70
N-MeFOSAA (Surrogate Recovery)	%	67	104	105		NR70
N-EtFOSAA (Surrogate Recovery)	%	64	105	94		NR70
N-MeFOSE (Surrogate Recovery)	%	92	111	110		NR70
N-EtFOSE (Surrogate Recovery)	%	97	95	100		NR70
4:2 FTS (Surrogate Recovery)	%	61	78	92		NR70
6:2 FTS (Surrogate Recovery)	%	62	81	89		NR70
8:2 FTS (Surrogate Recovery)	%	62	84	93		NR70
8:2 diPAP (Surrogate Recovery)	%	70	59	69		NR70
Dates						
Date extracted		29-AUG-2019	29-AUG-2019	29-AUG-2019		
Date analysed		5-SEP-2019	5-SEP-2019	5-SEP-2019		

N19/021334
to

REPORT OF ANALYSIS

N19/021340:

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

06-SEP-2019

Lab Reg No.		N19/021334	N19/021338	N19/021340		
Date Sampled		19-AUG-2019	20-AUG-2019	20-AUG-2019		
	Units					Method
Trace Elements						
Total Solids	%	83.9	75.7	51.2		NT2_49

Pankaj Barai, Analyst
Inorganics - NSW
Accreditation No. 198

06-SEP-2019

All results are expressed on a dry weight basis.

ACCREDITED FOR TECHNICAL COMPETENCE

Accredited for compliance with ISO/IEC 17025 - Testing.

Results relate only to the sample(s) tested.

REPORT OF ANALYSIS

This Report supersedes reports: *RN1244537* *RN1245328*

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: AECO06/190823 **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	87	NA
PFPeA (2706-90-3)	NR70	0.002	<0.002	NA	NA	NA	114	NA
PFHxA (307-24-4)	NR70	0.001	<0.001	NA	NA	NA	105	NA
PFHpA (375-85-9)	NR70	0.001	<0.001	NA	NA	NA	102	NA
PFOA (335-67-1)	NR70	0.001	<0.001	NA	NA	NA	108	NA
PFNA (375-95-1)	NR70	0.001	<0.001	NA	NA	NA	117	NA
PFDA (335-76-2)	NR70	0.001	<0.001	NA	NA	NA	104	NA
PFUdA (2058-94-8)	NR70	0.002	<0.002	NA	NA	NA	103	NA
PFDoA (307-55-1)	NR70	0.002	<0.002	NA	NA	NA	111	NA
PFTrDA (72629-94-8)	NR70	0.002	<0.002	NA	NA	NA	112	NA
PFTeDA (376-06-7)	NR70	0.002	<0.002	NA	NA	NA	109	NA
PFHxDA (67905-19-5)	NR70	0.002	<0.002	NA	NA	NA	99	NA
PFODA (16517-11-6)	NR70	0.005	<0.005	NA	NA	NA	97	NA
FOUEA (70887-84-2)	NR70	0.001	<0.001	NA	NA	NA	122	NA
PFBS (375-73-5)	NR70	0.001	<0.001	NA	NA	NA	107	NA
PFPeS (2706-91-4)	NR70	0.001	<0.001	NA	NA	NA	123	NA
PFHxS (355-46-4)	NR70	0.001	<0.001	NA	NA	NA	101	NA
PFHpS (375-92-8)	NR70	0.001	<0.001	NA	NA	NA	98	NA
PFOS (1763-23-1)	NR70	0.002	<0.002	NA	NA	NA	133	NA
PFNS (68259-12-1)	NR70	0.001	<0.001	NA	NA	NA	105	NA
PFDS (335-77-3)	NR70	0.001	<0.001	NA	NA	NA	107	NA
PFOSA (754-91-6)	NR70	0.001	<0.001	NA	NA	NA	117	NA
N-MeFOSA (31506-32-8)	NR70	0.002	<0.002	NA	NA	NA	114	NA
N-EtFOSA (4151-50-2)	NR70	0.002	<0.002	NA	NA	NA	99	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	110	NA
N-MeFOSE (24448-09-7)	NR70	0.005	<0.005	NA	NA	NA	97	NA
N-EtFOSE (1691-99-2)	NR70	0.005	<0.005	NA	NA	NA	105	NA
4:2 FTS (757124-72-4)	NR70	0.001	<0.001	NA	NA	NA	111	NA
6:2 FTS (27619-97-2)	NR70	0.001	<0.001	NA	NA	NA	116	NA
8:2 FTS (39108-34-4)	NR70	0.001	<0.001	NA	NA	NA	126	NA
10:2 FTS (120226-60-0)	NR70	0.002	<0.002	NA	NA	NA	145	NA
8:2 diPAP (678-41-1)	NR70	0.002	<0.002	NA	NA	NA	110	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: **6/09/2019**

ANZ

FQM - Generic Chain of Custody Form

9/9

AECOM

Q4AN(EV)-007-FM1

CONSULTANT: AECOM	ADDRESS / OFFICE: 540 Wickham St, Fortitude Valley, 4006	SAMPLER: Nem Krco	**Destination Laboratory**
PROJECT MANAGER (PM): James Peachey	SITE: Toowoomba	MOBILE: 0499 989 474 PHONE:	
PROJECT NUMBER & TASK CODE: 60609758	P.O. NO.: 60609758 2.0	EMAIL REPORT TO: camden.mccosker@aecom.com, james.peachey@aecom.com, nem.krco@aecom.com	
RESULTS REQUIRED (Date): 5 Days TAT	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) Yes No N/A
Intact: Yes No N/A
SAMPLE TEMPERATURE:
CHILLED: Yes No

COMMENTS / SPECIAL HANDLING / STORAGE OR DISPOSAL:

Hold samples for possible future TOPA analysis.

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															
1	TW_GW01_190830	W	30/8/19	11:10	1P	1	X														
2	TW_GW02_190830	W	30/8/19	10:10	1P	1	X														
3	TW_GW03_190829	W	29/8/19	17:40	1P	1	X														
4	TW_GW04_190830	W	30/8/19	12:00	1P	1	X														
5	TW_GW05_190829	W	29/8/19	16:20	1P	1	X														
6	TW_SED01_190829	S	29/8/19	13:30	1J	1						X									
7	TW_SED02_190829	S	29/8/19	14:00	1J	1						X									
8	TW_SW1_190829	W		13:50	1P	1				X											
9	TW_SW2_190829	W		14:15	1P	1				X											
10	TW_QC111_190829	S	29/8/19		1J	1						X									
	TW-QC211-190829	S	29/8/19		1J	1						X									Forward to NMI
10	TW-QC112-190829	W	29/8/19		1P	1	X														
	TW_QC212_190829	W	29/8/19		1P	1	X														Forward to NMI
12	TW-QC305-190829	W	29/8/19		1P	1	X														
13	TW-QC306-190830	W	30/8/19		1P	1	X														

Environmental Division
Brisbane
Work Order Reference
EB1922854

Telephone : +61-7-3243 7222

RELINQUISHED BY:		RECEIVED BY		RECEIVED BY		METHOD OF SHIPMENT
Name: Nem Krco	Date: 30/8/19	Name: Liam C	Date: 30/8/19	Name:	Date:	Con' Note No:
Of:	Time: 16:00	Of: ALS	Time: 16:00	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

COC Page of

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order	: **EB1922854**		
Amendment	: **2**		
Client	: **AECOM Australia Pty Ltd**	Laboratory	: Environmental Division Brisbane
Contact	: JAMES PEACHEY	Contact	: Carsten Emrich
Address	: PO BOX 1307 FORTITUDE VALLEY QLD, AUSTRALIA 4006	Address	: 2 Byth Street Stafford QLD Australia 4053
E-mail	: james.peachey@aecom.com	E-mail	: carsten.emrich@alsglobal.com
Telephone	: ----	Telephone	: +61 7 3552 8616
Facsimile	: ----	Facsimile	: +61-7-3243 7218
Project	: 60609758	Page	: 1 of 3
Order number	: 60609758 2.0	Quote number	: EB2019AECOMAU0002 (BN/112/19)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: TOOWOOMBA		
Sampler	: NEM KRCO		

Dates

Date Samples Received	: 30-Aug-2019 16:00	Issue Date	: 18-Nov-2019
Client Requested Due Date	: 06-Sep-2019	Scheduled Reporting Date	: **16-Sep-2019**

Delivery Details

Mode of Delivery	: Client Drop Off	Security Seal	: Not Available
No. of coolers/boxes	: 1	Temperature	: 0.6°C - Ice present
Receipt Detail	: HARD SMALL ESKY	No. of samples received / analysed	: 13 / 13

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- ***09/09/2019*: SRN has been resent to acknowledge additional comments added regarding Super Trace PFAS analysis, and the estimated due date for these results. For any further information regarding these adjustments please contact client services at ALSEnviro.Brisbane@alsglobal.com.**
- **20/9/19: SRN has been resent to acknowledge the change in sample ID's. For any further information regarding these adjustments please contact client services at ALSEnviro.Brisbane@alsglobal.com.**
- ***18/11/19*: SRN has been resent to acknowledge change of samples IDs (samples #1-5) as per email request by Camden McCosker on the 18/11/19. For any further information regarding these adjustments 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). The estimated date for this data is 16/09/2019.**
- 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.**
- **Sample 'TW_QC211_190829' and 'TW_QC212_190829' has been forwarded to NMI, as requested. Please note that this will incur a freight forwarding fee.**
- 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)
EB1922854-006	29-Aug-2019 13:30	TW_SED01_190829	✓	✓
EB1922854-007	29-Aug-2019 14:00	TW_SED02_190829	✓	✓
EB1922854-010	29-Aug-2019 00:00	TW_QC111_190829	✓	✓

Matrix: **WATER**

Laboratory sample ID	Client sampling date / time	Client sample ID	WATER - EP231X-LL (EB) PFAS - Full Suite Low Level (28 analytes)	WATER - EP231X-ST PFAS - Super Trace Waters Long Suite (28
EB1922854-001	30-Aug-2019 11:10	TW_MW01_190830	✓	
EB1922854-002	30-Aug-2019 10:10	TW_MW02_190830	✓	
EB1922854-003	29-Aug-2019 17:40	TW_MW03-190829	✓	
EB1922854-004	30-Aug-2019 12:00	TW_MW04_190830	✓	
EB1922854-005	29-Aug-2019 16:20	TW_MW05_190829	✓	
EB1922854-008	29-Aug-2019 13:50	TW_SW1_190829		✓
EB1922854-009	29-Aug-2019 14:15	TW_SW2_190829		✓
EB1922854-011	29-Aug-2019 00:00	TW_QC112_190829	✓	
EB1922854-012	29-Aug-2019 00:00	TW_QC305_190829	✓	
EB1922854-013	30-Aug-2019 00:00	TW_QC306_190830	✓	

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
- Chain of Custody (CoC) (COC)	Email	camden.mccosker@aecom.com
- EDI Format - ESDAT (ESDAT)	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
- Chain of Custody (CoC) (COC)	Email	james.peachey@aecom.com
- EDI Format - ESDAT (ESDAT)	Email	james.peachey@aecom.com

NEM KRCO

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

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB1922854**	Page	: 1 of 11
Amendment	: **2**		
Client	: **AECOM Australia Pty Ltd**	Laboratory	: Environmental Division Brisbane
Contact	: JAMES PEACHEY	Contact	: Carsten Emrich
Address	: PO BOX 1307 FORTITUDE VALLEY QLD, AUSTRALIA 4006	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: ----	Telephone	: +61 7 3552 8616
Project	: 60609758	Date Samples Received	: 30-Aug-2019 16:00
Order number	: 60609758 2.0	Date Analysis Commenced	: 02-Sep-2019
C-O-C number	: ----	Issue Date	: 18-Nov-2019 13:22
Sampler	: NEM KRCO		
Site	: TOOWOOMBA		
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*
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW
Matt Frost	Assistant Laboratory Manager	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.

