Preliminary Site Investigation into Per- and Polyfluoroalkyl Substances (PFAS)

Norfolk Island Airport

Prepared for:

Department for Infrastructure, Transport, Regional Development and Communications

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Distribution

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Executive Summary

Senversa was engaged by the Department of Infrastructure, Transport, Cities and Regional Development (DITCRD) now the Department for Infrastructure, Transport, Regional Development and Communications (DITRDC) to prepare a Detailed Environmental Investigation of per- and poly-fluoroalkyl substances (PFAS) site conditions at Norfolk Island Airport (the site) and surrounding catchments.

The investigation was initiated after a CSIRO led investigation identified elevated levels of PFAS in the Mission Creek surface water catchment in December 2019.

This report is the preliminary site investigation (PSI) which has been completed to report on the identification of PFAS sources, contaminant transport pathways and receptors and to present the finding of the initial, targeted investigation into the nature and extent of PFAS Norfolk Island Airport at the Norfolk Island Airport and surrounding catchments.

The objectives of this Preliminary Site Investigation (PSI) included investigation of potential PFAS source areas; identification of PFAS migration pathways and sensitive receptors; and the targeted assessment of drinking water sources across the island.

The scope of work included a two week on-island investigation undertaken in January 2020 to meet with the community and identify potential PFAS source areas; assess sensitive human and ecological receptors; and confirm key drinking water sources that should be assessed for PFAS impact. The targeted sampling undertaken included the collection of 172 samples consisting of 25 groundwater samples, 17 surface water samples, 41 sediment samples and 89 soil samples both on the airport and across the wider island.

Through the completion of the PSI and targeted groundwater, surface water, soil and sediment assessment works, Senversa was able to achieve the objectives outlined in **Section 1.2** and draw the following conclusions:

PFAS Source Areas

- Six significant potential PFAS primary source areas (Group 1 Source Areas) were identified within the Airport that may have contributed to the elevated PFAS concentrations identified within the Mission Creek catchment.
- All six sources were associated with the training, storage and maintenance of fire trucks that historically used PFAS containing aqueous film-forming foam (AFFF).
- A further 11 lower significant potential PFAS source areas (Groups 2 – 4 Source Areas) were identified on and outside the airport within the Mission Creek and other catchments.

PFAS Impact to Utilised Water

- All privately owned drinking water sources that were sampled by Senversa were found to have concentrations below the adopted health based guidance value (HBGV) for PFAS (sum of PFOS + PFHxS). The privately owned drinking water sources assessed included three of five known water carters and tanks / groundwater bores within the Mission Creek catchment.
- Concentrations of PFAS above the adopted HBGV was identified in three public facilities (hospital, works depot and fire station) at internal water taps and groundwater tanks. Upon confirmation of the analytical results alternative drinking water supplies were implemented at these locations and other potentially impacted public facilities (including the airport, which is understood to have previously used the same water source as the facilities mentioned above). The elevated PFAS concentrations at all three public facilities was linked to supply of water from the same “Airport Bore” within the Mission Creek catchment that was identified by CSIRO in December 2019 as having elevated concentrations of PFAS.

- It is understood that "Airport Bore" water is also utilised in public toilets across the island but the potential for exposure during hand washing will be relatively low given the frequency and duration of exposure, the limited potential for PFAS adsorption through the skin and the non-volatile nature of PFAS. Signage is understood to be at place at toilet facilities across the island to indicate the water should not be drunk. These measures will effectively manage potential exposures to PFAS within public toilets. As a number of the public toilets run septic systems there is the potential for the use of PFAS impacted water at these facilities to pose a secondary source of PFAS impacts to groundwater. However, it is noted that the mass and concentrations of PFAS associated with these uses is likely to be very small when compared with primary sources associated with the on-site direct use of AFFF.
- PFAS was identified in three water sources used for the watering of stock, chicken eggs and vegetables within the Mission Creek catchment. Exposure to the measured concentrations of PFAS is unlikely to impact upon the health or condition of cattle. However, where PFAS is present in water used for stock watering and/or irrigation, it can be taken up into meat, eggs and produce and people who consume the produce can be subsequently exposed. It is noted that there is no available regulatory screening level specifically for these pathways; the presence of PFAS in this water does not necessarily indicate potential risks, but does indicate that further assessment of these pathways is required. It is noted that when cattle source their water from a variety of sources (i.e. not all of the water they drink is from the PFAS impacted source) this will reduce the potential exposures via this pathway.

PFAS Impact to Surface and Groundwater

- Concentrations of PFAS above the HBGV in groundwater was restricted to the Mission Creek surface water catchment. The 11 groundwater samples obtained in five other surface water catchments on the island were all below laboratory detection limits with the exception of one groundwater sample obtained adjacent Headstone Creek, which was above laboratory detection limits but below the HBGV.
- Elevated concentrations of PFAS above the HBGV was identified within the surface waters of Mission Creek and Watermill Creek. Concentrations above laboratory detection limits but below the HBGV was identified in Headstone Creek, with the one surface water sample obtained from Broken Bridge Creek below detection limits.

Data Gaps and Further Investigation

- Following a qualitative assessment of source-pathway receptor linkages, eight data gaps requiring further assessment and / or completion of a Tier 2 or 3 risk assessment were identified.
- A detailed site investigation is proposed to address the identified data gaps relating to the nature and extent PFAS in groundwater, surface water, soil and sediment and biota on Norfolk Island

Contents

In text Plates and Tables:

List of Acronyms

Acronym	Definition
AFFF	Aqueous Film Forming Foam
AHD	Australian Height Datum
AMG	Australian Map Grid
ANZECC	Australian and New Zealand Environment and Conservation Council
BoM	Bureau of Meteorology
CSM	Conceptual site model
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DITRDC	The Department for Infrastructure, Transport, Regional Development and Communications
DoH	Department of Health
HBGV	Health based guidance value
HHSV	Human Health Screening Values
IBC	Intermediate bulk containers
LOR	Limit of reporting
m AHD	Metres Australian Height Datum
m bgl	Metres below ground level
NEPC	National Environment Protection Council
NEPM	National Environment Protection Measure
NHMRC	National Health and Medical Research Council
NIFS	Norfolk Island Fire Service
PFAS	Per- and poly-fluoroalkyl substances
PFOA	Perfluorooctanoic acid
PFOS	Perfluorooctane sulfonate
PFHxS	Perfluorohexane sulfonate
PSI	Preliminary Site Investigation
QA/QC	Quality Assurance / Quality Control
SPR	Source Pathway Receptor (Linkage)
TDS	Total dissolved solids
USEPA	United States Environmental Protection Agency
µg/kg	Micrograms per kilogram
µg/L	Micrograms per litre

1.0 Introduction

Senversa was engaged by the Department of Infrastructure, Transport, Cities and Regional Development (DITCRD) now the Department for Infrastructure, Transport, Regional Development and Communications (DITRDC) to prepare a Detailed Environmental Investigation of per- and poly-fluoroalkyl substances (PFAS) site conditions at Norfolk Island Airport (the site) and surrounding catchments. The PFAS detailed environmental investigation process consists of three main steps:

A. Preliminary Site Investigation (i.e. this report).
B. Detailed Site Investigation.
C. Human Health & Ecological Risk Assessment (if deemed necessary).

This report is the preliminary site investigation (PSI) which has been completed to report on the identification of PFAS sources, contaminant transport pathways and receptors and to present the finding of the initial, targeted investigation into the nature and extent of PFAS Norfolk Island Airport at the Norfolk Island Airport and surrounding catchments. The description of the source-pathway-receptor linkages is presented within the Conceptual Site Model (CSM), a subsection of this report.

The investigation was initiated after a CSIRO led investigation in relation to a separate water resource assessment project identified elevated levels of PFAS in the Mission Creek surface water catchment in December 2019.

The location of the airport (in black) and the Mission Creek surface water catchment (in yellow) with reference to the wider Norfolk Island is shown on **Plate 1** below and is detailed on **Figure 1** (all figures appended at the end of the main report body).

Plate 1: Site Location

1.1 Background

1.1.1 Project Background

Norfolk Island experienced drought conditions between 2016 and early 2020, with anecdotal reports of groundwater levels dropping across the island as a result of increased reliance on groundwater for drinking and other water uses. Water carting from groundwater bores that remained operational was being undertaken across the island both prior to and during January 2020 and in February 2020 a temporary desalination plant was commissioned by the Australian Government and Army on Norfolk Island.

In December 2019, as a part of a wider water resource assessment, CSIRO sampled three sources of water both on and in close proximity to the Norfolk Island Airport. The sampling indicated the presence of PFAS in three samples within the headwaters of the Mission Creek catchment directly below the aviation fire services drill ground, adjacent to the Airport.

Upon review of the findings of the CSIRO work, DITRDC initiated the PFAS environmental investigation at Norfolk Island. The DITRDC strategic aim is to manage potential risks to human health, or the ecological environment posed by the legacy PFAS contamination from the Norfolk Island Airport and surrounding catchment. The specific objectives of the PSI are presented in **Section 1.2** below.

In response to the CSIRO's findings, DITRDC prepared three initial fact sheets to share information on presence of PFAS on Norfolk Island and the status of this investigation. These initial fact sheets are provided in **Appendix A** of this report.

1.1.2 Why is PFAS a Contaminant of Concern in the Airport Environment?

Nationally, airports have been identified in the PFAS National Environmental Management Plan (HEPA, 2018) as sites with the potential for PFAS impacts. The main source of PFAS at airports is the historical use of aqueous film-forming foams (AFFFs) containing PFAS as active ingredients . AFFFs are 'Class B' firefighting foams that are used to prevent or extinguish flammable liquid fires by forming a barrier that inhibits oxygen from feeding the fire, while limiting volatilisation of flammable vapours from fuels.

Historically (from the 1970s), Airports used AFFF that contained perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA) (herein referred to as legacy AFFF), as distinct from currently produced AFFF formulations that do not contain PFAS as active ingredients. From 2004, the Australian Government commenced phasing out legacy AFFF, however the chemical characteristics of PFOS and PFOA make them highly resistant to degradation. These and some other PFAS compounds may persist in environmental media such as soil, groundwater or surface water for many years after the release/s occurred.

PFAS are a large group of fluorinated compounds which were first manufactured in the 1940's and have been widely used for a number of industrial applications and consumer products since. PFAS form strong surfactants which are utilised in applications requiring heat resistance, dispersion of liquids, and surface protection (NICNAS, 2016).

PFAS are characterised by fluorinated carbon chains where hydrogen atoms have been replaced with fluorine atoms; the resulting carbon-fluorine bond is the strongest in organic chemistry and PFAS are subsequently highly resistant to degradation (Grijalva & Manuel, 2009). The fluorinated carbon forms a hydrophobic linear chain (typically C_4 to C_{16}) and an attached functional group creating a hydrophilic component. This structure results in variable surface active (polar and non-polar) properties.

PFOS ($C_8F_{17}SO_3$) is the most common PFAS encountered during environmental investigations undertaken in Australia, due to its widespread historic use and its physico-chemical characteristics. PFOS is also the ultimate degradation or metabolic perfluorinated compound for a number of longer chain PFAS. PFOS is listed as a persistent organic pollutant (POP) under the Stockholm Convention.

It is understood that legacy AFFF containing PFAS as active ingredients was used on Norfolk Island from the early 1980s until 2015 to supress liquid fuel fires and for fire training activities.

1.2 Objectives

This PSI constitutes the first stage of an assessment of potential risk to human health and the environment associated with the presence of PFAS in the environment at the airport and in surrounding areas. The PSI was conducted in accordance with guidance provided in the National Environment Protection (Assessment of Site Contamination) Measure, 1999 (NEPC, 2013 amendment), 'the NEPM'.

The objectives of this PSI are to:

- Identify potential sources of PFAS contamination associated with the former uses, storage and waste management of historical AFFF products.
- Identify key sources and pathways of PFAS contamination.
- Identify and consider off-property land and water uses that may be associated with food production related to the human food chain.

In conjunction with these PSI objectives, DITRDC requested that Senversa undertake a preliminary targeted assessment of PFAS, focussed particularly on drinking water sources. Key objectives included:

- Identify what drinking water sources (i.e. carted water, groundwater) are impacted by PFAS.
- Assessment of the airport property and surrounding area to confirm that the on-property and off-property community stakeholders have access to safe drinking water that has not been affected by PFAS contamination.
- Opportunistically assess the nature and extent of PFAS in groundwater utilising existing groundwater bores to better understand the risk to receptors.

All information collected during the preliminary targeted investigation was to be captured and retained for use by DITRDC, CSIRO and other stakeholders that are currently investigating water supply alternatives.

In conjunction with these works, Senversa was to provide support to DITRDC-led stakeholder and community engagement activities proactively and appropriately inform stakeholders .

1.3 Scope of Works

To achieve the above objectives, Senversa completed the following scope of work:

- Collation of site identification information (**Section 2.0)**.
- Review of environmental setting information for on and off-site areas (**Section 3.0)**.
- Research historical activities, particularly as they relate to legacy AFFF use at the site (**Section 4.0**).
- Site inspection to assess potential activities or infrastructure that used or stored legacy AFFF, including completion of interviews with long term staff, knowledgeable in the use of AFFF at the site (**Section 4.3**).
- Preliminary water use survey of surrounding landowners to assess how water is used in the vicinity of the airport (**Appendix G**).
- Collection and analysis of 172 targeted samples including 25 groundwater samples, 17 surface water samples, 41 sediment samples and 89 soil samples (**Section 5.0**).
- Sampling of public water supply sources including three water carriers that supply water across the Island and tank / tap water at high use public places including the hospital and the school (**Table 2**).
- Development of a preliminary CSM (**Section 7.0)**.

1.4 Regulatory Framework

Senversa adopted federal legislation and guidance to provide the primary framework for the assessment for the airport, which included the following:

- National Environment Protection (Assessment of Site Contamination) 1999, as amended 2013, NEPC (2013).
- PFAS National Environmental Management Plan (NEMP) 2.0, Heads of EPAs (HEPA) Australia and New Zealand (2019).
- Australian guidance values for assessing exposure to perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA), Commonwealth Department of Health (3 April 2017).
- Australian and New Zealand Guidelines for Fresh and Marine Water Quality, ANZG (2018). These guidelines update the Australian Water Quality Guidelines for Fresh and Marine Waters (ANZECC/ARMCANZ, 2000).

2.0 Site Description

This section defines the parcel of land identified as the Norfolk Island Airport and describes the land use characteristics of on- and off-site areas being assessed in this PSI.

2.1 Site Details

Site identifying details are summarised below.

Table 2-1: Site Planning Information

Item	Relevant Site Information
Site Location and Size	The Norfolk Island Airport site is approximately 120 ha in size and is in the south western portion of Norfolk Island. Norfolk Island is situated in the Pacific Ocean, approximately 1,676 km north east of Sydney, NSW. See **Figure 1** for an overview of the site location and layout.
Site Use	The site is the Norfolk Island Airport which comprises two runways and associated terminal buildings, maintenance and cargo sheds and carparks. The first runway of the airport was constructed on 25 December 1942 with the assistance of the United States Air Force to assist with war efforts.
Site Zoning	The site is zoned for light industry use with surrounding land zoned for rural and rural residential land use.

The Norfolk Island land use zoning map is provided in **Appendix B**.

2.2 Site Features

Current site infrastructure, operations and facilities, as identified during a site inspection on 22 January 2020, are summarised below.

Table 2-2: Site Layout and Features

Item	Observations
Current Use	The site is primarily used for aviation purposes with an average of 3 - 5 flights arriving per week.
Current Site Features	Key site features include: • Operational airport with two runways. • Aircraft and airport operational infrastructure in the north east portion of the site, including terminals, storage and cargo facilities. • Maintenance facilities in the mid-eastern portion of the site. • Fire station in the mid-eastern portion of the site, south of the maintenance facilities. • Waste Management facility and Bureau of Meteorology (BOM) facility in the northern portion of the site. • The fire training facility was currently occupied by Boral in the north western portion of the site. Boral were temporarily using the space for airport runway upgrade works in early 2020.
Visual Evidence of PFAS Impacts	During the inspection, there was no visual evidence of PFAS-containing impacts such as staining around areas where PFAS was known to have been used or stored.

Item	Observations
Surface Waste / Stockpiled Material	Stockpiles were evident on the site in the Waste Management Facility located on the northern portion of the site that was also the former fire training area.
Chemical Storage Areas	The site historically used for AFFF concentrate storage was largely unsealed with no bunding or overflow catchment or treatment system evident. The fire station currently has Ansulite AFFF remaining on-site in un-bunded intermediary bulk containers (IBCs) on a mezzanine level. Identified storage areas considered to represent potential PFAS sources zones are discussed in **Table 1.**
Water Supply	On-site water is understood to be a combination of rainwater capture and/or groundwater bore water stored in several large tanks across the site. The groundwater bore that CSIRO identified as being impacted by PFAS, known as the “Airport Bore”, has historically been the source of site water (for airport infrastructure and the council office and fire station), which is pumped into a large concrete holding tank.

2.3 Surrounding Land Uses

The site is in a rural area west of Burnt Pine township, with land surrounding the site zoned as either ‘Rural’ or ‘Rural Residential’ (refer to **Appendix B**). The surrounding land use is predominantly residential and agricultural.

Table 2-3: Surrounding Land Uses

Direction	Land Uses
North	Mission Creek is located to the immediate north-west of the site followed by St Barnabas Chapel, rural properties and Headstone Reserve. The Norfolk Island National Park is located approximately 2 km to the north of the site.
East	North east of the site is the township of Burnt Pine, consisting of mixed land use. The land to the immediate east consists of rural and rural residential land.
South	Rural residential properties, Point Ross and Bombara Reserves followed by the South Pacific Ocean approximately 400 m from the most southern point of the site.
West	Rural residential properties, Rocky Point and 100 Acres Reserve followed by the South Pacific Ocean approximately 400 m from the most western point of the site.

3.0 Environmental Setting

Information from several sources, including a site inspection and public reports on regional information were reviewed to establish the environmental setting of the site.

Knowledge of the site's environmental setting is critical to understanding potential PFAS migration pathways and the sensitivity of the receiving environment (i.e. human and ecological receptors).

3.1 Regional Setting

3.1.1 Landscape Setting

The site is located on Norfolk Island, in the South Pacific Ocean north east of Sydney, NSW, and covers an area of approximately 35 square kilometres. Norfolk Island is volcanic in origin with an average elevation of 110 m above sea level rising steeply to 319 m above sea level at the peak of Mount Bates in the north western portion of the island. The island undulates rapidly with several water catchment zones creating steep valleys and low-lying creeks.

Prior to European settlement in 1788, the vegetation on Norfolk Island was a dense subtropical forest of palms, ferns and pines. Following settlement, a large portion of the Island was cleared for cultivation and cattle grazing (Abell & Falkland, 1991).

3.1.2 Climate

Norfolk Island is classified as a sub-tropical climate which is primarily affected by high-pressure systems which fluctuate over the island annually. The mean maximum temperatures on the island range from 19°C in winter to 25°C in summer with a high average relative humidity of 74% to 79% (BoM, 2019).

Norfolk Island's median annual rainfall is 1,302 mm with the highest rainfall between May to August, with monthly means of approximately 130 to 147 mm. The driest month is typically November with an average rainfall of 75 mm (BoM, 2019). Rainfall on the island between 2016 and early 2020 was below average and little to no rain fell on the island between October 2019 and January 2020 (ABC, 2020). However above average rainfall was recorded for the remainder of 2020.

Winds are predominantly from the east to south east during the summer and autumn, becoming south to south westerly in the winter months. Tropical cyclones occasionally influence the island in the early months of the year (BoM, 2019).

3.1.3 Topography

The airport site is generally flat however, the surrounding area undulates with steep gullies and surface water bodies in every direction around the site. The airport is between 95 and 115 m above sea level (Geoscience Australia, 2020).

The topography of the site and surrounding land is detailed on **Figure 2** attached with a sub-section focussed on the airport and Mission Creek Catchment (in purple) provided on **Plate 2** below. A hydrogeological cross section showing the airport relative to the Mission Creek surface water catchment is also provided as **Figure 10**.

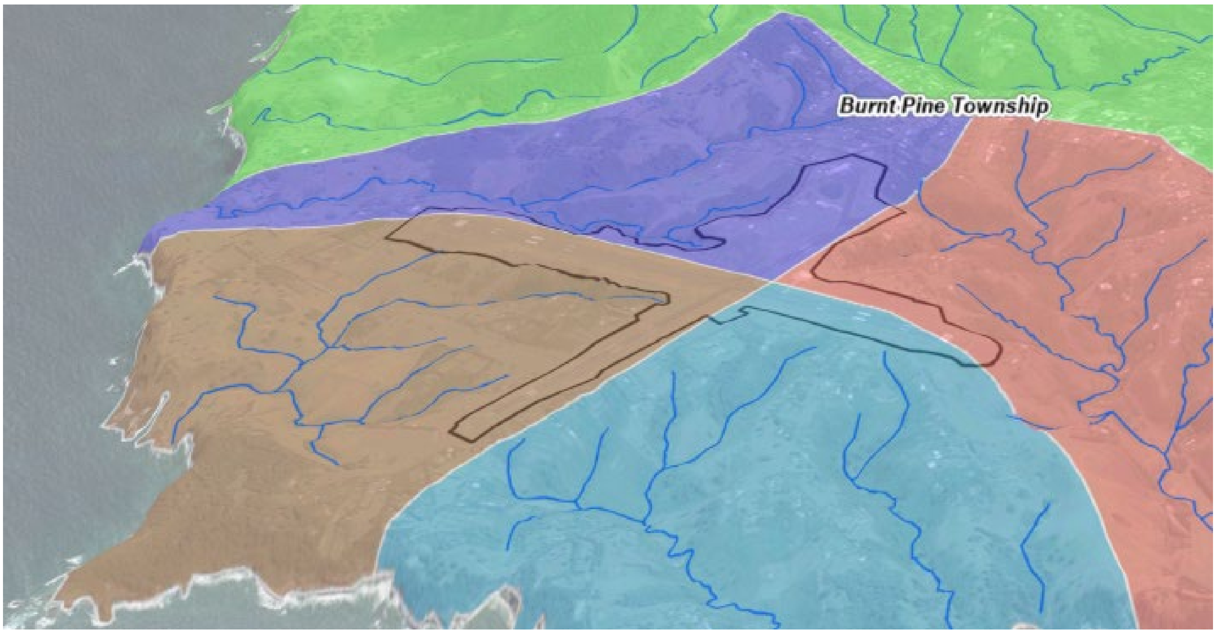

Plate 2: Topographical Model of Norfolk Island (Mission Creek Catchment in Purple – See Figure 2 for details on other catchments)

3.2 Surface Water

3.2.1 Drainage

The site is located on the southern plateau of the island with drainage occurring in all directions into four different catchments (Refer to **Figure 2** for catchment detail).

The surface water catchment to the north of the site is known as the Mission Creek Catchment which receives all surface water runoff from the north western portion of the airport. Town Creek surface water catchment is located to the east of the site, with Rocky Point surface water catchment to the south and Headstone Creek Catchment to the west. All four catchments received surface water runoff from the site. During periods of heavy rain, surface water runoff enters a network of creeks and eventually discharges into the ocean.

3.2.2 On-site Surface Water Features

No significant surface water bodies were identified within the boundary of the airport.

3.2.3 Dams

No significant dams or surface water storage bodies were identified within the boundary of the airport.

Several dams are present on properties surrounding the site, including the Headstone Dam and Mission Pool to the north of the site, both are major public sources of water used for cattle watering purposes in particular.

3.3 Flora and Fauna

Limited flora and fauna are present due to the highly modified nature of the airport environment. As an airport, birds are excluded where possible, and any unpaved areas of the site is generally covered in grass with the exception of the large Banyan Tree present south west of the main terminal and visible on **Figure 4** as the darker green colour immediately south east of the “Former Flushing Area (PS02)”.

Low lying areas near the site boundary have limited thick vegetation. These vegetated areas generally coincide with natural drainage lines such as creek beds.

3.4 Geology

Norfolk Island is the erosional remnant of Pliocene aged volcanic centres located on a north trending continental ridge between New Zealand and North Caledonia (Abell, R S & Falkland A C, 1991). The island consists of the former shield volcano (Mt Pitt) and horizontal basalt flows. The major formations are summarised below:

- Tertiary volcanic sequences are comprised of a series of generally flat lying basalts. Basalt flows are unconformably overlain by and interbedded with pyroclastics (generally tuffs), indicating periods of erosion between cycles of eruption.
- Quaternary aged sedimentary deposits comprising unconsolidated clays and silts are present to the south of the island and along drainage channels and adjacent surface water bodies. Calcarenite limestone is exposed along the coastline near the Kingston Jetty.
- The humid, sub-tropical climate has resulted in deep weathering of the basaltic sheet lavas. The weathered mantle is up to 80 m thick in some sections. The basalt flows generally have fragmental tops which have weathered to clay.
- The prominent soil type found at and surrounding the site is the Rooty Hill Clay. A soil type map of Norfolk Island is provided in **Appendix C**.

3.5 Hydrogeology

The water table on Norfolk Island is within the weathered and fractured rock profile in a ring around Mt Pitt. Recharge is dominated by rainfall and as a result shallow groundwater is generally fresh and slightly acidic.

Plate 3 shows the main features of Norfolk's hydrological cycle including the brackish zone which occurs where seawater mixes with the freshwater lens (Abell, 1993).

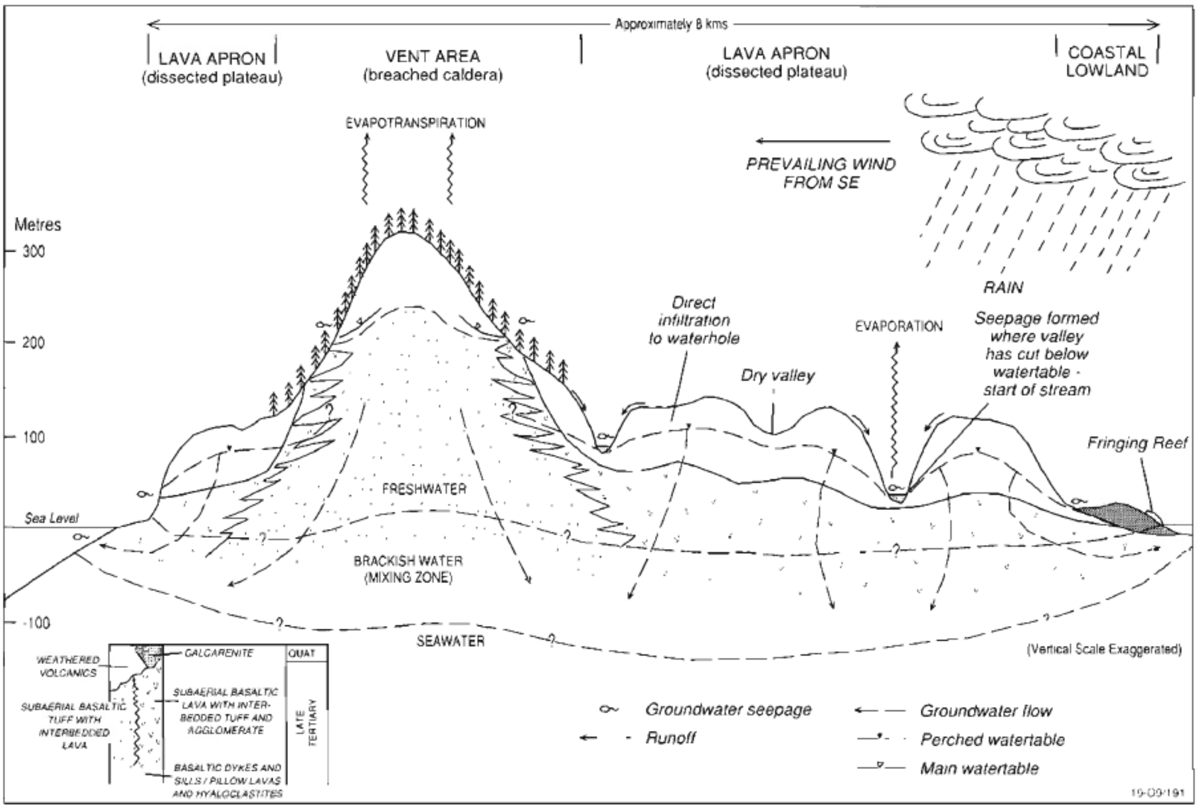

Plate 3: Hydrological Cycle of Norfolk Island (from Abell, 1993)

3.5.1 Hydrogeological Units

Based on research undertaken by Abell (1993), the following hydrostratigraphic sequence is likely to be present beneath the island:

- Weathered volcanic mantle : Major aquifer on the island, porous but clayey. The upper water table on Norfolk sits within the weathered mantle.
- Basaltic lavas: Heterogeneous water-bearing systems, dominated by water movement through fractures, joints and bedding.
- Vertical movement of groundwater through fractures in the basalt likely form localised, semi-confined aquifers within tuff beds and fragmented layers.

To assess groundwater provenance, cations and anions were analysed from groundwater samples obtained during this investigation with the results provided in **Table 3**. A piper plot prepared from the samples obtained (see **Plate 4** below), shows the ionic balance of the aquifers sampled. The piper plot indicates that sodium and potassium are the dominant cations and chloride is the dominant anion indicating that the groundwater on Norfolk Island falls within the sodium chloride type, which is expected given the source of island recharge (i.e. rainfall).

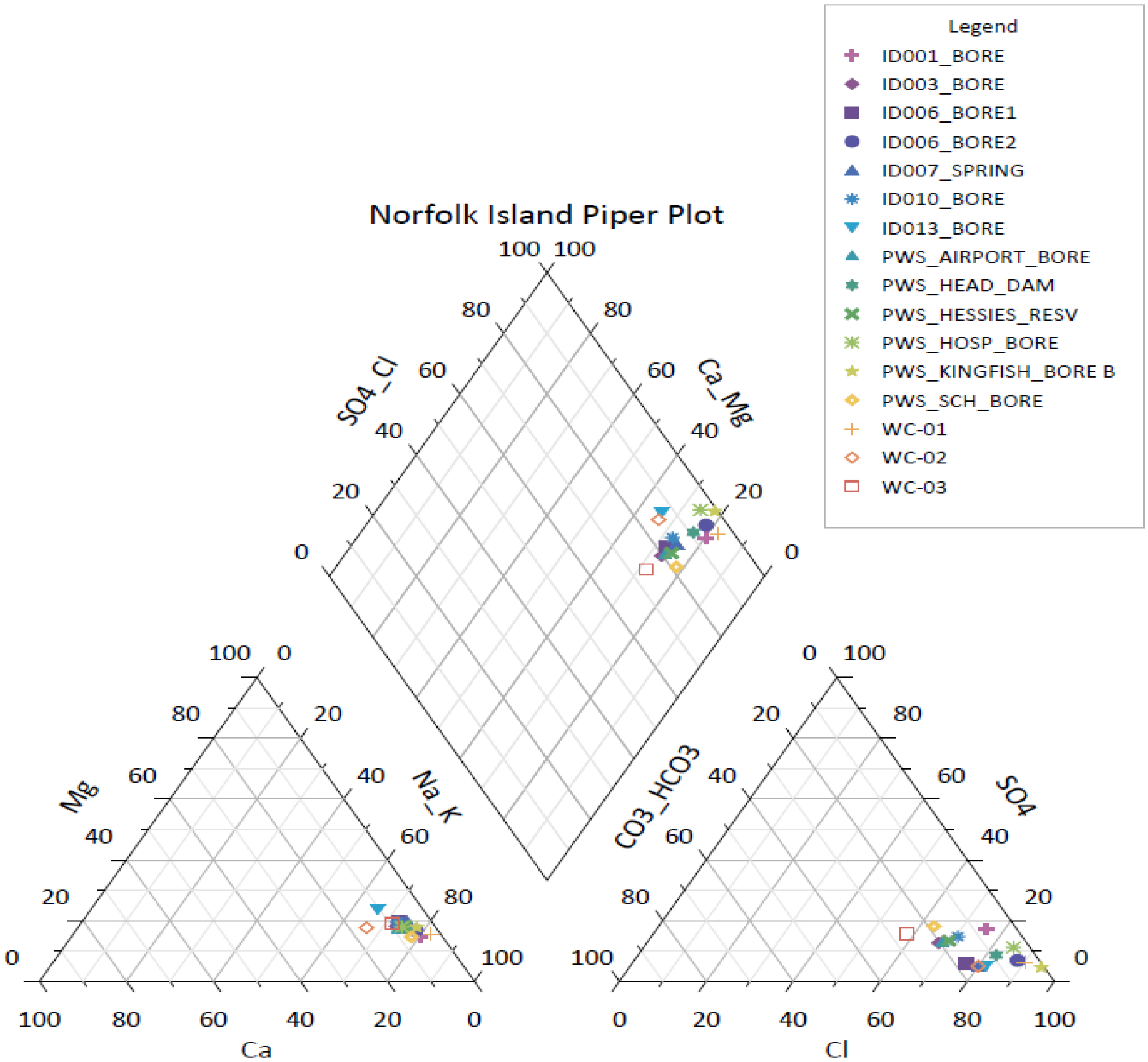

Plate 4: Piper plot detailing ionic balance of groundwater

3.5.2 Groundwater Depth and Flow Direction

The heterogeneous nature of basaltic aquifers results in a complex groundwater flow regime. In general, groundwater flow follows, to a subdued degree, topographic features, discharging to surface water bodies and further towards the coastline (refer to **Figure 3**). Preferential flow pathways are created by water following the fracture orientation in the basalt.