- EP231X-ST: Low Matrix spike recovery due to matrix interference. Confirmed by re-extraction and re-analysis
- **Super Trace PFAS analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911 (Micro site no. 14913). The estimated date for this data is 16/09/2019.**
- EP231X: Particular samples required dilution prior to analysis due to matrix interferences. LOR values have been adjusted accordingly and surrogate recoveries not determined.
- Amendment (18/11/2019): This report has been amended as a result of a request to change sample identification numbers (IDs) received by ALS from Camden McCosker on 18/11/2019. All analysis results are as per the previous report.
- Amendment (20/09/2019): This report has been amended to alter the sample ID's. All analysis results are as per the previous report.
- EP231X: Duplicate shows results out of control limit due to sample heterogeneity. Confirmed by re-extraction and re-analysis.
- EP231X: Matrix spike shows results out of control limit due to primary sample matrix interference. Confirmed by re-extraction and re-analysis.

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	TW_SED01_190829	TW_SED02_190829	TW_QC111_190829	----	----
			Client sampling date / time	29-Aug-2019 13:30	29-Aug-2019 14:00	29-Aug-2019 00:00	----	----
Compound	CAS Number	LOR	Unit	EB1922854-006	EB1922854-007	EB1922854-010	--------	--------
				Result	Result	Result	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	**42.5**	**27.6**	**40.6**	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	**0.0007**	<0.0005	**0.0007**	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	**0.0006**	<0.0005	**0.0006**	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	**0.0111**	**0.0044**	**0.0093**	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	**0.0008**	**0.0006**	<0.0005	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	**0.0633**	**0.0355**	**0.0415**	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0005	<0.0005	<0.0005	----	----
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	<0.0005	<0.0005	<0.0005	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	**0.0005**	**0.0005**	**0.0005**	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0005	<0.0005	<0.0005	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0005	<0.0005	<0.0005	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0005	<0.0005	<0.0005	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0005	<0.0005	<0.0005	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0005	<0.0005	<0.0005	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0005	**0.0006**	<0.0005	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0005	<0.0005	<0.0005	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0012	<0.0012	<0.0012	----	----
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0005	<0.0005	<0.0005	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0012	<0.0012	<0.0012	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	TW_SED01_190829	TW_SED02_190829	TW_QC111_190829	----	----
				Client sampling date / time	29-Aug-2019 13:30	29-Aug-2019 14:00	29-Aug-2019 00:00	----	----
Compound	CAS Number	LOR	Unit		EB1922854-006	EB1922854-007	EB1922854-010	--------	--------
					Result	Result	Result	----	----
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg		**0.0094**	<0.0012	**0.0071**	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg		<0.0012	<0.0012	<0.0012	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg		<0.0065	<0.0150	<0.0040	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg		<0.0005	<0.0005	<0.0005	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg		<0.0005	<0.0005	<0.0005	----	----
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		**0.0008**	<0.0005	**0.0012**	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg		<0.0005	**0.0005**	<0.0005	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg		<0.0005	**0.0006**	<0.0005	----	----
EP231P: PFAS Sums									
Sum of PFAS	----	0.0002	mg/kg		**0.0872**	**0.0427**	**0.0609**	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg		**0.0744**	**0.0399**	**0.0508**	----	----
Sum of PFAS (WA DER List)	----	0.0002	mg/kg		**0.0764**	**0.0409**	**0.0532**	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.0002	%		**Not Determined**	**Not Determined**	**Not Determined**	----	----
13C8-PFOA	----	0.0002	%		**Not Determined**	**Not Determined**	**Not Determined**	----	----

Analytical Results

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

Compound	CAS Number	LOR	Unit	Client sample ID	TW_MW01_190830	TW_MW02_190830	TW_MW03-190829	TW_MW04_190830	TW_MW05_190829
				Client sampling date / time	30-Aug-2019 11:10	30-Aug-2019 10:10	29-Aug-2019 17:40	30-Aug-2019 12:00	29-Aug-2019 16:20
					EB1922854-001	EB1922854-002	EB1922854-003	EB1922854-004	EB1922854-005
					Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.002	µg/L		**0.006**	**0.519**	**0.156**	**0.002**	**0.588**
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.002	µg/L		**0.006**	**0.481**	**0.158**	<0.002	**0.568**
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.002	µg/L		**0.067**	**5.69**	**1.60**	**0.010**	**3.38**
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.002	µg/L		<0.002	**0.167**	**0.108**	<0.002	**0.163**
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.002	µg/L		**0.046**	**2.87**	**2.24**	**0.005**	**3.33**
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.002	µg/L		<0.002	<0.002	<0.002	<0.002	<0.002
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.01	µg/L		<0.01	**0.05**	**0.01**	<0.01	**0.04**
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.002	µg/L		<0.002	**0.088**	**0.030**	<0.002	**0.086**
Perfluorohexanoic acid (PFHxA)	307-24-4	0.002	µg/L		<0.002	**0.554**	**0.168**	<0.002	**0.525**
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.002	µg/L		<0.002	**0.085**	**0.034**	<0.002	**0.116**
Perfluorooctanoic acid (PFOA)	335-67-1	0.002	µg/L		<0.002	**0.113**	**0.060**	<0.002	**0.205**
Perfluorononanoic acid (PFNA)	375-95-1	0.002	µg/L		<0.002	<0.002	<0.002	<0.002	<0.002
Perfluorodecanoic acid (PFDA)	335-76-2	0.002	µg/L		<0.002	<0.002	<0.002	<0.002	<0.002
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.002	µg/L		<0.002	<0.002	<0.002	<0.002	<0.002
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.002	µg/L		<0.002	<0.002	<0.002	<0.002	<0.002
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.002	µg/L		<0.002	<0.002	<0.002	<0.002	<0.002
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.005	µg/L		<0.005	<0.005	<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	<0.002	**0.005**
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.005	µg/L		<0.005	<0.005	<0.005	<0.005	<0.005
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.005	µg/L		<0.005	<0.005	<0.005	<0.005	<0.005

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	TW_MW01_190830	TW_MW02_190830	TW_MW03-190829	TW_MW04_190830	TW_MW05_190829
				Client sampling date / time	30-Aug-2019 11:10	30-Aug-2019 10:10	29-Aug-2019 17:40	30-Aug-2019 12:00	29-Aug-2019 16:20
Compound	CAS Number	LOR	Unit		EB1922854-001	EB1922854-002	EB1922854-003	EB1922854-004	EB1922854-005
					Result	Result	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	<0.005	<0.005
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.005	µg/L		<0.005	<0.005	<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	<0.002	<0.002
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.002	µg/L		<0.002	<0.002	<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	<0.005	<0.005
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.005	µg/L		<0.005	**0.072**	**0.036**	<0.005	**0.024**
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.005	µg/L		<0.005	<0.005	<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	<0.005	<0.005
EP231P: PFAS Sums									
Sum of PFAS	----	0.002	µg/L		**0.125**	**10.7**	**4.60**	**0.017**	**9.03**
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.002	µg/L		**0.113**	**8.56**	**3.84**	**0.015**	**6.71**
Sum of PFAS (WA DER List)	----	0.002	µg/L		**0.119**	**10.0**	**4.33**	**0.017**	**8.29**
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.002	%		**97.9**	**94.7**	**94.1**	**95.3**	**90.2**
13C8-PFOA	----	0.002	%		**94.0**	**98.5**	**93.1**	**93.8**	**95.9**

Analytical Results

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

Compound	CAS Number	LOR	Unit	Client sample ID	TW_SW1_190829	TW_SW2_190829	TW_QC112_190829	TW_QC305_190829	TW_QC306_190830
				Client sampling date / time	29-Aug-2019 13:50	29-Aug-2019 14:15	29-Aug-2019 00:00	29-Aug-2019 00:00	30-Aug-2019 00:00
					EB1922854-008	EB1922854-009	EB1922854-011	EB1922854-012	EB1922854-013
					Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0005	µg/L		**0.802**	**1.12**	----	----	----
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.002	µg/L		----	----	**0.614**	<0.002	<0.002
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0005	µg/L		**0.180**	**0.348**	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.002	µg/L		----	----	**0.543**	<0.002	<0.002
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0005	µg/L		**0.429**	**0.719**	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.002	µg/L		----	----	**3.21**	<0.002	<0.002
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0005	µg/L		**0.0050**	**0.0375**	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.002	µg/L		----	----	**0.159**	<0.002	<0.002
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0003	µg/L		**0.243**	**0.374**	----	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.002	µg/L		----	----	**3.16**	<0.002	<0.002
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0005	µg/L		<0.0005	<0.0005	----	----	----
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	0.002	µg/L		<0.002	<0.002	----	----	----
Perfluorobutanoic acid (PFBA)	375-22-4	0.01	µg/L		----	----	**0.04**	<0.01	<0.01
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0005	µg/L		**0.0317**	**0.0779**	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.002	µg/L		----	----	**0.088**	<0.002	<0.002
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0005	µg/L		**0.0441**	**0.103**	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.002	µg/L		----	----	**0.540**	<0.002	<0.002
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0005	µg/L		**0.0095**	**0.0083**	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.002	µg/L		----	----	**0.120**	<0.002	<0.002
Perfluorooctanoic acid (PFOA)	335-67-1	0.0005	µg/L		**0.0212**	**0.0267**	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.002	µg/L		----	----	**0.215**	<0.002	<0.002
Perfluorononanoic acid (PFNA)	375-95-1	0.0005	µg/L		**0.0042**	**0.0031**	----	----	----

Analytical Results

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

Compound	CAS Number	LOR	Unit	Client sample ID	TW_SW1_190829	TW_SW2_190829	TW_QC112_190829	TW_QC305_190829	TW_QC306_190830
				Client sampling date / time	29-Aug-2019 13:50	29-Aug-2019 14:15	29-Aug-2019 00:00	29-Aug-2019 00:00	30-Aug-2019 00:00
					EB1922854-008	EB1922854-009	EB1922854-011	EB1922854-012	EB1922854-013
					Result	Result	Result	Result	Result
EP231B: Perfluoroalkyl Carboxylic Acids - Continued									
Perfluorononanoic acid (PFNA)	375-95-1	0.002	µg/L		----	----	<0.002	<0.002	<0.002
Perfluorodecanoic acid (PFDA)	335-76-2	0.0005	µg/L		**0.0027**	**0.0036**	----	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.002	µg/L		----	----	<0.002	<0.002	<0.002
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0005	µg/L		<0.0005	<0.0005	----	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.002	µg/L		----	----	<0.002	<0.002	<0.002
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0005	µg/L		<0.0005	<0.0005	----	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.002	µg/L		----	----	<0.002	<0.002	<0.002
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0005	µg/L		<0.0005	<0.0005	----	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.002	µg/L		----	----	<0.002	<0.002	<0.002
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	µg/L		<0.0005	<0.0005	----	----	----
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	0.0005	µg/L		<0.0005	<0.0005	----	----	----
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.002	µg/L		----	----	**0.005**	<0.002	<0.002
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.001	µg/L		<0.001	<0.001	----	----	----
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	0.001	µg/L		<0.001	<0.001	----	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.005	µg/L		----	----	<0.005	<0.005	<0.005
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.001	µg/L		<0.001	<0.001	----	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.005	µg/L		----	----	<0.005	<0.005	<0.005