Expressions of groundwater are present across the island. Seepages are formed where the valley has cut below the water table.

There is uncertainty as to whether there are a distinct and potentially separated shallow and deeper aquifer systems on the island. There are a number of existing groundwater bores drilled beneath the sea level that appear to have different characteristics to more shallow bores. Further investigation into the extent of this groundwater is currently being undertaken by CSIRO.

3.5.3 Groundwater Use

Council provided survey data indicated that there are 228 active groundwater bores, 38 dry bores and 10 “contaminated” bores across the island. Other sources indicate approximately 450 bores exist across the island (Abell, 1993). It is understood that not all bores on the island are registered with the Norfolk Island Regional Council or surveyed for height or location.

On the airport there is one known groundwater well (small shed and well body approximately 1 m diameter) that was not in use at the time of the investigation that was sampled by Senversa (Senversa sample A_BORE1). This well is located south west of the banyan tree and should not be confused with the “Airport Bore” that was found to be PFAS impacted by CSIRO that is located just off-site near the head waters of Mission Creek.

This Airport Bore is used to pump water into a large concrete holding tank on site adjacent to the current council office. This water is used across the site and accessed by the public for offsite use via a fill point near the waste management centre access track just off Douglas Drive. There was also anecdotal evidence (see **Section 4.4**) of this bore being used to supply off-site public buildings in times of low rainfall including the hospital and works depot.

3.5.4 Groundwater Issues and Vulnerability

Overreliance on groundwater resulting in pumping from bores in excess of recharge can result in a thickening of the brackish water zone (see **Plate 3** above). This issue is exacerbated in times of low recharge (e.g. during summer months or in times of drought). In January 2020 this was anecdotally observed to be occurring in a number groundwater bores near the perimeter of the island where groundwater bores had shown increasing salinity.

The shallow, unconfined aquifer is vulnerable to bacteriological and chemical pollution associated with land use practices including domestic and livestock waste (e.g. septic systems and agricultural practices). Based on a digital data set provided by the Norfolk Island Regional Council and reviewed by Senversa, 10 bores predominately around the Burnt Pine area were identified as being “contaminated” by the council was considered likely to be a result of the positioning of the bores close to septic systems / poor maintenance of septic systems, however this could not be confirmed at the time of this investigation. Deeper groundwater is considered potentially less vulnerable to polluting surface activities, however, is anecdotally considered more vulnerable to seawater intrusion based on on-island discussions held in January 2020.

4.0 Historical PFAS Source Identification

This section of the PSI presents the information used to establish historical activities at the site, with focus on the storage, handling and use of legacy PFAS-containing AFFF. Additional information sources, including public records and previous site investigations were reviewed to provide a general overview of the site history and land uses. Interviews with long-term firefighters knowledgeable about legacy AFFF use, and with other Norfolk Island residents were also conducted.

4.1 Historical Aerial Photographs

Available historical aerial photographs dating back to 1978 were obtained from Lotsearch and are provided in **Appendix D**. Review of these photographs can assist in identifying relevant site developments, features and changes over time.

The land use surrounding the site did not appear to significantly change from 1978 to 2019 with the land primarily used for agricultural purposes with low density rural residential properties also present. The key changes in land use observed on-site are detailed in **Table 4-1** below.

Table 4-1: Historical Aerial Photograph Review

Year	Observations
1978 - 1997	The northeast portion of the site contained several buildings as shown on **Plate 5** and further discussed below.

Plate 5: 1997 Aerial Photograph

- One main terminal building with associated carparking is visible.
- Two smaller buildings to the west of the terminal with associated sheds and drainage features (known to be the former fire station) are visible.
- A large building with multiple smaller buildings is visible approximately 250 m to the south west of the main terminal building.
- Thick vegetation and surface water bodies approximately 300 m to the southwest of the terminal buildings. A clearing in the vegetation is noticeable with an unsealed driveway leading to this area.
- Several small buildings to the south east of the terminal on the opposite side of the runway are present. What appears to be above ground storage tanks were located adjacent to these buildings. This area is known to be the maintenance and refuelling area.

Year	Observations
1978 - 1997	Remainder of the site: • Two intersecting runways occupied majority of the site. • The north and north western portions of the site were vegetated with cleared areas along the northern site boundary. • Two small buildings were in the northern portion of the site adjacent to the cleared vegetation. A small portion in the south east of the site appears to have contained housing with up to seven properties obvious in the aerial photograph.
2006	The infrastructure on-site remained consistent except for the following changes in the northeast portion of the site, as shown below in **Plate 6.**

Plate 6: 2006 Aerial Photograph

- The terminal building appears to have been redeveloped, now covering a larger footprint, as shown in the top right corner of the image below.
- A large shed with two smaller sheds had been constructed in the clearing approximately 300 m southwest of the terminal building. This is known to currently be used as the islands waste management facility.
- A new building to the east of the waste management facility had been constructed, this building is currently known as the Bureau of Meteorology (BoM) centre.

Year	Observations
2016 - 2019	The infrastructure on-site remained consistent except for the following changes in the northeast portion of the site and the addition of the new fire station in the centre of the site, as shown below in **Plate 7.**

Plate 7: 2019 Aerial Photograph

- A new building with associated concrete hardstand had been constructed to the south of the terminal building.
- A second new building with associated concrete hardstand had been constructed along the eastern site boundary. This building is known as the new fire station building and can be accessed from both on-site and off-site.

The aerial photographs indicate that the general site layout, including location of the runways and the areas developed with buildings, has remained largely unchanged since 1978. Photographs from 1978 to 1997 show the former fire station adjacent to the terminal building in the north east corner of the site. Photographs post 2006 show the upgrades to the terminal building with the new fire station visible in the 2016 photograph.

4.2 Information Searches

These other information searches are presented for completeness and were conducted with consideration of the NEPM guidance for PSI information sources. While these searches can provide useful information on site history and general sources of impacts to the environment, limited information relating to legacy AFFF use or PFAS was available from both online and on-island resources.

4.2.1 Norfolk Island Regional Council Records

The Norfolk Island Regional Council archives were searched on 15 January 2020. Documents found in the council archives are provided in **Appendix E** and include a survey plan of the airport and historical contour maps from 1968 and 1988. The airport survey plan demonstrates the location of the terminal building, the refuelling area, the electrical and waste administration areas and the airport fire drill ground boundary.

4.2.2 Historical Site Photographs

Historical photographs were accessed through the Norfolk Island Living Library (http://www.livinglibrary.edu.nf/_/Fire_Services.html). Two relevant site photographs were viewed, which included images of firefighting training activities where AFFF appeared to have been used. The photographs obtained are shown below.

Plate 8: Firefighting Drill – Historical Photographs

4.3 Previous Investigations

Initial water sampling in three locations was undertaken by CSIRO in December 2019, with the results reported within Fact Sheet 3 (see **Appendix A**). The sampling indicated the presence of PFAS within the headwaters of the Mission Creek catchment directly below the aviation fire services training ground, adjacent to Norfolk Island Airport. These sample locations were all on public land and included two surface water samples (the World War II Dam in the headwaters of Mission Creek, and from Mission Creek where it crosses Douglas Drive) and one groundwater sample (the Airport "Bore").

Given the presence of PFAS in these sampling locations, and prior to the engagement of Senversa, the CSIRO's Norfolk Island Water Resource Assessment (NIWRA) project scope was expanded temporarily to ensure sampling and testing commenced as soon as possible in the Mission Creek catchment area. CSIRO conducted testing of a number of properties within the Mission Creek catchment on 21 to 23 December 2019, with a focus on drinking water, specifically taps and tanks on the properties, along with some bores. Senversa was then engaged to undertake the detailed environmental investigation and the CSIRO's NIWRA project has now returned to an exclusive focus on an assessment of hydrology and hydrogeology and options for enhancing the community's water security.

The results of the CSIRO additional sampling were not formally reported by CSIRO, however review of the analytical results provided by CSIRO to DITRDC identified five properties sampled within the Mission Creek catchment where detected PFAS concentrations were above the screening value for drinking water. The water sampled at the five properties was understood to be either groundwater bought to the surface via a bore or surface water pumped to the property directly out of Mission Creek. It is understood that the water is primarily used for cattle watering.

Three out of these five private properties were resampled by Senversa in January 2020 with results discussed further in **Section 5.10**. For the other two private properties that were not resampled by Senversa during this preliminary phase, discussions where held regarding the management of PFAS impacted water, and further sampling of these properties is proposed to take place during the next phase of investigation.

All other properties sampled by CSIRO reported concentrations of PFAS below the laboratory limit of reporting (LOR).

4.4 Senversa On-Island Investigation – January 2020

Senversa was on island between the 12 and 26 of January 2020 and during this time undertook a number of activities to assist in the identification of historical PFAS sources, including:

- conducting interviews;
- documenting water use surveys; and
- undertaking site inspections.

The section below summarises the results of these investigation activities.

4.4.1 Interviews

Interviews were conducted with a number of long-term Norfolk Island Fire Service (NIFS) employees and Norfolk Island Residents on 13 and 17 January 2020. NIFS staff interviewed included personnel from the former fire station who were responsible for maintenance and flushing out of fire trucks and associated infrastructure. Interview records are provided in **Appendix F**.

The current Chief Fire Officer from the NIFS who has been involved in responding to fires and undertaking firefighting training was interviewed. The Chief Fire Officer provided site-specific knowledge relating to legacy AFFF use, firefighting practices, and general maintenance activities at the site. The following key information was obtained from the interview:

- Protein foam was utilised until the introduction of 3M Lightwater® in the early 1980s.
- PFAS containing 3M Lightwater® was used by the NIFS for approximately 20 years (from the early 1980s) until the change to Tyco Ansulite® (also PFAS-containing but with a lower PFAS concentration) occurred in 2004.
- The use of PFAS containing products ceased in 2015. Tyco Ansulite® is still present in the current fire station and in fire vehicles which were sampled during the investigation to assist with off-island disposal.
- Flush outs of the fire trucks occurred up to three times a week. This historically took place in the unsealed area to the south of the former fire station where it would runoff towards Mission Creek.
- A large-scale annual training drill historically took place in the vacant land behind St Barnabas Chapel located approximately 250 m north west of the western extent of the east-west runway.

CSIRO Representatives, who were also involved in the CSIRO sampling in December 2019 were interviewed to discuss areas of interest both at and surrounding the airport. The following key items were discussed:

- The current drill area has only been used since the mid 1990’s, prior to this all fire training occurred in the area that is now occupied by the waste management facility.
- The former fire station was located adjacent to the terminal building, the infrastructure is still present including a small wooden shed that was used to store 3M Lightwater® concentrate.
- A drainage culvert drains surface water from the new fire station under the runway back towards Mission Creek.
- Water from the airport bore was historically used to fill the water tanks at the hospital. It was also noted that during refill events, water would overflow from the tanks and run downhill into Broken Bridge Creek.

Anecdotal information recorded during conversations with Islanders indicated that:

- AFFF was used on multiple occasions to ‘foam up’ (spraying of foams to provide coverage) an area as a display or exhibition for staff or the public. This was conducted at many locations but was mainly on the grassed area in Kingston known as ‘The Common’ oval and the area to the west of St Barnabas Chapel where annual training also occurred.
- AFFF was used up to three times per year in a residential backyard on Webb Adams Road for training purposes.

Based on the information obtained through these interviews, a number of potential source areas were identified. These areas are shown on **Figures 4** and **5** and information on the sources is summarised in **Table 1**.

In general, it was reported that chemical and waste management practices relating to legacy AFFF use were historically quite limited, given that at the time, AFFF was generally considered inert and without special handling requirements. It is understood that excess volumes of concentrate and/or foam were often disposed of onto bare earth or to stormwater, and foams were repeatedly applied to a number of unsealed locations as part of regular equipment testing and maintenance within the airport. In addition, off-site fire training activities, community events and incidents requiring AFFF application (e.g. vehicle crashes / petroleum based fires) were reported, which may have resulted in the limited use of AFFF in 11 locations outside of the airport.

4.4.2 Water Use Survey

A Water Use Survey (provided in **Appendix G**) was developed to investigate water supply and patterns of use at off-site private properties.

A total of 7 water use surveys were completed in conjunction with private property sampling between 14 and 23 January. The key findings of the survey are summarised in the table below:

Table 4-2: Water Use Survey Results

Question	Response Summary
Land use	• Residential – 6 • Growing produce / raising livestock – 4 • Other (build site) – 1
Primary drinking water source	• Rainwater tank - 4 • Bore water - 1 • Other (surface water spring) – 1 • No drinking water currently on property - 1
Bore on property	• Yes – 5 • No – 2
Bore uses	• Drinking water – 1 • Indoor domestic uses – 1 • Outdoor domestic uses - 4 • Irrigation of fruit and vegetables – 3 • Stock watering - 1
Surface water bodies on property	• Yes – 6 • No – 1
Food production on property (fruit, vegetables)	• Yes – 5 ▪ 1 property with commercial gardens ▪ 4 properties grow produce for private use ▪ 1 property does not currently grow produce but has plans to in future
Livestock	• Chickens – 2 • Livestock – 4* *3 properties noted that neighbouring cattle utilise drinking water on their property (bore, surface water bodies)

4.4.3 Site Inspection

Senversa inspected the airport on 22 January 2020. Site inspection documentation is provided in **Appendix H,** and photographs collected during the inspection are provided in **Appendix I.**

The following key observations were made during the site inspection:

- The former fire station comprised several small weatherboard buildings with concrete hardstand (Photograph 1 to 4). These buildings are still present and are currently used for general storage.
- A concrete trough was located to the south of the former fire station (Photograph 6) known as the flushing out area. This was historically used to clean firefighting hoses. Water from the trough drained to the west underground for approximately 30 m where a drain outlet was located.
- All surface water runoff from the former fire station and flushing out area drained to the west (Photograph 5).
- Soil in the waste management area (former drill ground) appeared to have been pushed to the boundary to make way for infrastructure and rubbish stockpiles. A small flammable goods storage shed was located at the rear of the waste management facility (Photographs 8 and 9).
- The current drill ground area is now occupied by Boral. Boral have set up asphalt batching plant machinery and stockpiles of raw materials. Evidence of the firefighting training was only evident by a small pile of burnt cars and buses along the site boundary (Photograph 10).
- The maintenance depot in the north eastern portion of the site is composed of several storage buildings and workshops. Fire trucks were historically serviced in this area which included flushing out and general maintenance (Photographs 11 and 12). Water from this area is collected in a network of drains which flows into a sump at the rear of the workshop.
- The current fire station appears to be well maintained with concrete hardstand. Fire hydrants to the north of the building are used to fill fire trucks. This water is pumped out of two underground tanks that are believed to contain airport bore water. Flushing out of fire trucks occurs on the grassed area adjacent to the fire hydrants (Photographs 13 – 15).

4.5 Summary of Site History and On-island Investigation

The site has operated as an airport with training facilities since 1942. The site layout includes two runways intersecting in the centre of the site and airport operation infrastructure in the northeast including terminal building, storage and cargo facilities. Maintenance facilities and a fire station are in the eastern portion of the site and a waste management facility in the northern portion of the site (**Figure 4**). The general site layout has remained largely unchanged since it was constructed except for the terminal upgrades and the relocation of the fire station in the early 2000's.

Legacy AFFF containing PFAS as an active ingredient was reportedly introduced at the site in the early 1980s and was used widely both on-site and across the entire island until 2015. The first AFFF product used on the site was 3M Lightwater®. 3M Lightwater® was used for approximately 20 years until the change to Tyco Ansulite® occurred in 2004. Tyco Ansulite® AFFF was then used predominately for fire training activities up until 2015 when the Norfolk Island Fire Station voluntarily stopped its use in fire drills. AFFF with PFAS as an active ingredients appears to have been used for a shorter time (and likely in smaller volumes) than for many similar mainland airports. The remaining stocks of Ansulite® are currently held at the fire station and are proposed to be taken off-island in the near future.

Through review of historical land use and activities that utilised legacy AFFF a total of 17 potential PFAS source areas were identified and are detailed in **Table 1**. On-site potential PFAS source areas are shown on **Figure 4**, with off-site potential PFAS source areas on public land shown on **Figure 5**. Areas on-site where heavier application occurred for several years are considered to be represent the Group 1 Source Areas and includes the following areas:

- Former fire station and adjacent former flushing area (Potential PFAS Source Areas 01 and 02).
- Former drill area (Potential PFAS Source Area 03).

- Current fire station (Potential PFAS Source Area 04).
- Maintenance depot (Potential PFAS Source Area 05).
- Current fire drill area (Potential PFAS Source Area 06).

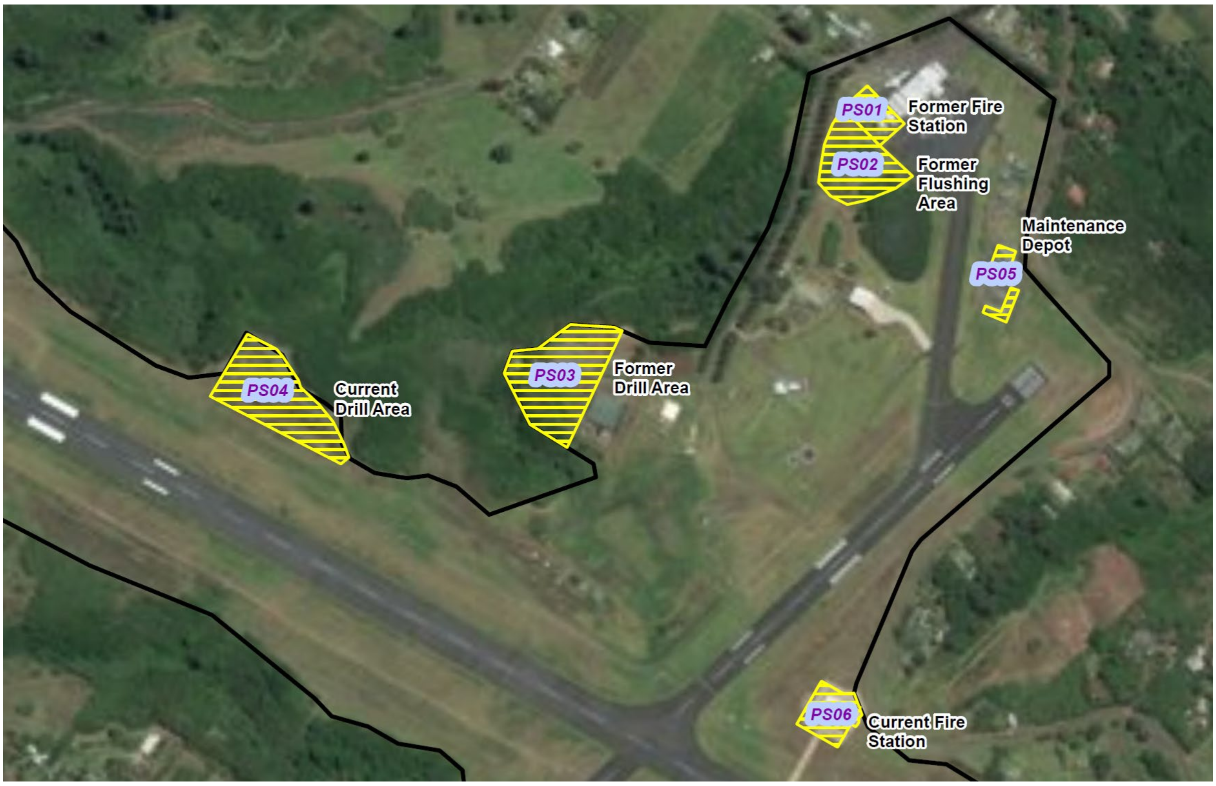

Plate 9: Group 1 Potential PFAS Source Areas (from Figure 4)

Other areas identified as potential sources were legacy AFFF was identified as being used included the off-site training area at St Barnabas Chapel (Potential PFAS Source Area 08), the council works depot where historical fire truck maintenance took place (Potential PFAS Source Area 09) and other areas where foam was applied as a single event (Potential PFAS Source Areas 12-15). These potential PFAS source areas were generally in response to incidents on or off the site, would be less significant potential sources of PFAS, due to the lower volume of AFFF applied over time.

Areas where no AFFF is known to have been used, however where water containing elevated concentrations of PFAS has been identified, or where it was understood that water containing PFAS may have been used include the public toilets across the island (Potential PFAS Source Area 16) and within hospital water tanks historically filled by the Airport Bore (Potential PFAS Source Area 17).

The location of the off-site identified potential PFAS source areas on public land is provided on **Figure 5**, with further details on each of the potential PFAS source areas provided in **Table 1**.

5.0 Preliminary Targeted PFAS Sampling - January 2020

The following section presents the findings of preliminary, targeted PFAS sampling conducted on both public and private land on- and off-site. In response to privacy requests, the figures only show sampling locations where residents agreed to this (**Figures 6 – 9)**. Sample results not presented on figures described in the discussion below and presented in **Tables 2 – 4**.

5.1 Data Quality Objectives

Senversa adopted quality assurance procedures to provide a consistent approach to evaluation of whether the data quality objectives (DQOs) required by the project have been achieved. The approach, detailed in a seven-step process, was consistent with NEPM DQO process, as outlined in Schedule B2 *Guideline on Site Characterisation.* The approach focusses on assessment of the useability of the data in terms of accuracy and reliability in forming conclusions on the condition of the element of the environment being investigated.

The approach taken by Senversa in accordance with the seven-step DQO process is presented in the following table.

Table 4-1: Data Quality Objectives – Seven Step Process

DQO Seven-Step Process
1. State the Problem In December 2019, as a part of a wider water resource assessment, CSIRO sampled three sources of water both on and in close proximity to the Norfolk Island Airport. The sampling indicated the presence of PFAS in three samples within the headwaters of the Mission Creek catchment directly below the aviation fire services drill ground, adjacent to the Airport. Given the results of the CSIRO study and remoteness of the island, it was determined that targeted preliminary sampling should be undertaken as a part of the PSI to principally assess the presence of PFAS in drinking water sources across the island, the Mission Creek Catchment and potential PFAS source areas on the airport.
2. Identify the Decision/Goal of the Study The primary goal of the preliminary targeted sampling was to investigate the presence of PFAS from legacy AFFF emissions within on and off-site environment. This information will be used to assess the following: • What is the extent of presence of PFAS in drinking water sources across the island? • What is the extent of PFAS in soils and sediments within the Mission Creek Catchment? • What is the extent of PFAS in soils and sediments within potential PFAS source areas at the airport?
3. Identify the Information Inputs To assess the required decisions, collection and analysis of environmental media (**Section 4.1**) included: • Soil samples. • Groundwater samples. • Sediment and surface water samples. • Select private property rainwater tanks and extraction bores. The results of the sample analysis, and the location and depth of the samples will be used to prepare a CSM, which includes environmental setting (geology, hydrogeology, topography, surface water movement) and the sources, pathways and receptors of potential PFAS impacts. Adopted screening criteria for the protected beneficial uses of soil/sediment, groundwater and surface water were based on a range of current sources, as detailed in **Section 5.3**.
4. Define the Boundaries of the Study The investigation area includes the on-site areas as defined in **Figure 1** and off-site areas as defined by the sampling locations presented on figures throughout this report, which typically targeted linear surface water features suspected of being off-site contaminant migration pathways (i.e. creeks and drains leading away from the airport). Decisions have been assessed based on the point in time of sampling. Further consideration of temporal variability of groundwater and surface water impacts, where identified, have been established as an area of uncertainty for consideration of future investigations or as part of routine site monitoring.

DQO Seven-Step Process

5. Develop the Analytical Approach/Decision Rule
The decision rule for the data quality objective of the DSI is do measured concentrations of PFAS exceed the adopted Tier 1 screening criteria (**Section 3**)? If they do, then further consideration of risk will be required in a human health and ecological risk assessment, which may require further sampling and assessment of receptors.

To enable the decision to be analysed, the primary chemicals of interest are PFAS (full 28-analyte suite). PFAS compounds were measured at all sampling locations proposed for investigation in this DSI stage of works. NATA accredited laboratories were used for the given analytes and media. Appropriate laboratory limits of reporting (LOR) to meet the relevant adopted criteria were requested, where achievable, from the primary and secondary laboratories for the assessment of PFAS. Further details are provided in **Section 5.3**.

6. Specify Performance or Acceptance Criteria
The overall goal of the study is to identify the presence of PFAS at concentrations which may be of concern to health or the environment. The statistical hypotheses to be tested are therefore:

- Ho: the true mean concentration of PFAS in any given 'exposure unit' to which a human or ecological receptor is exposed is at or above the relevant health- or ecological-based screening level.
- Ha: the true mean concentration in any given exposure unit is below the relevant screening level.

Given the preliminary / targeted nature of the investigation a detailed statistical analysis to estimate confidence or tolerance intervals and/or likelihood of Type 1 or Type 2 errors for individual exposure units is not feasible at this stage of the investigation.

The maximum reported PFAS concentrations in individual exposure areas or units will therefore be compared to relevant screening levels. Where any individual result exceeds the screening level, the null hypothesis will be accepted, and the exposure area and associated receptors will be identified as requiring further assessment.

7. Develop the Plan for Obtaining Data
The scope of works, strategy and methodology for investigation are detailed in **Section 1.3**.

5.2 Relevant Standards, Guidelines and Criteria

The ASC NEPM (NEPC, 2013) sets the national framework for the assessment of site contamination. The Tier 1 assessment criteria contained within these guidelines form the basis of a screening risk assessment. Given the absence of PFAS criteria in the NEMP, assessment criteria have been adopted from the following recently released publications:

- HEPA (2018) PFAS National Environmental Management Plan (PFAS NEMP) January 2018; and
- Department of Health (DoH) (2017) Final Health Based Guidance Values for PFAS for use in site investigations in Australia, developed by Food Standards Australia New Zealand (FSANZ), 2017.

The PFAS NEMP was developed by the heads of EPA (HEPA) to establish a practical basis for nationally consistent environmental guidance and standards for managing PFAS contamination. The plan has been developed by all jurisdictions and recognises the need for implementation of best practice regulation through individual jurisdictional mechanisms.

The following sections describe the assessment criteria adopted for this investigation to be used to assess the soil, sediment, groundwater and surface water quality data.

5.3 Assessment Criteria

Assessment criteria for PFAS are not presented in guideline sources such as the ASC NEPM (NEPC, 2013), relevant State environment protection policies or the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG, 2018).The health based guidance values below are referenced in the PFAS National Environmental Management Plan (NEMP) 2.0 (HEPA 2019) and have been adopted for comparison with results.

The NEMP aims to provide governments with a consistent, practical, risk-based framework for the environmental regulation of PFAS-contaminated materials and sites. The NEMP was originally released in 2018 (HEPA, 2018) and was developed collaboratively by the Heads of EPAs Australia and New Zealand and the Commonwealth Department of Environment and Energy (DoEE) and has been endorsed by the Commonwealth Government. More recently, the New Draft NEMP 2.0 (HEPA, 2019) guidelines have been released. While this guidance remains in draft, it has been endorsed by the Department of Agriculture, Water and the Environment (DAWE). The health based guidance values below are selected from the NEMP 2.0 (HEPA, 2019), and it is noted that there are only minor changes when compared with the health based guidance values presented in the earlier version of the NEMP (HEPA, 2018).

Senversa has not adopted guidance values for ecosystems criteria at this PSI stage of the investigation as it was not identified as being the key pathway of concern. However, potential pathways to ecosystem receptors are discussed and qualitatively assessed in Section 6 (CSM) and Table 6-1 draws conclusions around the need for further assessment of these pathways.

Table 5-2: Adopted Assessment Criteria

Media	Receptor	Assessment Criteria	Source and Justification
Groundwater Surface Water / Dam / Rain Tank Water	**Drinking Water**	PFOS + PFHxS (sum) – 0.07 µg/L PFOA – 0.56 µg/L	**Health Based Guidance Values (HBGV)** sourced from the Australian Government Department of Health, 2017. For use in health-based guidance values for use in site investigations in Australia. Also referenced in the NEMP (HEPA, 2018). The water collected during this preliminary targeted assessment is used for a combination of domestic purposes, watering of stock and poultry, and watering edible and non-edible plants and grasses. For the purposes of this investigation all water samples from every source has conservatively been compared to drinking water criteria (irrespective of whether the water sampled is actually used for drinking purposes).
Soil and/or Sediment	**On-site: Human Health – Commercial Industrial**	PFOS + PFHxS (sum) – 20 mg/kg PFOA – 50 mg/kg	**Human Health Screening Values (HHSV)** sourced from the NEMP 2.0 (HEPA, 2019). All on-site soil and sediments were compared to health based commercial guidelines (see **Table 4a**). All off-site soils and sediments collected during the targeted assessment (see **Table 4b**) were compared to residential guidelines as a conservative approach which is considered appropriate in meeting the project objectives. The approach is particularly conservative for sediments, where the potential for exposure will be much lower than for soils in residential back yards. It is noted that the residential value considers uptake into home-grown produce (fruit and vegetables) but does not consider consumption of home-grown poultry/egg or livestock products.
	Off-site: Human Health – Residential with Garden/Accessible Soil	PFOS + PFHxS (sum) – 0.01 mg/kg PFOA – 0.3 mg/kg	

5.4 Investigation Rationale

The overall approach to sampling comprised a:

1. Targeted off-site investigation within areas suspected to potentially be PFAS impacted based on: water use; proximity to source areas and the local drainage features; and to confirm CSIRO results.
2. Targeted on-site assessment of areas identified as potential source zones from the site history review.