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	TW_SW1_190829	TW_SW2_190829	TW_QC112_190829	TW_QC305_190829	TW_QC306_190830
				Client sampling date / time	29-Aug-2019 13:50	29-Aug-2019 14:15	29-Aug-2019 00:00	29-Aug-2019 00:00	30-Aug-2019 00:00
Compound	CAS Number	LOR	Unit		EB1922854-008	EB1922854-009	EB1922854-011	EB1922854-012	EB1922854-013
					Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.001	µg/L		<0.001	<0.001	----	----	----
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	0.0005	µg/L		<0.0005	**0.0005**	----	----	----
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	0.0005	µg/L		<0.0005	<0.0005	----	----	----
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	0.001	µg/L		<0.001	<0.001	----	----	----
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	0.001	µg/L		**0.068**	**0.096**	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.005	µg/L		----	----	**0.047**	<0.005	<0.005
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.001	µg/L		**0.005**	**0.003**	----	----	----
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	0.001	µg/L		<0.001	<0.001	----	----	----
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	----	0.0003	µg/L		**1.84**	**2.92**	----	----	----
Sum of PFAS	----	0.002	µg/L		----	----	**8.74**	<0.002	<0.002

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	TW_SW1_190829	TW_SW2_190829	TW_QC112_190829	TW_QC305_190829	TW_QC306_190830
				Client sampling date / time	29-Aug-2019 13:50	29-Aug-2019 14:15	29-Aug-2019 00:00	29-Aug-2019 00:00	30-Aug-2019 00:00
Compound	CAS Number	LOR	Unit		EB1922854-008	EB1922854-009	EB1922854-011	EB1922854-012	EB1922854-013
					Result	Result	Result	Result	Result
EP231P: PFAS Sums - Continued									
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0003	µg/L		**0.672**	**1.09**	**----**	**----**	**----**
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.002	µg/L		**----**	**----**	**6.37**	<0.002	<0.002
Sum of PFAS (WA DER List)	----	0.0003	µg/L		**1.65**	**2.53**	**----**	**----**	**----**
Sum of PFAS (WA DER List)	----	0.002	µg/L		**----**	**----**	**8.03**	<0.002	<0.002
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.0005	%		**84.2**	**80.4**	**----**	**----**	**----**
13C4-PFOS	----	0.002	%		**----**	**----**	**94.9**	**76.0**	**76.6**
13C8-PFOA	----	0.0005	%		**93.6**	**98.9**	**----**	**----**	**----**
13C8-PFOA	----	0.002	%		**----**	**----**	**97.9**	**87.1**	**85.3**

Surrogate Control Limits

Sub-Matrix: SOIL		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	130
13C8-PFOA	----	60	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	: **EB1922854**	Page	: 1 of 15
Amendment	: **2**		
Client	: **AECOM Australia Pty Ltd**	Laboratory	: Environmental Division Brisbane
Contact	: JAMES PEACHEY	Contact	: Carsten Emrich
Address	: PO BOX 1307 FORTITUDE VALLEY QLD, AUSTRALIA 4006	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: ----	Telephone	: +61 7 3552 8616
Project	: 60609758	Date Samples Received	: 30-Aug-2019
Order number	: 60609758 2.0	Date Analysis Commenced	: 02-Sep-2019
C-O-C number	: ----	Issue Date	: 18-Nov-2019
Sampler	: NEM KRCO		
Site	: TOOWOOMBA		
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*
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW
Matt Frost	Assistant Laboratory Manager	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: 2561992)									
EB1922827-001	Anonymous	EA055: Moisture Content	----	0.1	%	16.2	15.8	1.96	0% - 20%
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 2557737)									
EB1922771-004	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	0.0002	0.0003	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	0.0010	0.0007	28.2	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	0.0028	# 0.0011	87.8	0% - 50%
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
EB1922843-007	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	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 2557737)									
EB1922771-004	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	0.0005	0.0002	80.3	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit

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: 2557737) - continued									
EB1922771-004	Anonymous	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
EB1922843-007	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	0.0012	0.0014	15.2	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	0.0009	0.0011	16.1	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.00	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 2557737)									
EB1922771-004	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
EB1922843-007	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: 2557737)									

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: 2557737) - continued									
EB1922771-004	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
EB1922843-007	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: 2557725)									
EB1922854-001	TW_MW01_190830	EP231X-LL: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.002	µg/L	0.006	0.006	0.00	No Limit
		EP231X-LL: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.002	µg/L	0.006	0.005	0.00	No Limit
		EP231X-LL: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.002	µg/L	0.067	0.069	2.92	0% - 20%
		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	0.046	0.046	0.00	0% - 20%
		EP231X-LL: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.002	µg/L	<0.002	<0.002	0.00	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 2578804)									
ES1928912-001	Anonymous	EP231X-ST: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0003	µg/L	<0.0003	<0.0003	0.00	No Limit
		EP231X-ST: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0005	µg/L	<0.0005	<0.0005	0.00	No Limit
		EP231X-ST: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0005	µg/L	<0.0005	<0.0005	0.00	No Limit
		EP231X-ST: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0005	µg/L	<0.0005	0.0005	0.00	No Limit
		EP231X-ST: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0005	µg/L	<0.0005	<0.0005	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: 2578804) - continued									
ES1928912-001	Anonymous	EP231X-ST: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0005	µg/L	<0.0005	<0.0005	0.00	No Limit
ES1928928-002	Anonymous	EP231X-ST: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0003	µg/L	0.0042	0.0047	10.7	0% - 50%
		EP231X-ST: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0005	µg/L	0.0008	0.0009	16.5	No Limit
		EP231X-ST: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0005	µg/L	<0.0005	0.0005	0.00	No Limit
		EP231X-ST: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0005	µg/L	0.0039	0.0047	19.2	No Limit
		EP231X-ST: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0005	µg/L	<0.0005	<0.0005	0.00	No Limit
		EP231X-ST: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0005	µg/L	<0.0005	<0.0005	0.00	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 2557725)									
EB1922854-001	TW_MW01_190830	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
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 2578804)									
ES1928912-001	Anonymous	EP231X-ST: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0005	µg/L	<0.0005	<0.0005	0.00	No Limit
		EP231X-ST: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0005	µg/L	<0.0005	<0.0005	0.00	No Limit
		EP231X-ST: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0005	µg/L	<0.0005	<0.0005	0.00	No Limit
		EP231X-ST: Perfluorooctanoic acid (PFOA)	335-67-1	0.0005	µg/L	<0.0005	<0.0005	0.00	No Limit
		EP231X-ST: Perfluorononanoic acid (PFNA)	375-95-1	0.0005	µg/L	<0.0005	<0.0005	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

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: 2578804) - continued									
ES1928928-002	Anonymous	EP231X-ST: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0005	µg/L	0.0010	0.0011	0.00	No Limit
		EP231X-ST: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0005	µg/L	0.0013	0.0014	10.2	No Limit
		EP231X-ST: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0005	µg/L	0.0006	0.0006	0.00	No Limit
		EP231X-ST: Perfluorooctanoic acid (PFOA)	335-67-1	0.0005	µg/L	<0.0005	0.0005	0.00	No Limit
		EP231X-ST: Perfluorononanoic acid (PFNA)	375-95-1	0.0005	µg/L	<0.0005	<0.0005	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	0.004	63.5	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 2557725)									
EB1922854-001	TW_MW01_190830	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
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 2578804)									
ES1928912-001	Anonymous	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

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: 2578804) - continued									
ES1928928-002	Anonymous	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
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 2557725)									
EB1922854-001	TW_MW01_190830	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
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 2578804)									
ES1928912-001	Anonymous	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	<0.001	<0.001	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
ES1928928-002	Anonymous	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	<0.001	<0.001	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
EP231P: PFAS Sums (QC Lot: 2557725)									

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP231P: PFAS Sums (QC Lot: 2557725) - continued									
EB1922854-001	TW_MW01_190830	EP231X-LL: Sum of PFAS	----	0.002	µg/L	0.125	0.126	0.797	0% - 20%
		EP231X-LL: Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.002	µg/L	0.113	0.115	1.75	0% - 20%
		EP231X-LL: Sum of PFAS (WA DER List)	----	0.002	µg/L	0.119	0.121	1.67	0% - 20%
EP231P: PFAS Sums (QC Lot: 2578804)									
ES1928912-001	Anonymous	EP231X-ST: Sum of PFAS	----	0.0003	µg/L	<0.0003	0.0005	50.0	No Limit
ES1928928-002	Anonymous	EP231X-ST: Sum of PFAS	----	0.0003	µg/L	0.0118	# 0.0184	43.7	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: 2557737)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	0.0011 mg/kg	115	57	121
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	0.00117 mg/kg	123	55	125
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	0.00118 mg/kg	114	52	126
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	0.00119 mg/kg	119	54	123
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	0.00116 mg/kg	108	55	127
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	0.0012 mg/kg	123	54	125
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 2557737)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	0.00625 mg/kg	83.9	34	108
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	110	54	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	115	58	127
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	106	57	128
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	107	60	134
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	106	63	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	0.00125 mg/kg	111	55	130
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	117	62	130
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	118	53	134
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	86.8	49	129
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	104	59	129
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 2557737)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	97.2	52	132
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	0.00312 mg/kg	113	48	115
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	96.2	49	107
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	68.6	40	107
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	73.6	48	104
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	112	61	130
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	107	55	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 2557737)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	0.00116 mg/kg	112	54	130
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	0.00118 mg/kg	119	61	130
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	0.00119 mg/kg	126	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: 2557737) - continued								
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	0.0012 mg/kg	99.6	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: 2557725)								
EP231X-LL: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.002	µg/L	<0.002	0.0442 µg/L	102	50	130
EP231X-LL: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.002	µg/L	<0.002	0.0469 µg/L	96.6	50	130
EP231X-LL: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.002	µg/L	<0.002	0.0473 µg/L	105	50	130
EP231X-LL: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.002	µg/L	<0.002	0.0476 µg/L	111	50	130
EP231X-LL: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.002	µg/L	<0.002	0.0464 µg/L	80.0	50	130
EP231X-LL: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.002	µg/L	<0.002	0.0482 µg/L	77.0	40	130
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 2578804)								
EP231X-ST: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0005	µg/L	<0.0005	0.01 µg/L	63.6	50	130
EP231X-ST: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0005	µg/L	<0.0005	0.01 µg/L	69.6	50	130
EP231X-ST: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0005	µg/L	<0.0005	0.01 µg/L	60.2	50	130
EP231X-ST: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0005	µg/L	<0.0005	0.01 µg/L	75.6	50	130
EP231X-ST: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0003	µg/L	<0.0003	0.01 µg/L	50.0	50	130
EP231X-ST: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0005	µg/L	<0.0005	0.01 µg/L	55.8	50	130
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 2557725)								
EP231X-LL: Perfluorobutanoic acid (PFBA)	375-22-4	0.01	µg/L	<0.01	0.25 µg/L	81.4	50	130
EP231X-LL: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.002	µg/L	<0.002	0.05 µg/L	90.4	50	130
EP231X-LL: Perfluorohexanoic acid (PFHxA)	307-24-4	0.002	µg/L	<0.002	0.05 µg/L	96.8	50	130
EP231X-LL: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.002	µg/L	<0.002	0.05 µg/L	102	50	130
EP231X-LL: Perfluorooctanoic acid (PFOA)	335-67-1	0.002	µg/L	<0.002	0.05 µg/L	94.6	50	130
EP231X-LL: Perfluorononanoic acid (PFNA)	375-95-1	0.002	µg/L	<0.002	0.05 µg/L	99.2	50	130
EP231X-LL: Perfluorodecanoic acid (PFDA)	335-76-2	0.002	µg/L	<0.002	0.05 µg/L	92.0	50	130
EP231X-LL: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.002	µg/L	<0.002	0.05 µg/L	83.2	40	130
EP231X-LL: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.002	µg/L	<0.002	0.05 µg/L	86.0	40	130
EP231X-LL: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.002	µg/L	<0.002	0.05 µg/L	107	40	130
EP231X-LL: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.005	µg/L	<0.005	0.125 µg/L	123	40	130
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 2578804)								
EP231X-ST: Perfluorobutanoic acid (PFBA)	375-22-4	0.002	µg/L	<0.002	0.05 µg/L	68.2	30	130
EP231X-ST: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0005	µg/L	<0.0005	0.01 µg/L	73.6	50	130
EP231X-ST: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0005	µg/L	<0.0005	0.01 µg/L	71.2	50	130
EP231X-ST: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0005	µg/L	<0.0005	0.01 µg/L	82.4	50	130
EP231X-ST: Perfluorooctanoic acid (PFOA)	335-67-1	0.0005	µg/L	<0.0005	0.01 µg/L	88.4	50	130
EP231X-ST: Perfluorononanoic acid (PFNA)	375-95-1	0.0005	µg/L	<0.0005	0.01 µg/L	77.4	50	130
EP231X-ST: Perfluorodecanoic acid (PFDA)	335-76-2	0.0005	µg/L	<0.0005	0.01 µg/L	60.8	50	130