The rationale for the targeted investigation was as follows:

- Assess potable water sources used by water carters to assess whether water being transported around the island as potable water may be impacted by PFAS.
- Assess potential PFAS presence in publicly accessible water sources that have potential to be used for potable water.
- Assess private property water sources where concern of contamination exists.
- Confirm CSIRO results by resampling a select number of locations.

The rationale for the background sampling included:

- Soil and sediment sampling in areas identified as potential sources both on-site and off-site.
- Surface water and sediment sampling off-site in areas down-gradient of identified source areas.

5.5 Fieldwork Methodology

Field work methodology adopted during the preliminary PFAS investigation is provided in **Appendix J.**

5.6 Laboratory Analysis

The analytical schedule completed during the investigation is summarised in the table below. The primary laboratory used for the water, soil and sediment analysis was ALS Environmental and the secondary laboratory was Eurofins.

Table 5-3: Laboratory Analysis

Matrix	Number of Samples	Analytical Regime
Water	42 water samples • 25 Groundwater • 7 surface water	All 42 primary water samples analysed for the following: • PFAS Full Suite (28 analytes)* A sub-set of 16 groundwater samples from across the island were also analysed for the following: • Major anions and cations including alkalinity, sulfate, chloride, calcium, magnesium, sodium, potassium, total anions and total cations.
Soil and Sediment	130 soil/sediment samples • 89 soil • 41 sediment	All 130 primary water samples analysed for the following: • PFAS Full Suite (28 analytes) * A sub-set of an additional 26 primary soil and sediment samples of primary samples from within different sources areas and within the Mission Creek were also analysed for the following: ASLP Leachability for PFAS Full Suite (28 analytes) *
Quality Control Samples	36 Quality Control Samples	36 secondary samples (18 pairs) (water, soil and sediment) for the following: • PFAS Full Suite (28 analytes) * Analysis of 4 secondary soil and sediment samples for the following: ASLP Leachability for PFAS Full Suite (28 analytes)

*PFAS Full Suite (28 analytes) includes – perfluorobutane sulfonic acid (PFBS), perfluoropentane sulfonic acid (PFPeS), perfluorohexane sulfonic acid (PFHxS), perfluoroheptane sulfonic acid (PFHpS), perfluorooctane sulfonic acid (PFOS), perfluorodecane sulfonic acid (PFDS), perfluorobutanoic acid (PFBA), perfluoropentanoic acid (PFPeA), perfluorohexanoic acid (PFHxA), perfluoroheptanoic acid (PFHpA), perfluorooctanoic acid (PFOA), perfluorononanoic acid (PFNA), perfluorodecanoic acid (PFDA), perfluoroundecanoic acid (PFUnDA), perfluorododecanoic acid (PFDoDA), perfluorotridecanoic acid (PFTrDA), perfluorotetradecanoic acid (PFTeDA), perfluoroctane sulphonamide (FOSA), N-Methyl perfluorooctane sulfonamide (MeFOSA), N-Ethyl perfluorooctane sulfonamide (EtFOSA), N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE), N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE), N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA), N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA), 4:2 fluorotelmoer sulfonic acid (4:2 FTS), 6:2 fluorotelmoer sulfonic acid (6:2 FTS), 8:2 fluorotelmoer sulfonic acid (8:2 FTS), 10:2 fluorotelmoer sulfonic acid (10:2 FTS).

The laboratory certificates of analysis and accompanying chain of custody information are provided in **Appendix K**.

5.7 Quality Assurance / Quality Control

The data QA/QC procedures were adopted by Senversa to provide a consistent approach to evaluate whether the data quality objectives (**Section 5.1**) of the project have been achieved. The process focused on assessment of the useability of the data in terms of accuracy and reliability in forming conclusions on the condition of the elements of the environment being investigated. The approach was generally based on guidance from the following sources:

- Australian Standard AS4482.1 - Guide to the investigation and sampling of sites with potentially contaminated soil, Part 1: Non-volatile and semi-volatile compounds (2005).
- NEPC, 2013. National Environment Protection (Assessment of Site Contamination) Amendment Measure 2013 (No. 1): Schedule B3 Guideline on Laboratory Analysis of Potentially Contaminated Soils, Canberra: National Environment Protection Council.
- United States Environmental Protection Agency (USEPA) - Guidance on Systematic Planning Using the Data Quality Objectives Process EPA QA/G-4 (2006).
- USEPA - Guidance on Environmental Data Verification and Data Validation EPA QA/G-8 (2002).

Documentation of the data QA/QC assessment is presented within **Appendix L**. The majority of the results conformed to acceptance criteria and the data was considered to be representative of chemical concentrations in the environmental media sampled and therefore useable for their intended purpose of gaining an understanding of the contamination status of soil, groundwater, surface water and sediment at and surrounding the site.

5.8 Groundwater Investigation Results

Groundwater analytical results compared to adopted screening levels are summarised in **Table 3.** Laboratory certificates of analysis are provided in **Appendix K.** Investigation locations with analytical results screened against human health screening levels are shown on **Figures 6** and **7.**

5.8.1 Field Observations

Groundwater across the site and surrounding area contained low total dissolved solids (TDS) ranging from 269 to 769 mg/L with a slightly acidic to neutral pH ranging from 4.81 to 7.09 confirming groundwater to be fresh (i.e. not saline) and that groundwater recharge in the upper aquifer occurs predominantly via rainwater infiltration. Groundwater was observed to be clear with low turbidity and no odour. Groundwater observations and parameters collected in the field are provided in **Appendix M.**

5.8.2 Groundwater Laboratory Results

The key findings of the water sampling are presented below:

- Senversa sampling confirmed the CSIRO identified impact at the “Airport Bore” (Sample ID PWS_AIRPORT_BORE), which was also found to contain the highest recorded concentration of sum of PFHxS + PFOS (44.5 µg/L) when compared to other groundwater samples.
- All groundwater bores used for water carting (WC_01 – WC_03) did not report detectable concentrations of PFAS.
- With exception of low-level PFAS detections at three properties, all private property groundwater drinking bores did not report detectable concentrations of PFAS. These results were from two properties within the Mission Creek catchment (ID014 and ID015) and one property within the Headstone Creek catchment (ID003).
- Two locations where privately owned bore water reported PFAS in concentrations above drinking water HBGV were found to be used for stock watering (i.e. for cattle drinking water) and were not used for potable drinking water. Exposure to the measured concentrations of PFAS is unlikely to impact upon the health or condition of cattle. However, cattle can accumulate PFAS from the water that they drink, resulting in PFAS concentrations in their tissues, including in meat which can then be consumed by people.

It is noted that there is no available regulatory screening level specifically for this pathway; the presence of PFAS in this water does not necessarily indicate potential risks, but does indicate that further assessment of these pathways is required. It is noted that where cattle source their water from a variety of sources (i.e. not all of the water they drink is from the PFAS impacted source) this will reduce the potential exposures via this pathway.

- The exceedance of the drinking water HBGV does not necessarily indicate that potential risks are posed via two specific pathways:
  - Human consumption of crops or eggs from chickens watered with this water.
  - Human consumption of stock that have used this water for their drinking water. Cattle source their water from a variety of sources (i.e. not all of the water they drink is from the PFAS impacted source) and this reduces the potential exposures via this pathway.

  However, the presence of elevated concentrations of PFAS in this water indicated that further assessment of these pathways is required.

- Groundwater within the Mission Creek catchment reported concentrations for sum of PFHxS + PFOS above HBGVs at three locations (PWS_AIRPORT_BORE, ID014 and ID015).

In summary, PFAS was reported in concentrations above the adopted HBGV from groundwater in samples collected within the Mission Creek Catchment, down-gradient of the former fire station and drill area. All groundwater samples collected outside of the Mission Creek Catchment did not report PFAS in concentrations above the HBGVs.

A summary of the exceedances of the adopted assessment values are summarised in **Table 5.3**.

Table 5-4: Summary of Groundwater Analytical Results

Analyte	Screening Value (µg/L)	No. of Samples[1]	Detectable Concentration Range (µg/L)	Number of Detections[1]	Number of Exceedances
PFOA	0.56[2]	25	0.02 – 0.57	7	1
PFOS	NA		0.46 – 33.1	7	-
PFHxS	NA		0.04 – 11.4	9	-
Sum of PFOS + PFHxS	0.07[2]		0.004 – 44.5	9	3

[1] Includes field quality control duplicate and triplicate samples
[2]PFAS National Environmental Management Plan – Drinking Water Guidelines (HEPA, 2018)
NA = No Australian screening values available

5.9 Surface Water Investigation Results

Surface water analytical results compared to adopted screening levels are summarised in **Table 3.** Laboratory certificates of analysis are provided in **Appendix K.** Investigation locations of samples obtained on public land (or private land with permission to display the results) with analytical results screened against HBGVs are shown on **Figures 6** and **7.**

5.9.1 Field Observations

The surface water bodies that were sampled included two dams, one reservoir, six creeks and one spring. The dams (headstone and watermill dam) and reservoir (Hessies reservoir) contained large volumes of water with relatively low TDS and neutral pH.

All but one creek contained stagnant pools of water with slight brown colouring and organic odours. The only creek that was flowing was Watermill Creek (sample IDs TC_SW02 and TC_SW02). Water quality parameters and observations are provided in **Appendix M**.

5.9.2 Surface Water Laboratory Results

The key findings of the water sampling are presented below:

- Surface water collected at WWII Dam (Sample ID PWS_WWII_DAM) confirmed CSIRO identified PFAS, and this location reported the highest detectable PFAS concentrations of sum of PFHxS + PFOS (67.2 µg/L) when compared to other surface water samples.
- Surface water collected from public water supply points exceeded the adopted HBGVs for sum of PFHxS + PFOS at one location (PWS_DUCK_DAM) with a concentration of 0.12 µg/L.
- Surface water sampled from Cascade Creek, down gradient of the council works depot (ID012_SW01) exceeded the adopted HBGVs for sum of PFHxS + PFOS with a concentration of 0.18 µg/L.
- Surface water sampled from Watermill Creek (TC_SW02), down gradient of the site and up-gradient of watermill Dam (PWS_DUCK_DAM) exceeded the adopted HBGVs for sum of PFHxS + PFOS with a concentration of 0.09 µg/L.
- Surface water sampled from Mission Creek (ID013_SW01), down gradient of the site exceeded the adopted HBGVs for sum of PFHxS + PFOS with a concentration of 4.50 µg/L. This water was sampled from a hose pumping water up from the creek onto the residential property where the water is understood to be used for watering crops and poultry. Exposure to the measured concentrations of PFAS is unlikely to impact upon the health or condition of produce or chickens. However, chickens can accumulate PFAS from the water that they drink, resulting in PFAS concentrations in their tissues, including in eggs which can then be consumed by people. Plants can also take up PFAS from the water they are irrigated with, and potentially accumulate it in their roots, leaves and fruit (which can then be consumed by people). It is noted that there is no available regulatory screening level specifically for this pathway; the presence of PFAS in this water does not necessarily indicate potential risks, but does indicate that further assessment of these pathways is required.

In summary, surface water collected from Mission Creek, Watermill Creek, Cascade Creek and Watermill Dam exceeded the adopted HBGVs for drinking water.

Exceedances of the adopted HBGVs are summarised in **Table 5.4** below.

Table 5-5: Summary of Surface Water Analytical Results

Analyte	Screening Value (µg/L)	No. of Samples[1]	Detectable Concentration Range (µg/L)	Number of Detections	Number of Exceedances
PFOA	0.56[2]	17	0.07 – 1.13	2	1
PFOS	NA		0.01 – 44.6	11	-
PFHxS	NA		0.02 – 22.6	8	-
PFOS + PFHxS	0.07[2]		0.01 – 67.2	12	5

[1] Includes field quality control duplicate and triplicate samples
[2] PFAS National Environmental Management Plan – Drinking Water Guidelines (HEPA, 2018)
NA = No screening values available

5.10 Tank / Tap Water Investigation Results

Water tank and tap water analytical results compared to adopted HBGVs are summarised in **Table 3**. Laboratory certificates of analysis are provided in **Appendix K**. Investigation locations with analytical results screened against adopted HBGVs are shown on **Figures 6** and **7**.

5.10.1 Field Observations

The water tanks sampled during the targeted assessment included tanks containing site derived rainwater and tanks that have historically been filled using airport bore water and water provided by water carriers. Any tank known to contain only bore water was labelled as a bore with these results discussed in **Section 5.7** above.

Eleven tanks were sampled during the targeted investigation. Tanks across the island are predominantly constructed out of high-density polyethylene (HDPE), however some older tanks on the island are of concrete construction. Seven taps were sampled during the investigation. Tap samples were of filtered water plumbed directly from tanks. Filtration systems varied between locations.

5.10.2 Tank Water Laboratory Results

The key findings of the water sampling are presented below:

- All tanks sampled did not report detectable concentrations of PFAS, except for one council depot tank (DEPOT_TANK2) and the one tap sampled inside together with the concrete underground tank at the Hospital (PWS_HOSP_TANK2). The council depot tank 2 (DEPOT_TANK2) was the only tank with water that exceeded the adopted HBGVs for sum of PFHxS + PFOS with a concentration of 9.01 µg/L.

Tank water samples in which PFAS was not detected included rainwater used for the supply of bottled water / water cooler water, and private rainwater tanks. The private rainwater tanks sampled included a tank known to have been historically filled from a water carter supply which was unable to be sampled directly; the absence of detectable PFAS in this water provides indirect evidence that this water carter supply is unlikely to be impacted by PFAS.A summary of the exceedances of the adopted assessment values are summarised in **Table 5.5A** below.

Table 5-6A: Summary of Tank Water Analytical Results

Analyte	Screening Value (µg/L)	No. of Samples[1]	Detectable Concentration Range (µg/L)	Number of Detections	Number of Exceedances
PFOA	0.56[2]	15	0.17	1	0
PFOS	NA		0.02 – 5.54	2	-
PFHxS	NA		3.47	1	-
PFOS + PFHxS	0.07[2]		0.02 – 9.01	2	1

[1] Includes field quality control duplicate and triplicate samples
[2] PFAS National Environmental Management Plan – Drinking Water Guidelines (HEPA, 2018)
NA = No screening values available

5.10.3 Tap Water Laboratory Results

Taps at the chapel, hospital, school, council works depot and fire station were sampled as part of the targeted investigation. The water from all taps sampled was tank water following filtration. The key findings of the water sampling are presented below:

- The council depot tap (DEPOT_TAP) exceeded the adopted HBGV for sum of PFHxS + PFOS with a concentration of 8.79 µg/L.
- Both the indoor and outdoor tap at the fire station (FRE_TAP1 and FRE_TAP2) exceeded the adopted HBGV for sum of PFOS + PFHxS with concentrations of 8.63 and 22.3 µg/L respectively.
- The hospital tap (PWS_HOSP_TAP1) exceeded the adopted HBGV for sum of PFHxS + PFOS with a concentration of 0.50 µg/L.

The water sampled from the depot tap reported elevated PFAS concentrations, consistent with the concentrations measured in DEPOT_TANK2 (one of the tanks supplying the facility). A replacement drinking water supply has been put in place at the depot, and advice has been provided that the tap water should not be used for drinking, cooking or other uses where it may be consumed (e.g. cleaning teeth).

The water sampled from the hospital and depot taps reported elevated concentrations of PFAS that was not observed in the tank in which the water was sourced. The elevated concentrations of PFAS were considered to come from either the pipework or filtration system between the tank and the tap. Further investigation to the source of this PFAS was subsequently undertaken and is discussed below in **Section 5.9.4**.