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 2578804) - continued								
EP231X-ST: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0005	µg/L	<0.0005	0.01 µg/L	48.6	40	130
EP231X-ST: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0005	µg/L	<0.0005	0.01 µg/L	54.6	40	130
EP231X-ST: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0005	µg/L	<0.0005	0.01 µg/L	57.0	40	130
EP231X-ST: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	µg/L	<0.0005	0.025 µg/L	58.3	40	130
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 2557725)								
EP231X-LL: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.002	µg/L	<0.002	0.05 µg/L	83.8	40	130
EP231X-LL: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.005	µg/L	<0.005	0.125 µg/L	78.3	40	130
EP231X-LL: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.005	µg/L	<0.005	0.125 µg/L	75.8	40	130
EP231X-LL: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.005	µg/L	<0.005	0.125 µg/L	76.5	50	130
EP231X-LL: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.005	µg/L	<0.005	0.125 µg/L	86.2	40	130
EP231X-LL: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.002	µg/L	<0.002	0.05 µg/L	84.0	50	130
EP231X-LL: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.002	µg/L	<0.002	0.05 µg/L	89.4	40	130
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 2578804)								
EP231X-ST: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0005	µg/L	<0.0005	0.01 µg/L	60.2	40	130
EP231X-ST: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.001	µg/L	<0.001	0.025 µg/L	70.0	40	130
EP231X-ST: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.001	µg/L	<0.001	0.025 µg/L	48.6	40	130
EP231X-ST: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.001	µg/L	<0.001	0.025 µg/L	65.0	40	130
EP231X-ST: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.001	µg/L	<0.001	0.025 µg/L	56.7	40	130
EP231X-ST: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0005	µg/L	<0.0005	0.01 µg/L	72.2	40	130
EP231X-ST: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0005	µg/L	<0.0005	0.01 µg/L	88.6	40	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 2557725)								
EP231X-LL: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.005	µg/L	<0.005	0.0467 µg/L	108	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	97.2	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	94.2	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	70.5	50	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 2578804)								
EP231X-ST: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.001	µg/L	<0.001	0.01 µg/L	83.6	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	91.0	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	50.2	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
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 2578804) - continued								
EP231X-ST: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.001	µg/L	<0.001	0.01 µg/L	62.0	50	130
EP231P: PFAS Sums (QCLot: 2557725)								
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: 2578804)								
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: 2557737)							
EB1922771-005	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.00125 mg/kg	# 29.8	57	121
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.00125 mg/kg	64.6	55	125
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.00125 mg/kg	# Not Determined	52	126
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.00125 mg/kg	109	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	82.8	54	125
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 2557737)							
EB1922771-005	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.00625 mg/kg	62.9	52	128
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.00125 mg/kg	88.7	54	129
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.00125 mg/kg	# 48.0	58	127
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.00125 mg/kg	83.2	57	128
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.00125 mg/kg	93.5	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	84.8	55	130
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.00125 mg/kg	84.4	62	130
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.00125 mg/kg	82.8	53	134
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.00125 mg/kg	60.4	49	129
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.00312 mg/kg	77.9	59	129
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 2557737)							

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
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 2557737) - continued							
EB1922771-005	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.00125 mg/kg	79.2	52	132
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.00312 mg/kg	# 50.5	65	126
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.00312 mg/kg	# 43.7	64	126
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.00312 mg/kg	# 55.1	63	124
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.00312 mg/kg	59.6	58	125
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.00125 mg/kg	85.2	61	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.00125 mg/kg	86.4	55	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 2557737)							
EB1922771-005	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.00125 mg/kg	84.4	54	130
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.00125 mg/kg	88.8	61	130
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.00125 mg/kg	90.0	62	130
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.00125 mg/kg	73.6	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: 2557725)							
EB1922854-002	TW_MW02_190830	EP231X-LL: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.05 µg/L	# Not Determined	50	130
		EP231X-LL: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.5 µg/L	88.4	50	130
		EP231X-LL: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.5 µg/L	# Not Determined	50	130
		EP231X-LL: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.5 µg/L	93.4	50	130
		EP231X-LL: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.5 µg/L	# Not Determined	50	130
		EP231X-LL: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.05 µg/L	79.0	40	130
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 2578804)							
ES1928912-002	Anonymous	EP231X-ST: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.01 µg/L	52.2	50	130
		EP231X-ST: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.01 µg/L	53.0	50	130
		EP231X-ST: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.01 µg/L	69.2	50	130
		EP231X-ST: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.01 µg/L	61.8	50	130
		EP231X-ST: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01 µg/L	59.8	50	130
		EP231X-ST: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.01 µg/L	33.2	30	130
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 2557725)							

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: 2557725) - continued							
EB1922854-002	TW_MW02_190830	EP231X-LL: Perfluorobutanoic acid (PFBA)	375-22-4	0.25 µg/L	67.7	50	130
		EP231X-LL: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.05 µg/L	70.6	50	130
		EP231X-LL: Perfluorohexanoic acid (PFHxA)	307-24-4	0.05 µg/L	# Not Determined	50	130
		EP231X-LL: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.05 µg/L	79.4	50	130
		EP231X-LL: Perfluorooctanoic acid (PFOA)	335-67-1	0.05 µg/L	77.0	50	130
		EP231X-LL: Perfluorononanoic acid (PFNA)	375-95-1	0.05 µg/L	76.0	50	130
		EP231X-LL: Perfluorodecanoic acid (PFDA)	335-76-2	0.05 µg/L	74.2	50	130
		EP231X-LL: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.05 µg/L	72.8	40	130
		EP231X-LL: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.05 µg/L	70.4	40	130
		EP231X-LL: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.05 µg/L	91.2	40	130
		EP231X-LL: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.125 µg/L	94.2	40	130
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 2578804)							
ES1928912-002	Anonymous	EP231X-ST: Perfluorobutanoic acid (PFBA)	375-22-4	0.05 µg/L	71.6	30	130
		EP231X-ST: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.01 µg/L	69.6	50	130
		EP231X-ST: Perfluorohexanoic acid (PFHxA)	307-24-4	0.01 µg/L	60.4	50	130
		EP231X-ST: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.01 µg/L	71.8	50	130
		EP231X-ST: Perfluorooctanoic acid (PFOA)	335-67-1	0.01 µg/L	81.6	50	130
		EP231X-ST: Perfluorononanoic acid (PFNA)	375-95-1	0.01 µg/L	76.0	50	130
		EP231X-ST: Perfluorodecanoic acid (PFDA)	335-76-2	0.01 µg/L	65.2	50	130
		EP231X-ST: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.01 µg/L	45.0	30	130
		EP231X-ST: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.01 µg/L	34.2	30	130
		EP231X-ST: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.01 µg/L	# 22.8	30	130
		EP231X-ST: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.025 µg/L	# 10.6	30	130
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 2557725)							
EB1922854-002	TW_MW02_190830	EP231X-LL: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.05 µg/L	71.2	40	130
		EP231X-LL: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.125 µg/L	56.2	40	130
		EP231X-LL: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.125 µg/L	65.9	40	130
		EP231X-LL: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.125 µg/L	65.0	50	130
		EP231X-LL: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.125 µg/L	69.4	40	130
		EP231X-LL: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.05 µg/L	71.6	50	130
		EP231X-LL: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.05 µg/L	71.0	40	130
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 2578804)							

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: 2578804) - continued							
ES1928912-002	Anonymous	EP231X-ST: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.01 µg/L	62.8	30	130
		EP231X-ST: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.025 µg/L	37.4	30	130
		EP231X-ST: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.025 µg/L	44.7	30	130
		EP231X-ST: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.025 µg/L	62.6	30	130
		EP231X-ST: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.025 µg/L	53.3	30	130
		EP231X-ST: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.01 µg/L	68.2	30	130
		EP231X-ST: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.01 µg/L	75.8	30	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 2557725)							
EB1922854-002	TW_MW02_190830	EP231X-LL: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05 µg/L	91.8	50	130
		EP231X-LL: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05 µg/L	83.2	50	130
		EP231X-LL: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05 µg/L	90.4	50	130
		EP231X-LL: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05 µg/L	74.8	50	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 2578804)							
ES1928912-002	Anonymous	EP231X-ST: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.01 µg/L	85.2	50	130
		EP231X-ST: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.01 µg/L	87.2	50	130
		EP231X-ST: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.01 µg/L	65.4	50	130
		EP231X-ST: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.01 µg/L	59.2	50	130

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EB1922854**	Page	: 1 of 7
Amendment	: **2**		
Client	: **AECOM Australia Pty Ltd**	Laboratory	: Environmental Division Brisbane
Contact	: JAMES PEACHEY	Telephone	: +61 7 3552 8616
Project	: 60609758	Date Samples Received	: 30-Aug-2019
Site	: TOOWOOMBA	Issue Date	: 18-Nov-2019
Sampler	: NEM KRCO	No. of samples received	: 13
Order number	: 60609758 2.0	No. of samples analysed	: 13