Table 5-7B: Summary of Tap Water Analytical Results

Analyte	Screening Value (µg/L)	No. of Samples[1]	Detectable Concentration Range (µg/L)	Number of Detections	Number of Exceedances
PFOA	0.56[2]	7	0.16 – 0.44	3	0
PFOS	NA		0.45 – 15.0	4	-
PFHxS	NA		0.05 – 7.30	4	-
PFOS + PFHxS	0.07[2]		0.5 – 22.3	4	4

[1] Includes field quality control duplicate and triplicate samples
[2] PFAS National Environmental Management Plan – Drinking Water Guidelines (HEPA, 2018)
NA = No screening values available

5.10.4 Further Hospital Tap Assessment

Following receipt of the elevated PFAS concentrations in the hospital tap (PWS_HOSP_TAP1), Senversa requested ALS (the primary laboratory) re-analyse the sample. The result was found to be within the same order of magnitude with the concentration of sum of PFOS + PFHxS being between 0.41 µg/L and 0.40 µg/L (see **Appendix K** for the laboratory report). This is slightly lower than the previous result of 0.50 µg/L but above the adopted HBGV (0.07 µg/L).

As shown on the picture below, the sample PWS_HOSP_TAP1 was obtained from a tap at the base of one of two “filtration cannisters”, immediately after water passed through the hospital’s filtration system. An inset within **Figure 7** shows the location of all the samples obtained from the hospital, including surrounding tanks and bores.

Plate 10: Hospital Water Filtration System

The hospital has seven water tanks and anecdotal evidence suggested that two of the older tanks at the rear of the hospital, (one concrete and one HDPE) were previously topped up with bore water from the airport bore (Senversa sampling ID: PWS_AIRPORT_BORE). However, all tanks were understood to be full of rain water with no bore water top ups occurring over the past two years.

All tanks are connected to a master tank (sample ID: PWS_HOSP_TANK1 taken from master tank did not detect PFAS), with water then transferred directly into the hospital water treatment system in a small building adjacent to the tank.

After passing through the water filtration system, water is then circulated through at least some or potentially all hospital buildings. However, we understand the water supply to the hospital laundry is separate, with this water coming from the bore at the rear of the property (sample ID: PWS_HOSP_BORE taken from this bore).

As PFAS was not detected in the tank supplying the filter and tap, it was identified that the source of the elevated concentrations reported in sample “PWS_HOSP_TAP1” may be attributed to PFAS being sorbed onto filtration substrate contained within the hospital filtration system that was deposited on occasions when the PFAS impacted airport bore was being used to supply water to the hospital. It was additionally identified that other taps within the hospital connected to the hospital’s water filtration system may contain similar PFAS concentrations.

Based on these results, the hospital was placed on an alternative drinking water supply. Subsequently, parts of the filtration system were replaced, and the system purged. Senversa undertook further sampling on 13 February 2020 following these works. Samples were collected as follows:

- HOSP_TAP1 is a repeat of the previously collected sample (collected from the right-hand filtration system following the full filtration process).
- HOSP_TAP2 is collected from part-way through this right-hand filtration chain (the filtration system contains several filters in series, and this was collected after the first filter, but before the second).

- HOSP_TAP3 was collected from the right-hand filtration system following the full filtration process (i.e. this sample is analogous to HOSP_TAP1, but from the left hand side).
- HOSP_TAP4 is from the tap in the kitchen, this is water which has passed through the filtration system which is being used utilised within the hospital.

With the exception of HOSP_TAP2, the measured concentrations in all of these samples (0.34 – 0.58 µg/L PFOS +PFHxS) exceeded the adopted HBGV, and were similar to those previously measured in HOSP_TAP1. As the results remained above the drinking water HBGV, the alternative drinking water supply should continue to be used for drinking and cooking within the hospital. These results indicate that part of the hospital filtration system may be a source for the identified PFAS, even following replacement of parts of the system and purging. PFOS +PFHxS concentrations were below laboratory detection limits in HOSP_TAP2 (collected after the first filter, but before the second), indicating that the second filter in the filtration system is the most likely source for the identified PFAS.

5.11 Targeted Soil Investigation Results

Soil analytical results compared to adopted screening values are summarised in **Table 4**. Laboratory certificates of analysis are provided in **Appendix K**. Investigation locations with analytical results screened against human health screening values are shown on **Figures 8** and **9**.

5.11.1 Field Observations

The soil observed across the site and surrounding area generally comprised of a grassed surface coverage underlain by dry, hard, brown silky clay with trace roots. Photographs of select sample locations and lithology are provided in **Appendix I**.

5.11.2 Soil Laboratory Results

The key findings of the soil sampling are presented below:

- All soil samples collected off-site (Ball Bay, St Barnabas Chapel and Webb Adams property) reported detectable concentrations of PFAS, but all were below the adopted human health screening values (HHSV) for residential land use.
- All 64 soil samples collected on-site from potential source zones contained concentrations of PFHxS + PFOS below the adopted commercial HHSV assessment criteria.

In summary, all targeted soil samples collected on and off-site were below the adopted HHSV relevant for the location sampled, however the soils with detectable PFAS present represent a potential ongoing source of surface water and groundwater contamination. Further investigation is recommended to further assess the identified soil source areas and to delineate the impacted areas.

A summary of the results is provided in **Table 5.7A** (on-site soils) and **Table 5.7B** (off-site soils) below.

Table 5-8A: Summary of On-Site Surface Soil Analytical Results

Analyte	Screening Value (mg/kg)	No. of Samples Analysed[1]	Detectable Concentration Range (mg/kg)	Number of Detections[1]	Number of Exceedances
PFOA	50[2]	87	0.0002 – 0.025	55	0
PFOS	NA		0.0002 – 0.986	86	-
PFHxS	NA		0.0002 – 0.0746	64	-
PFOS + PFHxS	20[2]		0.0002 -1.04	0	0

[1] Includes field quality control duplicate and triplicate samples
[2] based on 20% of FSANZ TDI, i.e. up to 80% exposure is assumed to come from other pathways.
NA = No screening values available

Table 5-9B: Summary of Off-Site Surface Soil Analytical Results

Analyte	Screening Value (mg/kg)	No. of Samples[1]	Detectable Concentration Range (mg/kg)	Number of Detections[1]	Number of Exceedances
PFOA	0.3[2]	43	0.0002 – 0.058	13	0
PFOS	NA		0.0002 – 0.456	13	-
PFHxS	NA		0.0002 – 0.0692	27	-
PFOS + PFHxS	0.01[2]		0.0002 -0.521	39	17

[1] Includes field quality control duplicate and triplicate samples
[2] based on 20% of FSANZ TDI, i.e. up to 80% exposure is assumed to come from other pathways.
NA = No screening values available

5.12 Targeted Sediment Investigation Results

Sediment analytical results compared to adopted screening levels are summarised in **Table 4.** Laboratory certificates of analysis are provided in **Appendix K.** Investigation locations with analytical results screened against human health screening levels are shown on **Figures 8** and **9.**

5.12.1 Field Observations

The sediment within the open drainage network both on and surrounding the site comprised of dry, brown gravelly silt. Sediment in off-site water bodies including Mission Creek and Mission Pool comprised of wet, brown silty clay. All sediment samples were dry with the exception of sediment collected from Cascade Creek where surface water was present. Photographs are provided in **Appendix I**, with a photograph showing the location of the Mission Pool samples provided as Photo 29.

5.12.2 Sediment Laboratory Results

The key findings of the sediment sampling are presented below:

- Sediment samples collected from on-site drains reported detectable concentrations of PFHxS+ PFOS in all samples with four samples (A_SD01, A_SD02, A_SD05 and A_SD07), but were below the adopted commercial HHSV.
- Samples collected from surface water drains surrounding the site (i.e. drains collecting surface water run-off from site) were generally below the adopted HHSV with the exception of two samples (AD_SD09 and AD_SD10), which were samples collected off-site adjacent to the maintenance facility.
- All samples collected off-site from within the Mission Creek and Mission Pool north of the Chapel (MCSD01 – MCSD10) reported elevated concentrations of sum of PFHxS + PFOS exceeding the adopted residential HHSV.
- One sediment sample collected from Cascade Creek (ID012), down gradient of the council works depot reported elevated concentrations of sum of PFHxS + PFOS exceeding the adopted residential HHSV. Elevated concentrations of PFAS was also found in surface water at this location.

While exceedances of the residential HHSV were noted in a number of locations, it is emphasised that the use of these HHSV for comparison with sediment concentrations is very conservative. The adopted HHSV consider that fruit and vegetables could be grown in soil for home consumption, as well as offering protection for people coming into daily contact with soil. PFAS concentrations in the sampled sediment are below the HHSV presented in the NEMP for all other land uses, including for public open space (PFOS+PFHxS = 1 mg/kg).

The public open space guidance values are derived on the basis that daily contact with soils could occur (but they assume that no produce is grown in the soils). The open space guidance values are considered conservative to assess the potential risks associated with incidental contact with these sediments (which is likely to occur infrequently).

Exceedances of the adopted assessment values are summarised in **Table 6.2** below.

Table 5-10: Summary of Sediment Analytical Results

Analyte	Screening Value (mg/kg)	No. of Samples[1]	Detectable Concentration Range (mg/kg)	Number of Detections[1]	Number of Exceedances
PFOA	0.3[2]	41	0.0002 – 0.0058	17	0
PFOS	NA		0.0002-0.456	38	-
PFHxS	NA		0.0002-0.0692	31	-
PFOS + PFHxS	0.01[2]		0.0004-0.521	39	15

[1] Includes field quality control duplicate and triplicate samples
[2] based on 20% of FSANZ TDI, i.e. up to 80% exposure is assumed to come from other pathways.
NA = No screening values available

5.13 Leachability of Soil & Sediment Results

A total of 26 soil and sediment samples from the Mission Creek, Watermill Creek and Headstone Creek surface water catchments were analysed for leachable PFAS and the results compared against the adopted HBGV for drinking water are presented in **Table 5**. The key findings from the assessment include:

- Leachable concentrations of PFAS were present in 25 of the 26 samples analysed, with sample ID012_SD01 (Total soils PFOS + PFHxS concentration: 0.0083 mg/kg) obtained from private land within the Watermill / Town Creek surface water catchment, being the only sample to have leachable PFAS concentrations below detection limits.
- 13 samples exceeded the HBGV for drinking water (sum of PFOS + PFHxS: 0.07 µg/L), with a highest concentration of 5.54 µg/L (sum of PFOS + PFHxS) present within sample obtained from the airport between the large Banyan Tree and airport apron at sample location A_SS54.

These results suggest that the soils / sediments where detectable PFAS was identified may represent an ongoing source of PFAS contamination to surface water and groundwater.

5.14 Analysis of AFFF within Fire Truck

For the purpose of assessing the concentration and ratio of PFAS in AFFF stocks remaining on island, one sample of AFFF “”FRE_UL_TENDER1”” was obtained directly from one of the airport fire fighting vehicles, with this location not shown on the figure.

- The concentration of PFOS + PFHxS in the remaining AFFF sampled from the aviation fire fighting trucks (Sample FRE_UL_TENDER1) was 683 µg/L. This concentration was considered indicative of the AFFF Ansulite being diluted with water from within the truck. The top five highest PFAS analyte concentrations within the potentially diluted AFFF formulation were:
- Perfluorohexanoic acid (PFHxA) – 1,160 µg/L
- Perfluorobutanoic acid (PFBA) – 662 µg/L
- 8:2 Fluorotelomer sulfonic acid (8:2 FTS) – 614 µg/L
- Perfluorooctanoic acid (PFOA) – 539 µg/L
- PFOS – 473 µg/L

The compositional data collected for this AFFF sample will assist in assessing disposal options for AFFF. It is emphasised that these concentrations do not represent environmental concentrations of PFAS; these are concentrations present in residual AFFF stocks in fire fighting vehicles rather than concentrations in water which may be used for drinking or other purposes. As such, it is not relevant to compare these concentrations to water screening levels.

6.0 Preliminary Conceptual Site Model

Based on the information reviewed and summarised in the previous sections, the following sections outline the key sources, pathways and receptors of the CSM.

6.1 Key PFAS of Interest

Published health based guidance values (HBGVs) within the PFAS NEMP relates to PFOS, PFHxS and PFOA only, and as such are considered the key PFAS of interest for the purposes of the PSI.

Assessment of the nature and extent of other PFAS will be undertaken as a part of the DSI.

6.2 Sources of PFAS

6.2.1 PFAS Source Areas

A number of source areas where legacy AFFF was used and introduced into the environment were identified during the site history review and Senversa's on-island investigation (refer to **Section 4.0**). Details on each identified source area are provided in **Table 1** (attached) with their location shown on **Figure 4** and **Figure 5.**

Generally, the most significant source areas ('Group 1 Source Areas' identified in **Table 1**) were locations where there was repeated application of foams and concentrate. These Group 1 Source Areas include the following primary source areas:

Group 1 Source Areas:

- Primary Source Area 01: The former fire station and foam shed.
- Primary Source Area 02: Flushing out area in the northeast corner of the site.
- Primary Source Area 03: The former drill ground south west of the former fire station in the northeast portion of the site. This area is now utilised as the waste management facility.
- Primary Source Area 04: Current fire drill area along the northern site boundary. This area is currently utilised by Boral and was unable to be accessed during the targeted investigation.
- Primary Source Area 05: The maintenance depot where general maintenance of fire trucks historically occurred.
- Primary Source Area 06: The current fire station.

Other source areas that were considered to be less significant based on frequency of AFFF application, were identified and grouped as follows:

- Group 2 Source Areas (Potential Sources 7-11) – Areas where legacy AFFF concentrate and / or foam was used or stored more than once, but with less frequent rates of application than Group 1. Also includes secondary source areas like the wastewater treatment plant on the Airport.
- Group 3 Source Areas (Potential Sources 12-15) – Areas where a single application of foams occurred due to an incident or a one off event.
- Group 4 Source Areas (Sources 16 & 17) – Areas where no AFFF is known to have been used, however water containing elevated concentrations of PFAS used.

Further information on potential PFAS Source Areas 7 through 17 is provided summarised in **Table 1**.

6.2.2 Impacted Environmental Media

Once released to the environment due to spills, leaks, application of foams, etc., AFFF can result in PFAS impacts to soil, surface water, groundwater and biota. The pathways by which PFAS may migrate through the environment, by processes such as desorption, adsorption, leaching, or bioaccumulation, are represented in the flow chart in **Plate 11** provided in **Section 6.5** below.

6.3 Exposure Pathways

Exposure pathways by which the above receptors may be exposed to PFAS in environmental media are listed below. The significance of these exposure pathways is dependent on a number of factors, such as the rate of exposure/intake, the concentrations within the impacted media at the point of exposure and characteristics of the receptor group.

6.3.1 Human Health

Human health receptors may be exposed to impacted environmental media through direct contact pathways. Generally, direct contact with soils is limited to the top 0.5 m, although construction or intrusive workers may disturb and be exposed to deeper soils. Groundwater may be accessible when extracted for uses such as domestic (non-potable), agricultural, or other purposes.

- Incidental ingestion – shallow soil, extracted groundwater, surface water.
- Dermal contact – shallow soil, extracted groundwater, surface water (noting that PFAS have very low/ negligible dermal absorption rates).
- Inhalation of dusts and aerosols.
- Bioaccumulation and ingestion via the food web – agricultural or aquatic (fish, water birds).

6.3.2 Ecological

Ecological receptors may be exposed to impacted environmental media through direct contact and uptake pathways. Generally, habitat areas for terrestrial receptors (the root zone, burrowing animals, etc.) are assumed to extend to approximately 2 m depth.

- Direct uptake from surface water, sediments or soils.
- Bioaccumulation via the ecological food web.

6.4 Receptors

Potential receptors that may be exposed to PFAS on or off the site are divided into two categories, human health and ecological. While these receptors may not be at risk from PFAS impacts (i.e. exposure pathways may be incomplete), the investigation into potential PFAS impacts should ensure that such receptors are considered and the potential for exposure should be appropriately assessed.

Key identified human health and ecological receptors are shown on the cross-section presented as **Figure 10** and summarised below.

6.4.1 Human Health

Current receptors **on-site** comprise:

- Airport and Council Office Workers.
- Fire Fighters.
- Waste Management Workers.
- Intrusive workers (including resurfacing workers).
- Airport visitors / travellers.