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

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

Summary of Outliers

Outliers : Quality Control Samples

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

- **NO Method Blank value outliers occur.**
- **NO Laboratory Control outliers occur.**
- **Duplicate 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							
EP231A: Perfluoroalkyl Sulfonic Acids	EB1922771--004	Anonymous	**Perfluorooctane sulfonic acid (PFOS)**	1763-23-1	87.8 %	0% - 50%	**RPD exceeds LOR based limits**
Matrix Spike (MS) Recoveries							
EP231A: Perfluoroalkyl Sulfonic Acids	EB1922771--005	Anonymous	**Perfluorobutane sulfonic acid (PFBS)**	375-73-5	29.8 %	57-121%	**Recovery less than lower data quality objective**
EP231A: Perfluoroalkyl Sulfonic Acids	EB1922771--005	Anonymous	**Perfluorohexane sulfonic acid (PFHxS)**	355-46-4	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EP231A: Perfluoroalkyl Sulfonic Acids	EB1922771--005	Anonymous	**Perfluorooctane sulfonic acid (PFOS)**	1763-23-1	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EP231B: Perfluoroalkyl Carboxylic Acids	EB1922771--005	Anonymous	**Perfluorohexanoic acid (PFHxA)**	307-24-4	48.0 %	58-127%	**Recovery less than lower data quality objective**
EP231C: Perfluoroalkyl Sulfonamides	EB1922771--005	Anonymous	**N-Methyl perfluorooctane sulfonamide (MeFOSA)**	31506-32-8	50.5 %	65-126%	**Recovery less than lower data quality objective**
EP231C: Perfluoroalkyl Sulfonamides	EB1922771--005	Anonymous	**N-Ethyl perfluorooctane sulfonamide (EtFOSA)**	4151-50-2	43.7 %	64-126%	**Recovery less than lower data quality objective**
EP231C: Perfluoroalkyl Sulfonamides	EB1922771--005	Anonymous	**N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)**	24448-09-7	55.1 %	63-124%	**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							
EP231P: PFAS Sums	ES1928928--002	Anonymous	**Sum of PFAS**	----	43.7 %	0% - 20%	**RPD exceeds LOR based limits**
Matrix Spike (MS) Recoveries							
EP231A: Perfluoroalkyl Sulfonic Acids	EB1922854--002	TW_MW02_190830	**Perfluorobutane sulfonic acid (PFBS)**	375-73-5	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EP231A: Perfluoroalkyl Sulfonic Acids	EB1922854--002	TW_MW02_190830	**Perfluorohexane sulfonic acid (PFHxS)**	355-46-4	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EP231A: Perfluoroalkyl Sulfonic Acids	EB1922854--002	TW_MW02_190830	**Perfluorooctane sulfonic acid (PFOS)**	1763-23-1	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries - Continued							
EP231B: Perfluoroalkyl Carboxylic Acids	EB1922854--002	TW_MW02_190830	**Perfluorohexanoic acid (PFHxA)**	307-24-4	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EP231B: Perfluoroalkyl Carboxylic Acids	ES1928912--002	Anonymous	**Perfluorotridecanoic acid (PFTrDA)**	72629-94-8	22.8 %	30-130%	**Recovery less than lower data quality objective**
EP231B: Perfluoroalkyl Carboxylic Acids	ES1928912--002	Anonymous	**Perfluorotetradecanoic acid (PFTeDA)**	376-06-7	10.6 %	30-130%	**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)								
TW_SED01_190829, TW_QC111_190829	TW_SED02_190829,	**29-Aug-2019**	**----**	----	----	**03-Sep-2019**	12-Sep-2019	✓
EP231A: Perfluoroalkyl Sulfonic Acids								
HDPE Soil Jar (EP231X)								
TW_SED01_190829, TW_QC111_190829	TW_SED02_190829,	**29-Aug-2019**	**02-Sep-2019**	25-Feb-2020	✓	**03-Sep-2019**	12-Oct-2019	✓
EP231B: Perfluoroalkyl Carboxylic Acids								
HDPE Soil Jar (EP231X)								
TW_SED01_190829, TW_QC111_190829	TW_SED02_190829,	**29-Aug-2019**	**02-Sep-2019**	25-Feb-2020	✓	**03-Sep-2019**	12-Oct-2019	✓
EP231C: Perfluoroalkyl Sulfonamides								
HDPE Soil Jar (EP231X)								
TW_SED01_190829, TW_QC111_190829	TW_SED02_190829,	**29-Aug-2019**	**02-Sep-2019**	25-Feb-2020	✓	**03-Sep-2019**	12-Oct-2019	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
HDPE Soil Jar (EP231X)								
TW_SED01_190829, TW_QC111_190829	TW_SED02_190829,	**29-Aug-2019**	**02-Sep-2019**	25-Feb-2020	✓	**03-Sep-2019**	12-Oct-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
EP231P: PFAS Sums							
HDPE Soil Jar (EP231X)							
TW_SED01_190829, TW_QC111_190829	TW_SED02_190829,	**29-Aug-2019**	**02-Sep-2019**	25-Feb-2020	✓	**03-Sep-2019**	12-Oct-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)							
TW_MW03-190829, TW_QC112_190829,	TW_MW05_190829, TW_QC305_190829	**29-Aug-2019**	**03-Sep-2019**	25-Feb-2020	✓	**03-Sep-2019**	25-Feb-2020	✓
HDPE (no PTFE) (EP231X-ST)							
TW_SW1_190829,	TW_SW2_190829	**29-Aug-2019**	**12-Sep-2019**	25-Feb-2020	✓	**12-Sep-2019**	25-Feb-2020	✓
HDPE (no PTFE) (EP231X-LL)							
TW_MW01_190830, TW_MW04_190830,	TW_MW02_190830, TW_QC306_190830	**30-Aug-2019**	**03-Sep-2019**	26-Feb-2020	✓	**03-Sep-2019**	26-Feb-2020	✓
EP231B: Perfluoroalkyl Carboxylic Acids							
HDPE (no PTFE) (EP231X-LL)							
TW_MW03-190829, TW_QC112_190829,	TW_MW05_190829, TW_QC305_190829	**29-Aug-2019**	**03-Sep-2019**	25-Feb-2020	✓	**03-Sep-2019**	25-Feb-2020	✓
HDPE (no PTFE) (EP231X-ST)							
TW_SW1_190829,	TW_SW2_190829	**29-Aug-2019**	**12-Sep-2019**	25-Feb-2020	✓	**12-Sep-2019**	25-Feb-2020	✓
HDPE (no PTFE) (EP231X-LL)							
TW_MW01_190830, TW_MW04_190830,	TW_MW02_190830, TW_QC306_190830	**30-Aug-2019**	**03-Sep-2019**	26-Feb-2020	✓	**03-Sep-2019**	26-Feb-2020	✓
EP231C: Perfluoroalkyl Sulfonamides							
HDPE (no PTFE) (EP231X-LL)							
TW_MW03-190829, TW_QC112_190829,	TW_MW05_190829, TW_QC305_190829	**29-Aug-2019**	**03-Sep-2019**	25-Feb-2020	✓	**03-Sep-2019**	25-Feb-2020	✓
HDPE (no PTFE) (EP231X-ST)							
TW_SW1_190829,	TW_SW2_190829	**29-Aug-2019**	**12-Sep-2019**	25-Feb-2020	✓	**12-Sep-2019**	25-Feb-2020	✓
HDPE (no PTFE) (EP231X-LL)							
TW_MW01_190830, TW_MW04_190830,	TW_MW02_190830, TW_QC306_190830	**30-Aug-2019**	**03-Sep-2019**	26-Feb-2020	✓	**03-Sep-2019**	26-Feb-2020	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE (no PTFE) (EP231X-LL)							
TW_MW03-190829, TW_QC112_190829,	TW_MW05_190829, TW_QC305_190829	**29-Aug-2019**	**03-Sep-2019**	25-Feb-2020	✓	**03-Sep-2019**	25-Feb-2020	✓
HDPE (no PTFE) (EP231X-ST)							
TW_SW1_190829,	TW_SW2_190829	**29-Aug-2019**	**12-Sep-2019**	25-Feb-2020	✓	**12-Sep-2019**	25-Feb-2020	✓
HDPE (no PTFE) (EP231X-LL)							
TW_MW01_190830, TW_MW04_190830,	TW_MW02_190830, TW_QC306_190830	**30-Aug-2019**	**03-Sep-2019**	26-Feb-2020	✓	**03-Sep-2019**	26-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)							
TW_MW03-190829, TW_MW05_190829, TW_QC112_190829, TW_QC305_190829	**29-Aug-2019**	**03-Sep-2019**	25-Feb-2020	✓	**03-Sep-2019**	25-Feb-2020	✓
HDPE (no PTFE) (EP231X-ST)							
TW_SW1_190829, TW_SW2_190829	**29-Aug-2019**	**12-Sep-2019**	25-Feb-2020	✓	**12-Sep-2019**	25-Feb-2020	✓
HDPE (no PTFE) (EP231X-LL)							
TW_MW01_190830, TW_MW02_190830, TW_MW04_190830, TW_QC306_190830	**30-Aug-2019**	**03-Sep-2019**	26-Feb-2020	✓	**03-Sep-2019**	26-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	1	4	**25.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	15	**13.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	15	**6.67**	**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	1	8	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X-ST	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	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X-ST	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	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X-ST	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	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X-ST	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 6.1 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

AECO Q6/190906

Due ~~17/9/19~~ ~~13/9/19~~ 13/9/2019

ANZ

FQM - Generic Chain of Custody Form

AECOM

Q4AN(EV)-007-FM1

CONSULTANT: AECOM	ADDRESS / OFFICE: 540 Wickham St, Fortitude Valley, 4006	SAMPLER: Nem Krco	Destination Laboratory
PROJECT MANAGER (PM): James Peachey	SITE: Toowoomba	MOBILE: 0499 989 474	PHONE:
PROJECT NUMBER & TASK CODE: 60609758	P.O. NO.: 60609758 2.0	EMAIL REPORT TO: camden.mccosker@aecom.com, james.peachey@aecom.com, nem.krco@aecom.com	
RESULTS REQUIRED (Date): 5 Days TAT	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 samples for possible future TOPA analysis.

SAMPLE INFORMATION (note: S = Soil, W=Water) | CONTAINER INFORMATION

ALS ID	SAMPLE ID	MATRIX	DATE	Time	Type / Code	Total bottles	EP231X-LL: PFAS Low Level	EP231X-LL(TOPA): PFAS TOPA Low Level	EP231X-ST: PFAS Full Suite Super Trace	EP231X: PFAS Full Suite	HOLD	Notes: e.g. Highly contaminated samples e.g. "High PAHs expected". Extra volume for QC or trace LORs etc.
	TW_GW01_190830	W	30/8/19	11:10	1P	1	X					
	TW_GW02_190830	W	30/8/19	10:10	1P	1	X					
	TW_GW03_190829	W	29/8/19	17:40	1P	1	X					
	TW_GW04_190830	W	30/8/19	12:00	1P	1	X					
	TW_GW05_190829	W	29/8/19	16:20	1P	1	X					
	TW_SED01_190829	S	29/8/19	13:30	1J	1				X		
	TW_SED02_190829	S	29/8/19	14:00	1J	1				X		
	TW_SW1_190829	W		13:50	1P	1			X			
	TW_SW2_190829	W		14:15	1P	1			X			
	TW_QC111_190829	S	29/8/19		1J	1				X		
	TW-QC211-190829	S	29/8/19		1J	1				X		N19/022728 Forward to NMI Sydney
	TW-QC112-190829	W	29/8/19		1P	1	X					
	TW-QC212-190829	W	29/8/19		1P	1	X					N19/022729 Forward to NMI Sydney
	TW-QC305-190829	W	29/8/19		1P	1	X					
	TW-QC306-190830	W	30/8/19		1P	1	X					

RELINQUISHED BY:		RECEIVED BY		RECEIVED BY		METHOD OF SHIPMENT
Name: Nem Krco	Date: 30/8/19	Name: Liam C	Date: 30/8/19	Name:	Date:	Con' Note No:
Of:	Time: 16:00	Of: AES	Time: 16:00	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

RECEIVED 05 SEP 2019

COC Page of

BY: ..N.N.....LL.L.S

Australian Government
Department of Industry, Innovation and Science

National Measurement Institute

SAMPLE RECEIPT NOTIFICATION

CUSTOMER DETAILS

Attention: CAMDEN MCCOSKER

Customer: AECOM AUSTRALIA PTY LTD

Address: LEVEL 8
FORTITUDE VALLEY QLD 4006

Email: camden.mccosker@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: **AECO06/190906**

Total No. of Samples: **2**

LRNs	Customer Sample ID	Lab Sample Description
N19/022728	TW_QC211_190829	SOIL 29/8/19
N19/022729	TW_QC212_190829	WATER 29/8/19

SAMPLE RECEIVED CONDITION

Date samples received: 6-SEP-2019

Sample received in good order: Yes

NMI Quotation no. provided:

Client purchase order number: 60609758

Temperature of samples: Chilled

Comments: all ok

Estimated report date: 13-SEP-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

Client	: AECOM AUSTRALIA PTY LTD	**Job No.**	: AECO06/190906
	LEVEL 8	**Quote No.**	: QT-02018
	540 WICKHAM STREET	**Order No.**	: 60609758
		Date Received	: 06-SEP-2019
Attention	: CAMDEN MCCOSKER	**Sampled By**	: CLIENT
Project Name	: 60609758		
Your Client Services Manager	: Richard Coghlan	**Phone**	: 02 9449 0161

Lab Reg No.	Sample Ref	Sample Description
N19/022728	TW_QC211_190829	SOIL 29/8/19

Lab Reg No.		N19/022728				
Date Sampled		29-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	<0.001				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	0.0073				NR70
PFHpS (375-92-8)	mg/kg	<0.001				NR70
PFOS (1763-23-1)	mg/kg	0.048				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
N-EtFOSE (1691-99-2)	mg/kg	<0.005				NR70
4:2 FTS (757124-72-4)	mg/kg	<0.001				NR70

REPORT OF ANALYSIS

Lab Reg No.		N19/022728				
Date Sampled		29-AUG-2019				
	Units					Method
PFAS (per-and poly-fluoroalkyl substances)						
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)	%	116				NR70
PFPeA (Surrogate Recovery)	%	119				NR70
PFHxA (Surrogate Recovery)	%	117				NR70
PFHpA (Surrogate Recovery)	%	117				NR70
PFOA (Surrogate Recovery)	%	111				NR70
PFNA (Surrogate Recovery)	%	86				NR70
PFDA (Surrogate Recovery)	%	119				NR70
PFUdA (Surrogate Recovery)	%	103				NR70
PFDoA (Surrogate Recovery)	%	102				NR70
PFTeDA (Surrogate Recovery)	%	82				NR70
PFHxDA (Surrogate Recovery)	%	126				NR70
FOUEA (Surrogate Recovery)	%	119				NR70
PFBS (Surrogate Recovery)	%	120				NR70
PFHxS (Surrogate Recovery)	%	118				NR70
PFOS (Surrogate Recovery)	%	123				NR70
PFOSA (Surrogate Recovery)	%	100				NR70
N-MeFOSA (Surrogate Recovery)	%	90				NR70
N-EtFOSA (Surrogate Recovery)	%	86				NR70
N-MeFOSAA (Surrogate Recovery)	%	105				NR70
N-EtFOSAA (Surrogate Recovery)	%	114				NR70
N-MeFOSE (Surrogate Recovery)	%	80				NR70
N-EtFOSE (Surrogate Recovery)	%	72				NR70
4:2 FTS (Surrogate Recovery)	%	124				NR70
6:2 FTS (Surrogate Recovery)	%	124				NR70
8:2 FTS (Surrogate Recovery)	%	110				NR70
8:2 diPAP (Surrogate Recovery)	%	196				NR70
Dates						
Date extracted		5-SEP-2019				
Date analysed		10-SEP-2019				

N19/022728
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.

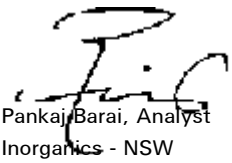
REPORT OF ANALYSIS

Lab Reg No.		N19/022728				
Date Sampled		29-AUG-2019				
	Units					Method

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

13-SEP-2019

Lab Reg No.		N19/022728				
Date Sampled		29-AUG-2019				
	Units					Method
Trace Elements						
Total Solids	%	53.9				NT2_49



Pankaj Barai, Analyst
Inorganics - NSW
Accreditation No. 198

13-SEP-2019

All results are expressed on a dry weight basis.

REPORT OF ANALYSIS

Client	: AECOM AUSTRALIA PTY LTD	**Job No.**	: AECO06/190906
	LEVEL 8	**Quote No.**	: QT-02018
	540 WICKHAM STREET	**Order No.**	: 60609758
		Date Received	: 06-SEP-2019
Attention	: CAMDEN MCCOSKER	**Sampled By**	: CLIENT
Project Name	: 60609758		
Your Client Services Manager	: Richard Coghlan	**Phone**	: 02 9449 0161

Lab Reg No.	Sample Ref	Sample Description
N19/022729	TW_QC212_190829	WATER 29/8/19

Lab Reg No.			N19/022729				
Date Sampled			29-AUG-2019				
		Units					Method
PFAS (per-and poly-fluoroalkyl substances)							
PFBA (375-22-4)		ug/L	0.053				NR70
PFPeA (2706-90-3)		ug/L	0.11				NR70
PFHxA (307-24-4)		ug/L	0.56				NR70
PFHpA (375-85-9)		ug/L	0.12				NR70
PFOA (335-67-1)		ug/L	0.20				NR70
PFNA (375-95-1)		ug/L	<0.001				NR70
PFDA (335-76-2)		ug/L	<0.001				NR70
PFUdA (2058-94-8)		ug/L	<0.001				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	0.65				NR70
PFPeS (2706-91-4)		ug/L	0.58				NR70
PFHxS (355-46-4)		ug/L	3.8				NR70
PFHpS (375-92-8)		ug/L	0.18				NR70
PFOS (1763-23-1)		ug/L	3.4				NR70
PFNS (68259-12-1)		ug/L	<0.001				NR70
PFDS (335-77-3)		ug/L	<0.001				NR70
PFOSA (754-91-6)		ug/L	0.0051				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
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

REPORT OF ANALYSIS

Lab Reg No.			N19/022729				
Date Sampled			29-AUG-2019				
		Units					Method
PFAS (per-and poly-fluoroalkyl substances)							
6:2 FTS (27619-97-2)		ug/L	0.023				NR70
8:2 FTS (39108-34-4)		ug/L	<0.001				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)		%	105				NR70
PFPeA (Surrogate Recovery)		%	90				NR70
PFHxA (Surrogate Recovery)		%	88				NR70
PFHpA (Surrogate Recovery)		%	96				NR70
PFOA (Surrogate Recovery)		%	101				NR70
PFNA (Surrogate Recovery)		%	87				NR70
PFDA (Surrogate Recovery)		%	92				NR70
PFUdA (Surrogate Recovery)		%	90				NR70
PFDoA (Surrogate Recovery)		%	86				NR70
PFTeDA (Surrogate Recovery)		%	87				NR70
PFHxDA (Surrogate Recovery)		%	136				NR70
FOUEA (Surrogate Recovery)		%	70				NR70
PFBS (Surrogate Recovery)		%	91				NR70
PFHxS (Surrogate Recovery)		%	73				NR70
PFOS (Surrogate Recovery)		%	90				NR70
PFOSA (Surrogate Recovery)		%	79				NR70
N-MeFOSA (Surrogate Recovery)		%	64				NR70
N-EtFOSA (Surrogate Recovery)		%	73				NR70
N-MeFOSAA (Surrogate Recovery)		%	113				NR70
N-EtFOSAA (Surrogate Recovery)		%	83				NR70
N-MeFOSE (Surrogate Recovery)		%	106				NR70
N-EtFOSE (Surrogate Recovery)		%	121				NR70
4:2 FTS (Surrogate Recovery)		%	75				NR70
6:2 FTS (Surrogate Recovery)		%	87				NR70
8:2 FTS (Surrogate Recovery)		%	79				NR70
8:2 diPAP (Surrogate Recovery)		%	138				NR70
Dates							
Date extracted			12-SEP-2019				
Date analysed			12-SEP-2019				

N19/022729

PFOS is quantified using a combined branched and linear standard,
linear and branched isomers are totalled for reporting.

REPORT OF ANALYSIS

All results corrected for labelled surrogate recoveries.

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

13-SEP-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: *RN1246201*

Measurement Uncertainty is available upon request.

Australian Government
National Measurement Institute

QUALITY ASSURANCE REPORT

Client: AECOM

NMI QA Report No: AECO06/190906 **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	107	NA
PFPeA (2706-90-3)	NR70	0.002	<0.002	NA	NA	NA	107	NA
PFHxA (307-24-4)	NR70	0.001	<0.001	NA	NA	NA	105	NA
PFHpA (375-85-9)	NR70	0.001	<0.001	NA	NA	NA	99	NA
PFOA (335-67-1)	NR70	0.001	<0.001	NA	NA	NA	101	NA
PFNA (375-95-1)	NR70	0.001	<0.001	NA	NA	NA	99	NA
PFDA (335-76-2)	NR70	0.001	<0.001	NA	NA	NA	90	NA
PFUdA (2058-94-8)	NR70	0.002	<0.002	NA	NA	NA	97	NA
PFDoA (307-55-1)	NR70	0.002	<0.002	NA	NA	NA	96	NA
PFTrDA (72629-94-8)	NR70	0.002	<0.002	NA	NA	NA	85	NA
PFTeDA (376-06-7)	NR70	0.002	<0.002	NA	NA	NA	101	NA
PFHxDA (67905-19-5)	NR70	0.002	<0.002	NA	NA	NA	93	NA
PFODA (16517-11-6)	NR70	0.005	<0.005	NA	NA	NA	104	NA
FOUEA (70887-84-2)	NR70	0.001	<0.001	NA	NA	NA	89	NA
PFBS (375-73-5)	NR70	0.001	<0.001	NA	NA	NA	102	NA
PFPeS (2706-91-4)	NR70	0.001	<0.001	NA	NA	NA	100	NA
PFHxS (355-46-4)	NR70	0.001	<0.001	NA	NA	NA	94	NA
PFHpS (375-92-8)	NR70	0.001	<0.001	NA	NA	NA	94	NA
PFOS (1763-23-1)	NR70	0.002	<0.002	NA	NA	NA	106	NA
PFNS (68259-12-1)	NR70	0.001	<0.001	NA	NA	NA	101	NA
PFDS (335-77-3)	NR70	0.001	<0.001	NA	NA	NA	101	NA
PFOSA (754-91-6)	NR70	0.001	<0.001	NA	NA	NA	101	NA
N-MeFOSA (31506-32-8)	NR70	0.002	<0.002	NA	NA	NA	92	NA
N-EtFOSA (4151-50-2)	NR70	0.002	<0.002	NA	NA	NA	107	NA
N-MeFOSAA (2355-31-9)	NR70	0.002	<0.002	NA	NA	NA	94	NA
N-EtFOSAA(2991-50-6)	NR70	0.002	<0.002	NA	NA	NA	103	NA
N-MeFOSE (24448-09-7)	NR70	0.005	<0.005	NA	NA	NA	99	NA
N-EtFOSE (1691-99-2)	NR70	0.005	<0.005	NA	NA	NA	83	NA
4:2 FTS (757124-72-4)	NR70	0.001	<0.001	NA	NA	NA	100	NA
6:2 FTS (27619-97-2)	NR70	0.001	<0.001	NA	NA	NA	103	NA
8:2 FTS (39108-34-4)	NR70	0.001	<0.001	NA	NA	NA	93	NA
10:2 FTS (120226-60-0)	NR70	0.002	<0.002	NA	NA	NA	98	NA
8:2 diPAP (678-41-1)	NR70	0.002	<0.002	NA	NA	NA	92	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: **11/09/2019**