Current **off-site** receptors located in proximity to the site include:

- Residents / Farmers.
- Workers and intrusive workers.
- Recreational users of creeks / dams.
- Consumers of produce in which PFAS may accumulate (e.g. meat, eggs, fruit, and vegetables).

6.4.2 Ecological

Potential ecological receptors include the following:

- On-site environments:
  - Grassland surrounding the runway and aprons.
- Off-site environments:
  - Freshwater aquatic flora and fauna present in surface waters (including Mission Creek, Cascade Creek, Watermill Creek, Watermill Dam, and drainage and irrigation lines).
  - Terrestrial flora and fauna, including grasses/pasture, cattle and chickens.
  - Saltwater aquatic flora and fauna present at Mission Creek discharge.
- Higher trophic level organisms (e.g. predatory birds) consuming fauna from on- and/or off-site.

6.5 Qualitative Source – Pathway - Receptor Linkages Assessment

Due to the high solubility of PFAS, these substances can readily migrate in the following ways:

- Leaching from PFAS impacted soils/sediments/concrete.
- Transport to/from/via surface water drainage (drains, natural surface water (creeks, rivers, wetlands), irrigation networks, dams and areas of inundation.
- Transport in groundwater and discharge to surface water bodies, or groundwater recharge from PFAS impacted surface runoff.

Historical use of legacy AFFF is likely to have also resulted in aerosols or sorption onto dust particles which may have migrated and deposited onto other media.

In accordance with the sources, receptors, and pathways summarised above, the following conceptual site model flow chart was developed to provide a summary of the key potential exposure to PFAS on Norfolk Island. The flow chart in **Plate 11** below provides a diagrammatic representation of the key Norfolk Island Airport Source-Pathway-Receptor (SPR) linkages. This summary CSM considers the key SPR linkages associated with the most significant source areas ('Group 1 Source Areas' identified in Table 1) where there was repeated application of foams and concentrate. Potential SPR linkages associated with all potential sources (including less significant Group 2, Group 3 and Group 4 sources) are discussed further in Table 6-1.

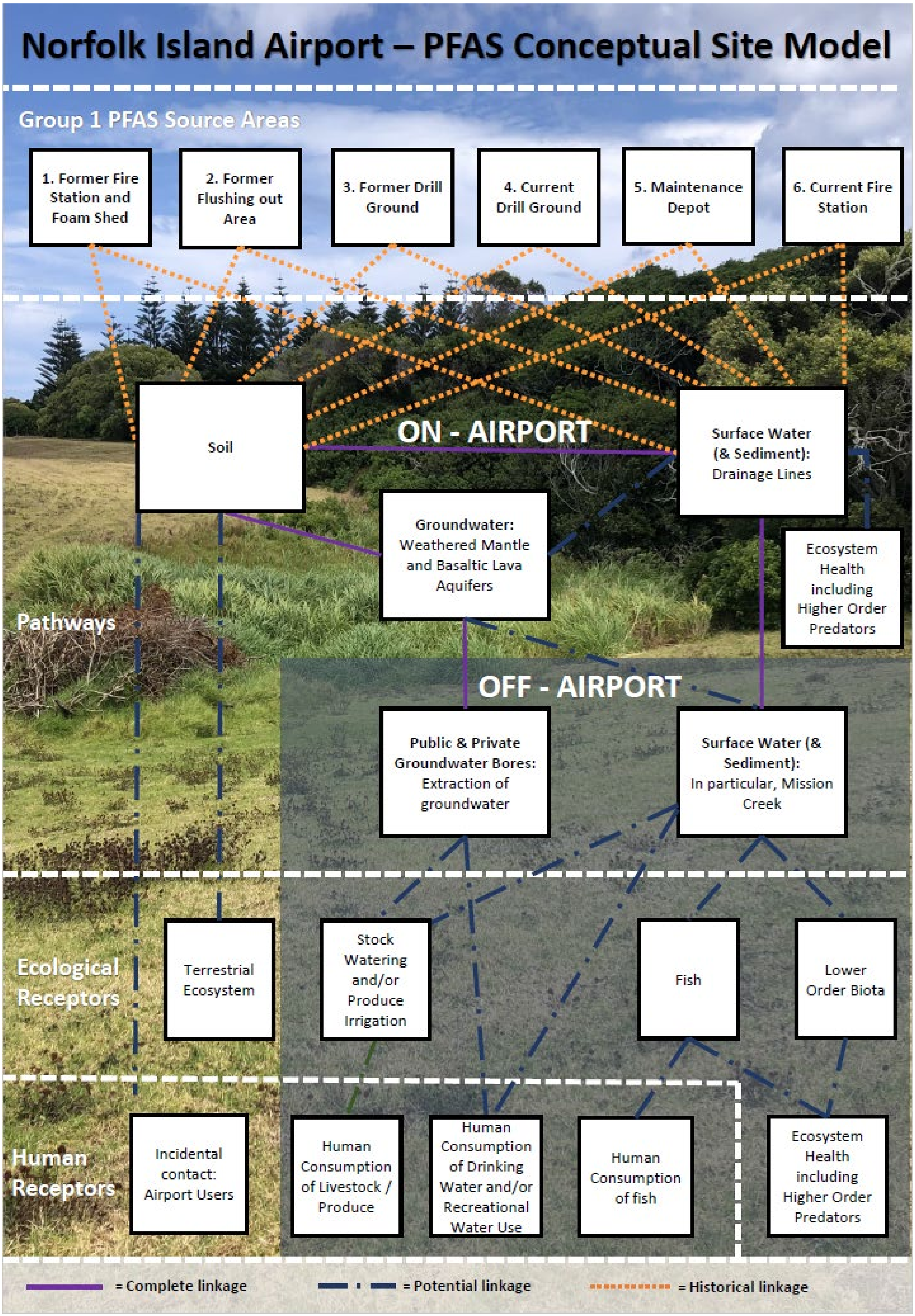

Plate 11: Preliminary Conceptual Site Model Flow Chart

Table 6-1: Risk Ranking of Potentially Complete Source-Pathway-Receptor Linkages

Area	Media of Potential Concern	Receptor	Potential Priority Level	Basis	Tier 2 Risk Assessment likely required?	Further sampling likely required?
On-Site: Norfolk Island Airport	**Soil / Sediments**	Airport and Council Office Workers	**Low**	Likelihood for general worker exposure to PFAS is considered to be low as majority of activities are not likely to involve soil disturbance.	No	No
		Airport Visitors	**Low**	Likelihood for visitor exposure to PFAS is considered to be low as the publicly accessible portions of the site generally contain hardstand and are not in areas of highest impact. Further, visitors only spend a very limited period of time at the airport, thereby limiting potential exposure.	No	No
		Current Fire Fighters	**Medium**	Likelihood for firefighter exposure to PFAS is considered to be medium as majority of activities are in high impact areas however are not likely to involve soil disturbance and fire fighters wear personal protective equipment during fire fighter activities.	No	Yes
		Waste Management Workers	**Medium**	Likelihood for Waste Management workers exposure to PFAS is considered to be medium as the Waste Management Facility is considered an area of high impact however general duties are not likely to involved soil disturbance.	No	Yes
		Intrusive workers (Incl. resurfacing workers)	**High**	Likelihood for intrusive workers including resurfacing workers exposure to PFAS is considered to be high due to the concentrations of PFAS in shallow surface soils in areas surrounding the runway and the high likelihood of the soil to be disturbed.	No	Yes
		Terrestrial ecological receptors	**Medium**	Given the nature of the airport site, the potential for sensitive ecosystems to be present is likely to be low. Additionally, it is unlikely that biota from within the impacted areas of the site would form a significant proportion of the diet of higher order predators (given the limited size of the area, and the limited biota which are likely to be present in these areas. Notwithstanding this, it is noted that that a number of the measured concentrations exceed the most conservative screening levels for terrestrial ecosystems presented in the NEMP, and as such, this pathway should be considered further in the next stages of assessment.	Potentially	No
	Surface / Tap Water (including from bore)	Airport and Council Office Workers	**Medium**	Likelihood for airport and council worker exposure to PFAS in water is considered to be medium as the water supplied to buildings across the airport is sourced from Airport Bore (located just outside the airport boundary) which contains elevated concentrations of PFAS. The priority is not considered high as it is understood this water is not used for potable purposes, with alternate drinking water supplied. Water from the Airport Bore continues to be utilised for other (non-potable) uses, for example the toilet facilities, but the potential for exposure during hand washing will be relatively low given the frequency and duration of exposure, and the limited potential for PFAS adsorption through the skin.	Yes	Yes

Area	Media of Potential Concern	Receptor	Potential Priority Level	Basis	Tier 2 Risk Assessment likely required?	Further sampling likely required?
On-Site: Norfolk Island Airport		Airport Visitors	**Low**	Likelihood for elevated airport visitor exposure to PFAS is considered to be low as alternative supplies for potable water is provided (for both drinking water and in the café). Water from the Airport Bore continues to be utilised for the toilet facilities, but the potential for exposure during hand washing will be relatively low given the frequency and duration of exposure, and the limited potential for PFAS adsorption through the skin.	Yes	No
		Fire Fighters	**Medium**	Likelihood for fire fighter exposure to PFAS is considered to be high as regular contact with PFAS contaminated water is likely. The kitchen tap and outside hydrants both contain elevated concentrations of PFAS which would be used daily. The priority is not considered high as it is understood this water is not used for potable purposes, with alternate drinking water supplied. Water from the Airport Bore continues to be utilised for other (non-potable) uses, for example the toilet facilities, but the potential for exposure during hand washing will be relatively low given the frequency and duration of exposure, and the limited potential for PFAS adsorption through the skin.	Yes	Yes
		Waste Management Workers	**Medium**	Likelihood for waste management worker exposure to PFAS in water is considered to be medium as the water supplied to buildings is likely sourced from Airport Bore (not confirmed) which contains elevated concentrations of PFAS.	Yes	Yes
		Intrusive workers (Including resurfacing workers)	**Medium**	Likelihood for intrusive worker exposure to PFAS in water is considered to be medium as a portion of the water used for dust suppression / fire drill training / resurfacing and potentially other uses (access to current drilling ground / resurfacing works area was not gained during this PSI) may have been or may currently be sourced from the PFAS impacted Airport Bore. The exposure potential will be limited where water is not used for drinking given the limited potential for PFAS adsorption through the skin.	Yes	Yes
	Shallow Groundwater– Direct Contact	Fire Fighters	**Low**	Likelihood for fire fighter exposure to PFAS in groundwater is considered low as there are no known fire fighter training activities that require excavation on site.	No	No
		Waste Management Workers	**Low**	Likelihood for waste management workers exposure to PFAS in groundwater is considered low as there is no bore on-site that is used at this facility.	No	No
		Intrusive & resurfacing workers.	**Medium**	Likelihood for intrusive works exposure to PFAS in shallow groundwater is considered medium however this is dependent on the type of intrusive works and the depth to groundwater. More information is required.	Potentially	No
		Terrestrial ecological receptors	**Medium**	Given the nature of the airport site, the potential for sensitive ecosystems to be present is likely to be low. Additionally, it is unlikely that biota from within the impacted areas of the site would form a significant proportion of the diet of higher order predators (given the limited size of the area, and the limited biota which are likely to be present in these areas. Notwithstanding this, it is noted that that the potential for PFAS uptake from groundwater via on-site plants has not currently been excluded, and as such, this pathway should be considered further in the next stages of assessment.	Potentially	No

Area	Media of Potential Concern	Receptor	Potential Priority Level	Basis	Tier 2 Risk Assessment likely required?	Further sampling likely required?
Off-Site: Wider Norfolk Island	**Soil**	Residents / Farmers	**Medium**	Potential for exposure if impacted groundwater used for irrigation of crops or gardens results in PFAS impacts to soil. Potential for exposure is greater in areas where contaminated groundwater has been identified.	Potentially	Yes
		All Workers	**Medium**	Potential for exposure if impacted groundwater used for irrigation of crops or gardens results in PFAS impacts to soil.	Potentially	Yes
		Terrestrial ecological	**Medium**	Potential for exposure if impacted groundwater used for irrigation of pasture or gardens results in PFAS impacts to soil.	Potentially	Potentially
	Surface Water / Sediments	Residents / Farmers	**Medium**	Potential direct contact with off-site drains and surface water bodies for recreation and farming purposes. Investigations to date have indicated this water is unlikely to be used for drinking, and the potential for PFAS exposure will be much lower for other uses when compared with drinking water exposure.	Potentially	Yes
		Workers incl. Intrusive	**Medium**	Potential direct contact with off-site drains and surface water bodies and the potential for PFAS exposure will be much lower for other uses when compared with drinking water. exposure.	Potentially	Yes
		Recreational creek users	**Medium**	Potential for direct contact pathways to be complete, however exposure would be intermittent/ occasional.	Yes	Yes
		Beef cattle, chickens, crops.	**Medium-High**	Likelihood of impacts in some surface water bodies/drains in grazing areas. Up to the time of the PSI, surface water is known to have been pumped from Mission Creek and used to water cattle and poultry and irrigate plants. It is noted that there is no available regulatory screening level specifically for these pathways; the presence of PFAS in this water does not necessarily indicate potential risks, but does indicate that further assessment of these pathways is required. It is noted that where e.g. cattle source their water from a variety of sources (i.e. not all of the water they drink is from the PFAS impacted source) this will reduce the potential exposures via this pathway.	Yes	Yes
		Freshwater aquatic ecological receptors	**High**	PFOS has been identified in off-site surface waters at concentrations exceeding NEMP screening levels for the protection of ecosystems. Further assessment of this potential pathway is required to assess the potential for sensitive freshwater ecosystems to be present, and to understand the potential for exposure to different receptors	Yes	Potentially

Area	Media of Potential Concern	Receptor	Potential Priority Level	Basis	Tier 2 Risk Assessment likely required?	Further sampling likely required?
		Saltwater aquatic ecological receptors	**Low**	A pathway of PFAS migration into the marine environment is potentially active, however given the relatively low flow rate along the creeks the mass of PFAS entering the marine environment will be relatively small. Additionally, the level of dilution which will occur in the marine environment will be very large. As such, PFAS concentrations will be rapidly reduced to negligible concentrations within the marine environment. On this basis, the potential for measurable PFAS impacts to be present within the marine environment is very low, and any such impacts would be very localised in extent. The potential for the marine ecosystem to be exposed to PFAS will therefore be very small, and in particular, the potential for bioaccumulation within the marine environment will be negligible. As such, it is qualitatively concluded that the risks to the marine environment are low, and further investigation and assessment is not considered warranted.	No	No
Off-Site: Wider Norfolk Island	**Shallow Groundwater: Extraction or Direct Contact**	Airport bore end users; off-site groundwater (impacted with the use of Airport Bore water)	**Medium**	A number of off-site water supplies are linked to current or historical use of Airport Bore water. Based on current investigations, these locations are known to include the works depot, the hospital and public toilets across the island. It is emphasised that PFAS impacts have not been identified in private drinking water supplies (including private rainwater tanks, or in water supplies utilised by water carters). At the works depot and the hospital, Airport Bore water was utilised historically but recent water supply has been from other sources. However, investigations to date have indicated that PFAS impacts remain (e.g. as a result of residual PFAS impacts within the tanks, filtration and plumbing systems). At these locations, alternate drinking water is supplied and advice has been given that the tap water should not be consumed (e.g. for drinking, cooking and cleaning teeth), effectively managing PFAS exposures. Water from the Airport Bore continues to be utilised for other (non-potable) uses at these facilities, for example the toilet facilities, but the potential for exposure during hand washing will be relatively low given the frequency and duration of exposure, the non-volatile nature of PFAS, and the limited potential for PFAS adsorption through the skin. At public toilets across the island, water from the Airport Bore continues to be utilised but the potential for exposure during hand washing will be relatively low given the frequency and duration of exposure, and the limited potential for PFAS adsorption through the skin. Signage is understood to be at place at toilet facilities across the island to indicate the water should not be drunk. These measures will effectively manage potential exposures to PFAS. It is understood that a number of the toilet facilities run septic systems; there is therefore the potential for the use of PFAS impacted water at these facilities to pose a secondary source of PFAS impacts to groundwater, although it is noted that the mass and concentrations of PFAS associated with these uses is likely to be very small when compared with primary sources associated with the on-site direct use of AFFF.	Yes	Potentially
		Residents / Farmers	**Medium**	Potential for direct contact with PFAS impacted extracted groundwater, noting preliminary results from public bores off-site were below adopted HBGV. Water considered unlikely to be used for drinking.	Yes	Potentially to confirm extent of PFAS impacted groundwater.
		Workers inc.. Intrusive	**Medium**	Potential for direct contact with extracted groundwater, noting preliminary results from public bores off-site were below criteria or <LOR. Potential for incidental contact with shallow groundwater in excavations.	Yes	Potentially