Australian Government
National Measurement Institute

QUALITY ASSURANCE REPORT

Client: AECOM

NMI QA Report No: AECO06/190906 **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	132	NA
PFPeA (2706-90-3)	NR70	0.002	<0.002	NA	NA	NA	107	NA
PFHxA (307-24-4)	NR70	0.001	<0.001	NA	NA	NA	105	NA
PFHpA (375-85-9)	NR70	0.001	<0.001	NA	NA	NA	98	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	108	NA
PFDA (335-76-2)	NR70	0.001	<0.001	NA	NA	NA	117	NA
PFUdA (2058-94-8)	NR70	0.001	<0.001	NA	NA	NA	102	NA
PFDoA (307-55-1)	NR70	0.001	<0.001	NA	NA	NA	112	NA
PFTrDA (72629-94-8)	NR70	0.002	<0.002	NA	NA	NA	103	NA
PFTeDA (376-06-7)	NR70	0.002	<0.002	NA	NA	NA	113	NA
PFHxDA (67905-19-5)	NR70	0.002	<0.002	NA	NA	NA	100	NA
PFODA (16517-11-6)	NR70	0.005	<0.005	NA	NA	NA	103	NA
FOUEA (70887-84-2)	NR70	0.001	<0.001	NA	NA	NA	101	NA
PFBS (375-73-5)	NR70	0.001	<0.001	NA	NA	NA	104	NA
PFPeS (2706-91-4)	NR70	0.001	<0.001	NA	NA	NA	106	NA
PFHxS (355-46-4)	NR70	0.001	<0.001	NA	NA	NA	103	NA
PFHpS (375-92-8)	NR70	0.001	<0.001	NA	NA	NA	102	NA
PFOS (1763-23-1)	NR70	0.002	<0.002	NA	NA	NA	100	NA
PFNS (68259-12-1)	NR70	0.001	<0.001	NA	NA	NA	95	NA
PFDS (335-77-3)	NR70	0.001	<0.001	NA	NA	NA	91	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	127	NA
N-EtFOSA (4151-50-2)	NR70	0.002	<0.002	NA	NA	NA	94	NA
N-MeFOSAA (2355-31-9)	NR70	0.002	<0.002	NA	NA	NA	130	NA
N-EtFOSAA(2991-50-6)	NR70	0.002	<0.002	NA	NA	NA	115	NA
N-MeFOSE (24448-09-7)	NR70	0.005	<0.005	NA	NA	NA	98	NA
N-EtFOSE (1691-99-2)	NR70	0.005	<0.005	NA	NA	NA	111	NA
4:2 FTS (757124-72-4)	NR70	0.001	<0.001	NA	NA	NA	114	NA
6:2 FTS (27619-97-2)	NR70	0.001	<0.001	NA	NA	NA	90	NA
8:2 FTS (39108-34-4)	NR70	0.001	<0.001	NA	NA	NA	123	NA
10:2 FTS (120226-60-0)	NR70	0.001	<0.001	NA	NA	NA	94	NA
8:2 diPAP (678-41-1)	NR70	0.002	<0.002	NA	NA	NA	101	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: **13/09/2019**

From: Peachey, James <james.peachey@aecom.com>
Sent: Friday, 30 August 2019 9:05 AM
To: Carsten Emrich <Carsten.Emrich@alsglobal.com>
Cc: McCosker, Camden <Camden.McCosker@aecom.com>
Subject: [EXTERNAL] - Rebatch request for ALS Workorder : EB1921880 | Your Reference: 60609758

Hi Carsten

Please can you rebatch sample –002 for TOPA (EP231X-TOP).

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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SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **EB1922827**

Client	: **AECOM Australia Pty Ltd**	Laboratory	: Environmental Division Brisbane
Contact	: CAMDEN McCOSKER	Contact	: Carsten Emrich
Address	: PO BOX 1307 FORTITUDE VALLEY QLD, AUSTRALIA 4006	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 1.0	Page	: 1 of 2
Order number	: 60609758 1.0	Quote number	: EB2019AECOMAU0002 (BN/112/19)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	:		

Dates

Date Samples Received	: 30-Aug-2019 09:05	Issue Date	: 02-Sep-2019
Client Requested Due Date	: 06-Sep-2019	Scheduled Reporting Date	: **06-Sep-2019**

Delivery Details

Mode of Delivery	: Samples On Hand	Security Seal	: Not Available
No. of coolers/boxes	: ----	Temperature	: <6.0°C
Receipt Detail	: REBATCH	No. of samples received / analysed	: 1 / 1

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- 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	SOIL - EA055-103 Moisture Content	SOIL - EP231X (TOP) (solids) PFAS - Total Oxidisable Precursor (TOP) Assay
EB1922827-001	19-Aug-2019 12:55	TW_SS1_0.5_190819	✓	✓

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
- Chain of Custody (CoC) (COC)	Email	camden.mccosker@aecom.com
- EDI Format - ESDAT (ESDAT)	Email	camden.mccosker@aecom.com

James McIntyre

- *AU Certificate of Analysis - NATA (COA)	Email	james.mcintyre@aecom.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	james.mcintyre@aecom.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	james.mcintyre@aecom.com
- Chain of Custody (CoC) (COC)	Email	james.mcintyre@aecom.com
- EDI Format - ESDAT (ESDAT)	Email	james.mcintyre@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
- Chain of Custody (CoC) (COC)	Email	james.peachey@aecom.com
- EDI Format - ESDAT (ESDAT)	Email	james.peachey@aecom.com

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB1922827**	Page	: 1 of 5
Client	: **AECOM Australia Pty Ltd**	Laboratory	: Environmental Division Brisbane
Contact	: CAMDEN McCOSKER	Contact	: Carsten Emrich
Address	: PO BOX 1307 FORTITUDE VALLEY QLD, AUSTRALIA 4006	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: ----	Telephone	: +61 7 3552 8616
Project	: 60609758 1.0	Date Samples Received	: 30-Aug-2019 09:05
Order number	: 60609758 1.0	Date Analysis Commenced	: 03-Sep-2019
C-O-C number	: ----	Issue Date	: 06-Sep-2019 08:25
Sampler	: ----		
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 Inorganics, Stafford, QLD
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.

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	TW_SS1_0.5_190819	----	----	----	----
			Client sampling date / time	19-Aug-2019 12:55	----	----	----	----
Compound	CAS Number	LOR	Unit	EB1922827-001	--------	--------	--------	--------
				Result	----	----	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	**16.2**	----	----	----	----
EP231_TOP_A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	**0.0003**	----	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	**0.0002**	----	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	**0.0072**	----	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	**0.0012**	----	----	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	**0.599**	----	----	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	**0.0025**	----	----	----	----
EP231_TOP_B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	**0.007**	----	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	**0.0171**	----	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	**0.0144**	----	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	**0.0030**	----	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	**0.0066**	----	----	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	**0.0004**	----	----	----	----
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	TW_SS1_0.5_190819	----	----	----	----
				Client sampling date / time	19-Aug-2019 12:55	----	----	----	----
Compound	CAS Number	LOR	Unit		EB1922827-001	--------	--------	--------	--------
					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		**0.659**	----	----	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg		**0.606**	----	----	----	----
Sum of TOP C4 - C14 Carboxylates and C4 - C8 Sulfonates	----	0.0002	mg/kg		**0.656**	----	----	----	----
Sum of TOP C4 - C14 as Fluorine	----	0.0002	mg/kg		**0.426**	----	----	----	----
EP231_TOP_S: PFAS Surrogate									
13C4-PFOS	----	0.0002	%		**74.0**	----	----	----	----
13C8-PFOA	----	0.0002	%		**79.0**	----	----	----	----

Surrogate Control Limits

Sub-Matrix: **SOIL**

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

QUALITY CONTROL REPORT

Work Order	: **EB1922827**	Page	: 1 of 5
Client	: **AECOM Australia Pty Ltd**	Laboratory	: Environmental Division Brisbane
Contact	: CAMDEN McCOSKER	Contact	: Carsten Emrich
Address	: PO BOX 1307 FORTITUDE VALLEY QLD, AUSTRALIA 4006	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: ----	Telephone	: +61 7 3552 8616
Project	: 60609758 1.0	Date Samples Received	: 30-Aug-2019
Order number	: 60609758 1.0	Date Analysis Commenced	: 03-Sep-2019
C-O-C number	: ----	Issue Date	: 06-Sep-2019
Sampler	: ----		
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 Inorganics, Stafford, QLD
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: **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: 2561992)									
EB1922827-001	TW_SS1_0.5_190819	EA055: Moisture Content	----	0.1	%	16.2	15.8	1.96	0% - 20%
EP231_TOP_A: Perfluoroalkyl Sulfonic Acids (QC Lot: 2560011)									
EB1922827-001	TW_SS1_0.5_190819	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	0.0003	0.0004	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	0.0072	0.0087	19.6	0% - 20%
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	0.0012	0.0015	20.6	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	0.599	0.687	13.7	0% - 20%
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	0.0025	0.0030	21.0	0% - 50%
EP231_TOP_B: Perfluoroalkyl Carboxylic Acids (QC Lot: 2560011)									
EB1922827-001	TW_SS1_0.5_190819	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	0.0171	0.0189	9.76	0% - 20%
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	0.0144	0.0162	11.6	0% - 20%
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	0.0030	0.0034	13.3	0% - 50%
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	0.0066	0.0080	19.2	0% - 20%
		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	<0.0002	<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	0.007	0.008	13.7	No Limit
EP231_TOP_C: Perfluoroalkyl Sulfonamides (QC Lot: 2560011)									
EB1922827-001	TW_SS1_0.5_190819	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: 2560011) - continued									
EB1922827-001	TW_SS1_0.5_190819	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: 2560011)									
EB1922827-001	TW_SS1_0.5_190819	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: 2560011)									
EB1922827-001	TW_SS1_0.5_190819	EP231X: Sum of PFAS	----	0.0002	mg/kg	0.659	0.756	13.7	0% - 20%
		EP231X: Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	0.606	0.696	13.7	0% - 20%
		EP231X: Sum of TOP C4 - C14 Carboxylates and C4 - C8 Sulfonates	----	0.0002	mg/kg	0.656	0.753	13.7	0% - 20%
		EP231X: Sum of TOP C4 - C14 as Fluorine	----	0.0002	mg/kg	0.426	0.489	13.7	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: 2560011)								
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	61.9	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	64.9	50	150
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	----	----	----	----
EP231_TOP_B: Perfluoroalkyl Carboxylic Acids (QCLot: 2560011)								
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	59.8	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: 2560011)								
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: 2560011)								
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	0.00	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: 2560011) - 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.**

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EB1922827**	Page	: 1 of 4
Client	: **AECOM Australia Pty Ltd**	Laboratory	: Environmental Division Brisbane
Contact	: CAMDEN McCOSKER	Telephone	: +61 7 3552 8616
Project	: 60609758 1.0	Date Samples Received	: 30-Aug-2019
Site	: ----	Issue Date	: 06-Sep-2019
Sampler	: ----	No. of samples received	: 1
Order number	: 60609758 1.0	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						
TW_SS1_0.5_190819	----	----	----	03-Sep-2019	02-Sep-2019	**1**

Analysis Holding Time Compliance

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

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

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

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

Matrix: **SOIL**

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

Method / 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)							
TW_SS1_0.5_190819	**19-Aug-2019**	**----**	----	----	**03-Sep-2019**	02-Sep-2019	×
EP231_TOP_A: Perfluoroalkyl Sulfonic Acids							
HDPE Soil Jar (EP231X (TOP))							
TW_SS1_0.5_190819	**19-Aug-2019**	**03-Sep-2019**	15-Feb-2020	✓	**03-Sep-2019**	13-Oct-2019	✓
EP231_TOP_B: Perfluoroalkyl Carboxylic Acids							
HDPE Soil Jar (EP231X (TOP))							
TW_SS1_0.5_190819	**19-Aug-2019**	**03-Sep-2019**	15-Feb-2020	✓	**03-Sep-2019**	13-Oct-2019	✓
EP231_TOP_C: Perfluoroalkyl Sulfonamides							
HDPE Soil Jar (EP231X (TOP))							
TW_SS1_0.5_190819	**19-Aug-2019**	**03-Sep-2019**	15-Feb-2020	✓	**03-Sep-2019**	13-Oct-2019	✓
EP231_TOP_D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE Soil Jar (EP231X (TOP))							
TW_SS1_0.5_190819	**19-Aug-2019**	**03-Sep-2019**	15-Feb-2020	✓	**03-Sep-2019**	13-Oct-2019	✓
EP231_TOP_P: PFAS Sums							
HDPE Soil Jar (EP231X (TOP))							
TW_SS1_0.5_190819	**19-Aug-2019**	**03-Sep-2019**	15-Feb-2020	✓	**03-Sep-2019**	13-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: Tuesday, 10 September 2019 3:51 PM
To: Carsten Emrich <Carsten.Emrich@alsglobal.com>
Cc: McCosker, Camden <Camden.McCosker@aecom.com>
Subject: [EXTERNAL] - Rebatch EB1922854

Hi Carsten

Please could you rebatch EB1922854-002 for PFAS TOPA (EP231X-TOP).

Regards

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

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SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order	: **EB1923753**		
Amendment	: **2**		
Client	: **AECOM Australia Pty Ltd**	Laboratory	: Environmental Division Brisbane
Contact	: MR JAMES PEACHEY	Contact	: Carsten Emrich
Address	: PO BOX 1307 FORTITUDE VALLEY QLD, AUSTRALIA 4006	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 2
Order number	: 60609758 2.0	Quote number	: EB2019AECOMAU0002 (BN/112/19)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: TOOWOOMBA		
Sampler	:		

Dates

Date Samples Received	: 10-Sep-2019 15:51	Issue Date	: 18-Nov-2019
Client Requested Due Date	: 17-Sep-2019	Scheduled Reporting Date	: **17-Sep-2019**

Delivery Details

Mode of Delivery	: Samples On Hand	Security Seal	: Not Available
No. of coolers/boxes	: ----	Temperature	: <6.0°C
Receipt Detail	: REBATCH	No. of samples received / analysed	: 1 / 1

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- **This work order has been created to rebatch samples from EB1922854.**
- **20/9/19: SRN has been resent to acknowledge the change in sample ID. For any further information regarding these adjustments please contact client services at ALSEnviro.Brisbane@alsglobal.com.**
- ***18/11/19*: SRN has been resent to acknowledge the chnage of smaple ID as per email request by Camden McCosker on the 18/11/19. For any further information regarding these adjustments 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.
- 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: **WATER**

Laboratory sample ID	Client sampling date / time	Client sample ID	WATER - EP231X (TOP) PFAS - Total Oxidisable Precursor (TOP) Assay
EB1923753-001	30-Aug-2019 10:10	TW_MW02_190830	✓

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
- Chain of Custody (CoC) (COC)	Email	camden.mccosker@aecom.com
- EDI Format - ESDAT (ESDAT)	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
- Chain of Custody (CoC) (COC)	Email	james.peachey@aecom.com
- EDI Format - ESDAT (ESDAT)	Email	james.peachey@aecom.com

NEM KRCO

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

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB1923753**	Page	: 1 of 5
Amendment	: **2**		
Client	: **AECOM Australia Pty Ltd**	Laboratory	: Environmental Division Brisbane
Contact	: MR JAMES PEACHEY	Contact	: Carsten Emrich
Address	: PO BOX 1307 FORTITUDE VALLEY QLD, AUSTRALIA 4006	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: +61 07 3553 2000	Telephone	: +61 7 3552 8616
Project	: 60609758	Date Samples Received	: 10-Sep-2019 15:51
Order number	: 60609758 2.0	Date Analysis Commenced	: 11-Sep-2019
C-O-C number	: ----	Issue Date	: 18-Nov-2019 13:27
Sampler	: ----		
Site	: TOOWOOMBA		
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*
Matt Frost	Assistant Laboratory Manager	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 (18/11/2019): This report has been amended as a result of a request to change sample identification numbers (IDs) received by ALS from Camden McCosker on 18/11/19. All analysis results are as per the previous report.
- Amendment (20/09/2019): This report has been amended to alter the sample ID. All analysis results are as per the previous report.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	TW_MW02_190830	----	----	----	----
				Client sampling date / time	30-Aug-2019 10:10	----	----	----	----
Compound	CAS Number	LOR	Unit		EB1923753-001	--------	--------	--------	--------
					Result	----	----	----	----
EP231_TOP_A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		**0.55**	----	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L		**0.49**	----	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L		**5.59**	----	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L		**0.15**	----	----	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		**2.40**	----	----	----	----
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		**0.2**	----	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		**0.21**	----	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		**1.04**	----	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		**0.10**	----	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		**0.12**	----	----	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L		<0.02	----	----	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L		<0.02	----	----	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L		<0.02	----	----	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L		<0.02	----	----	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L		<0.02	----	----	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L		<0.05	----	----	----	----
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)				Client sample ID	TW_MW02_190830	----	----	----	----
				Client sampling date / time	30-Aug-2019 10:10	----	----	----	----
Compound	CAS Number	LOR	Unit		EB1923753-001	--------	--------	--------	--------
					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		**10.8**	----	----	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		**7.99**	----	----	----	----
Sum of TOP C4 - C14 Carboxylates and C4 - C8 Sulfonates	----	0.01	µg/L		**10.8**	----	----	----	----
^ **Sum of TOP C4 - C14 as Fluorine**	----	0.01	µg/L		**6.80**	----	----	----	----
EP231_TOP_S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**72.5**	----	----	----	----
13C8-PFOA	----	0.02	%		**88.5**	----	----	----	----

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	: **EB1923753**	Page	: 1 of 5
Amendment	: **2**		
Client	: **AECOM Australia Pty Ltd**	Laboratory	: Environmental Division Brisbane
Contact	: MR JAMES PEACHEY	Contact	: Carsten Emrich
Address	: PO BOX 1307 FORTITUDE VALLEY QLD, AUSTRALIA 4006	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: +61 07 3553 2000	Telephone	: +61 7 3552 8616
Project	: 60609758	Date Samples Received	: 10-Sep-2019
Order number	: 60609758 2.0	Date Analysis Commenced	: 11-Sep-2019
C-O-C number	: ----	Issue Date	: 18-Nov-2019
Sampler	: ----		
Site	: TOOWOOMBA		
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*
Matt Frost	Assistant Laboratory Manager	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: 2575809)									
EB1923577-001	Anonymous	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	0.03	0.02	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	0.06	0.05	16.9	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: 2575809)									
EB1923577-001	Anonymous	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	0.00	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	0.10	0.11	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	0.10	0.09	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: 2575809)									
EB1923577-001	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit

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_C: Perfluoroalkyl Sulfonamides (QC Lot: 2575809) - continued									
EB1923577-001	Anonymous	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: 2575809)									
EB1923577-001	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP231_TOP_P: PFAS Sums (QC Lot: 2575809)									
EB1923577-001	Anonymous	EP231X: Sum of PFAS	----	0.01	µg/L	0.31	0.29	6.67	0% - 20%
		EP231X: Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	0.09	0.07	25.0	No Limit
		EP231X: Sum of TOP C4 - C14 Carboxylates and C4 - C8 Sulfonates	----	0.01	µg/L	0.31	0.29	6.67	0% - 20%
		EP231X: Sum of TOP C4 - C14 as Fluorine	----	0.01	µg/L	0.20	0.19	6.57	0% - 20%

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

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

Sub-Matrix: **WATER**

				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: 2575809)								
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	73.5	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	68.5	50	150
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	----	----	----	----
EP231_TOP_B: Perfluoroalkyl Carboxylic Acids (QCLot: 2575809)								
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	76.6	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: 2575809)								
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: 2575809)								
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	----	----
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: 2575809) - 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: 2575809)								
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	: **EB1923753**	Page	: 1 of 4
Amendment	: **2**		
Client	: **AECOM Australia Pty Ltd**	Laboratory	: Environmental Division Brisbane
Contact	: MR JAMES PEACHEY	Telephone	: +61 7 3552 8616
Project	: 60609758	Date Samples Received	: 10-Sep-2019
Site	: TOOWOOMBA	Issue Date	: 18-Nov-2019
Sampler	: ----	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

- **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))							
TW_MW02_190830	**30-Aug-2019**	**11-Sep-2019**	26-Feb-2020	✓	**11-Sep-2019**	26-Feb-2020	✓
EP231_TOP_B: Perfluoroalkyl Carboxylic Acids							
HDPE (no PTFE) (EP231X (TOP))							
TW_MW02_190830	**30-Aug-2019**	**11-Sep-2019**	26-Feb-2020	✓	**11-Sep-2019**	26-Feb-2020	✓
EP231_TOP_C: Perfluoroalkyl Sulfonamides							
HDPE (no PTFE) (EP231X (TOP))							
TW_MW02_190830	**30-Aug-2019**	**11-Sep-2019**	26-Feb-2020	✓	**11-Sep-2019**	26-Feb-2020	✓
EP231_TOP_D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE (no PTFE) (EP231X (TOP))							
TW_MW02_190830	**30-Aug-2019**	**11-Sep-2019**	26-Feb-2020	✓	**11-Sep-2019**	26-Feb-2020	✓
EP231_TOP_P: PFAS Sums							
HDPE (no PTFE) (EP231X (TOP))							
TW_MW02_190830	**30-Aug-2019**	**11-Sep-2019**	26-Feb-2020	✓	**11-Sep-2019**	26-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)	1	9	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
PFAS by LCMSMS after oxidation (TOP)	EP231X (TOP)	1	9	**11.11**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
PFAS by LCMSMS after oxidation (TOP)	EP231X (TOP)	1	9	**11.11**	**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.