Area	Media of Potential Concern	Receptor	Potential Priority Level	Basis	Tier 2 Risk Assessment likely required?	Further sampling likely required?
		Beef cattle, chickens, crops.	**Medium-High**	PFAS impacted groundwater has been identified in a small number of off-site bores which may be utilised for stock watering, and potentially other agricultural uses.	Yes	Potentially
		Terrestrial ecological receptors	**Low-medium**	Potential for direct contact with extracted groundwater, or exposure to occur within the root zone	Potentially	Potentially
Off-Site: Wider Norfolk Island	**Bio-accumulation**	Consumers of fruit & veg.	**Medium-High**	Potential for exposure via consumption of home grown produce in areas where PFAS impacted water has been used for irrigation of fruit and vegetables. It is noted that there is no available regulatory screening level specifically for this pathway; the presence of PFAS in this water does not necessarily indicate potential risks, but does indicate that further assessment of these pathways is required.	Yes	Yes
		Consumers of eggs	**Medium-High**	Potential for exposure via consumption of chicken eggs in areas where PFAS impacted water has been used for watering chickens. It is noted that there is no available regulatory screening level specifically for this pathway; the presence of PFAS in this water does not necessarily indicate potential risks, but does indicate that further assessment of these pathways is required.	Yes	Yes
		Meat / offal Consumers	**Medium-High**	Potential for exposure via consumption of meat and offal in areas where PFAS impacted water has been used for stock watering. It is noted that there is no available regulatory screening level specifically for this pathway; the presence of PFAS in this water does not necessarily indicate potential risks, but does indicate that further assessment of these pathways is required. It is noted that where e.g. cattle source their water from a variety of sources (i.e. not all of the water they drink is from the PFAS impacted source) this will reduce the potential exposures via this pathway.	Yes	Yes
		Fishing	**Medium**	Considered low exposure potential due to minimal recreational fishing observed to be undertaken in surface water bodies due to difficult access and low water levels. However, the risks cannot be excluded based on the available information, and further assessment is required.	Yes	No
		Terrestrial receptors	**Low-medium**	Identified PFAS concentrations in soil off-site require further investigation to confirm the potential for ecological impacts and bioaccumulation. However, current investigations indicate such impacts are likely to be very localised, reducing the potential for bioaccumulation.	Potentially	Potentially
		Aquatic receptors	**High**	Identified PFAS concentrations in water in the Mission Creek catchment likely to result in potential exposures through the aquatic food chain. Further investigations are required to better understand exposure potential.	Yes	Yes

6.6 Data Gaps

As presented in the preliminary CSM presented above, there are a number of potentially complete SPR linkages at the site and surrounds, which have arisen from the site's historical use of legacy AFFF. Further assessment of these pathways will be undertaken as part of the Detailed Site Investigation (DSI) to assess whether these pathways are complete and, if so, whether there is a potentially unacceptable risk to receptors. A qualitative priority ranking of data gaps based on potential risk level identified within the SPR linkages table in **Section 6.5.1**, and on the requirement to collect additional data to inform development of management options, is also provided.

Based on this PSI and CSM, the following data gaps have been identified:

Table 6-2: Data Gaps

Data Gap ID	Site Area / Catchment	Data Gap	Priority Ranking
DG1	On-site and off-site	Extent of Potential PFAS Source Areas Further investigation of the vertical and horizontal extent of PFAS in soil and sediments in the six known Group 1 source areas on the airport. This will involve delineation of the extent of PFAS around each of the Group 1 source areas to enable development of management options for each of the source areas. For the other Potential PFAS Source Areas considered less significant based on the available information (see Table 1), initial targeted investigation is required to determine if these sources present a risk to sensitive receptors and / or likely contribute a significant percentage of the PFAS mass present on the island and therefore require management.	High
DG2	On-site and Off-site	Extent of PFAS Impacted Water Supplies Further investigation into on-site water supplies (e.g. within fire station and airport terminal) including all tanks and facility taps to identify impacted tank water and possible impacted pipework / filtration systems. These facilities were previously or currently supplied with Airport Bore water (known to be impacted with PFAS). Current exposures are effectively managed through the supply of alternate drinking water. Water from the Airport Bore continues to be utilised for other (non-potable) uses, for example the toilet facilities, but the potential for exposure during hand washing will be relatively low given the frequency and duration of exposure, and the limited potential for PFAS adsorption through the skin. Further investigations are required to confirm the requirement for ongoing management. Further investigations are also required to confirm current concentrations of PFAS in off-site water supplies linked to current or historic use of Airport Bore water, and to understand ongoing management requirements. Based on current investigations, these locations are known to include the works depot, the hospital and public toilets across the island. It is emphasised that PFAS impacts have not been identified in private drinking water supplies, including private rainwater tanks, rainwater used for bottled water / water cooler supply, or from the water carter supplies tested during the investigation (which included supplies used by three of the five known water carters at the time of the investigation. Further investigation of unassessed water carter supplies (including from the two carters not currently assessed) is also required. At the works depot and the hospital, Airport Bore water was utilised historically but recent water supply has been from other sources. However, investigations to date have indicated that PFAS impacts remain (e.g. as a result of residual PFAS impacts within the tanks, filtration and plumbing systems). At these locations, alternate drinking water is supplied and advice has been given that the tap water should not be consumed (e.g. for drinking, cooking and cleaning teeth), effectively managing PFAS exposures. Water from the Airport Bore continues to be utilised for other (non-potable) uses at these facilities, for example the toilet facilities, but the potential for exposure during hand washing will be relatively low given the frequency and duration of exposure, and the limited potential for PFAS adsorption through the skin. Further investigations at these locations is required to understand ongoing management requirements.	Medium

Data Gap ID	Site Area / Catchment	Data Gap	Priority Ranking
		At public toilets across the island, water from the Airport Bore continues to be utilised but the potential for exposure during hand washing will be relatively low given the frequency and duration of exposure, and the limited potential for PFAS adsorption through the skin. Signage is understood to be at place at toilet facilities across the island to indicate the water should not be drunk. These measures will effectively manage potential exposures to PFAS. It is understood that a number of the toilet facilities run septic systems; further investigations should therefore include further assessment of the potential for the use of PFAS impacted water at these facilities to pose a secondary source of PFAS impacts to groundwater (while noting that the that the mass and concentrations of PFAS associated with these uses is likely to be very small when compared with primary sources associated with the on-site direct use of AFFF.)	
DG3	Mission Creek Catchment	Off-Site: PFAS Concentrations in Biota / Soil and Grass in Mission Creek Further assessment of biota and / or soil and grass within the Mission Creek catchment where PFAS impacted water and/or soil has been identified. Biota may include cattle, chicken eggs, grass, fruits and vegetables.	High
DG4	Mission Creek Catchment	Off-Site: PFAS in Groundwater Further assessment and sampling of existing bores in Mission Creek catchment to delineate the extent of PFAS impacts.	Medium
DG5	Mission Creek, Watermill Creek and Headstone Creek	Off-Site: PFAS in Surface Water Further assessment into PFAS concentrations in Mission Creek, Watermill Creek and Headstone Creek where up-gradient potential primary sources are present and PFAS was detected as being present. During the preliminary investigation, Mission Creek was dry in all areas accessed. Sampling following rainfall when the creek is running is also a priority. If this cannot be achieved, assessment of likely surface water concentrations will need to be made based on sediment total and leachable concentrations and comparison with results in other surface water bodies on the island.	Medium
DG6	Mission Creek Catchment	Off-Site: Confirmation of CSIRO Results Resampling of two sample locations where elevated concentrations of PFAS were found during the CSIRO investigation.	Medium
DG7	Mission, Watermill & Cascade Creek Catchments	Off-Site: PFAS Concentrations in Saline Sediment Investigation into PFAS concentrations in saline sediments at the mouth of creeks known to be impacted by PFAS.	Medium
DG8	On-Site, Mission, Watermill & Cascade Creek Catchments	On & Off-Site: Consideration of Ecological Receptors This investigation has not considered impacts to the sensitive ecological receptors that may be present in the areas identified as being impacted. Further investigation into sensitive receptors including endemic flora and fauna and EPBC listed organisms needs to be undertake in order to be able to understand the potential for PFAS exposure.	Medium

7.0 Conclusions

Through the completion of the PSI and targeted groundwater, surface water, soil and sediment assessment works, Senversa was able to achieve the objectives outlined in **Section 1.2** and draw the following conclusions:

PFAS Source Areas

- Six significant potential PFAS primary source areas (Group 1 Source Areas) were identified within the Airport that may have contributed to the elevated PFAS concentrations identified within the Mission Creek catchment.
- All six sources were associated with the training, storage and maintenance of fire trucks that historically used PFAS containing aqueous film-forming foam (AFFF).
- A further 11 lower significant potential PFAS source areas (Groups 2 – 4 Source Areas) were identified on and outside the airport within the Mission Creek and other catchments.

PFAS Impact to Utilised Water

- All privately owned drinking water sources that were sampled by Senversa were found to have concentrations below the adopted health based guidance value (HBGV) for PFAS (sum of PFOS + PFHxS). The privately owned drinking water sources assessed included three of five known water carters and tanks / groundwater bores within the Mission Creek catchment.
- Concentrations of PFAS above the adopted HBGV was identified in three public facilities (hospital, works depot and fire station) at internal water taps and groundwater tanks. Upon confirmation of the analytical results alternative drinking water supplies have been implemented at these locations and other potentially impacted public facilities (including the airport, which is understood to have previously used the same water source as the facilities mentioned above). The elevated PFAS concentrations at all three public facilities was linked to supply of water from the same “Airport Bore” within the Mission Creek catchment that was identified by CSIRO in December 2019 as having elevated concentrations of PFAS.
- It is understood that “Airport Bore” water is also utilised in public toilets across the island but the potential for exposure during hand washing will be relatively low given the frequency and duration of exposure, the limited potential for PFAS adsorption through the skin and the non-volatile nature of PFAS. Signage is understood to be at place at toilet facilities across the island to indicate the water should not be drunk. These measures will effectively manage potential exposures to PFAS within public toilets. As a number of the public toilets run septic systems there is the potential for the use of PFAS impacted water at these facilities to pose a secondary source of PFAS impacts to groundwater. However, it is noted that the mass and concentrations of PFAS associated with these uses is likely to be very small when compared with primary sources associated with the on-site direct use of AFFF.
- PFAS was identified in three water sources used for the watering of stock, chicken eggs and vegetables within the Mission Creek catchment. Exposure to the measured concentrations of PFAS is unlikely to impact upon the health or condition of cattle. However, where PFAS is present in water used for stock watering and/or irrigation, it can be taken up into meat, eggs and produce and people who consume the produce can be subsequently exposed. It is noted that there is no available regulatory screening level specifically for these pathways; the presence of PFAS in this water does not necessarily indicate potential risks, but does indicate that further assessment of these pathways is required. It is noted that when cattle source their water from a variety of sources (i.e. not all of the water they drink is from the PFAS impacted source) this will reduce the potential exposures via this pathway.

PFAS Impact to Surface and Groundwater

- Concentrations of PFAS above the HBGV in groundwater was restricted to the Mission Creek surface water catchment. The 11 groundwater samples obtained in five other surface water catchments on the island were all below laboratory detection limits with the exception of one groundwater sample obtained adjacent Headstone Creek, which was above laboratory detection limits but below the HBGV.
- Elevated concentrations of PFAS above the HBGV was identified within the surface waters of Mission Creek and Watermill Creek. Concentrations above laboratory detection limits but below the HBGV was identified in Headstone Creek, with the one surface water sample obtained from Broken Bridge Creek below detection limits.

Data Gaps and Further Investigation

- Following a qualitative assessment of source-pathway receptor linkages, eight data gaps requiring further assessment and / or completion of a Tier 2 or 3 risk assessment were identified.
- A detailed site investigation into the identified data gaps relating to the nature and extent PFAS in groundwater, surface water, soil and sediment and biota on Norfolk Island is proposed to be undertaken.

8.0 Principles and Limitations of Investigation

The following principles are an integral part of site contamination assessment practices and are intended to be referred to in resolving any ambiguity or exercising such discretion as is accorded the user or site assessor.

Area	Field Observations and Analytical Results
Elimination of Uncertainty	Some uncertainty is inherent in all site investigations. Furthermore, any sample, either surface or subsurface, taken for chemical testing may or may not be representative of a larger population or area. Professional judgment and interpretation are inherent in the process, and even when exercised in accordance with objective scientific principles, uncertainty is inevitable. Additional assessment beyond that which was reasonably undertaken may reduce the uncertainty.
Failure to Detect	Even when site investigation work is executed competently and in accordance with the appropriate Australian guidance, such as the National Environmental Protection (Assessment of Site Contamination) Amendment Measure ('the NEPM'), it must be recognised that certain conditions present especially difficult target analyte detection problems. Such conditions may include, but are not limited to, complex geological settings, unusual or generally poorly understood behaviour and fate characteristics of certain substances, complex, discontinuous, random, or heterogeneous distributions of existing target analytes, physical impediments to investigation imposed by the location of services, structures and other man-made objects, and the inherent limitations of assessment technologies.
Limitations of Information	The effectiveness of any site investigation may be compromised by limitations or defects in the information used to define the objectives and scope of the investigation, including inability to obtain information concerning historic site uses or prior site assessment activities despite the efforts of the user and assessor to obtain such information. Information received during preparation of this report from third parties or anecdotal sources, such as the sources of PFAS identified, was not able to be independently verified by Defence records.
Chemical Analysis Error	Chemical testing methods have inherent uncertainties and limitations. Senversa routinely seeks to require the laboratory to report any potential or actual problems experienced, or non-routine events which may have occurred during the testing, so that such problems can be considered in evaluating the data.
Level of Assessment	The investigation herein should not be considered to be an exhaustive assessment of environmental conditions on a property. There is a point at which the effort of information obtained and the time required to obtain it outweigh the benefit of the information gained and, in the context of private transactions and contractual responsibilities, may become a material detriment to the orderly conduct of business. If the presence of target analytes is confirmed on a property, the extent of further assessment is a function of the degree of confidence required and the degree of uncertainty acceptable in relation to the objectives of the assessment.
Comparison with Subsequent Inquiry	The justification and adequacy of the investigation findings in light of the findings of a subsequent inquiry should be evaluated based on the reasonableness of judgments made at the time and under the circumstances in which they were made.
Data Useability	Investigation data generally only represent the site conditions at the time the data were generated. Therefore, the usability of data collected as part of this investigation may have a finite lifetime depending on the application and use being made of the data. In all respects, a future reader of this report should evaluate whether previously generated data are appropriate for any subsequent use beyond the original purpose for which they were collected, or are otherwise subject to lifetime limits imposed by other laws, regulations or regulatory policies.
Nature of Advice	The investigation works herein are intended to develop and present sound, scientifically valid data concerning actual site conditions. Senversa does not seek or purport to provide legal or business advice.

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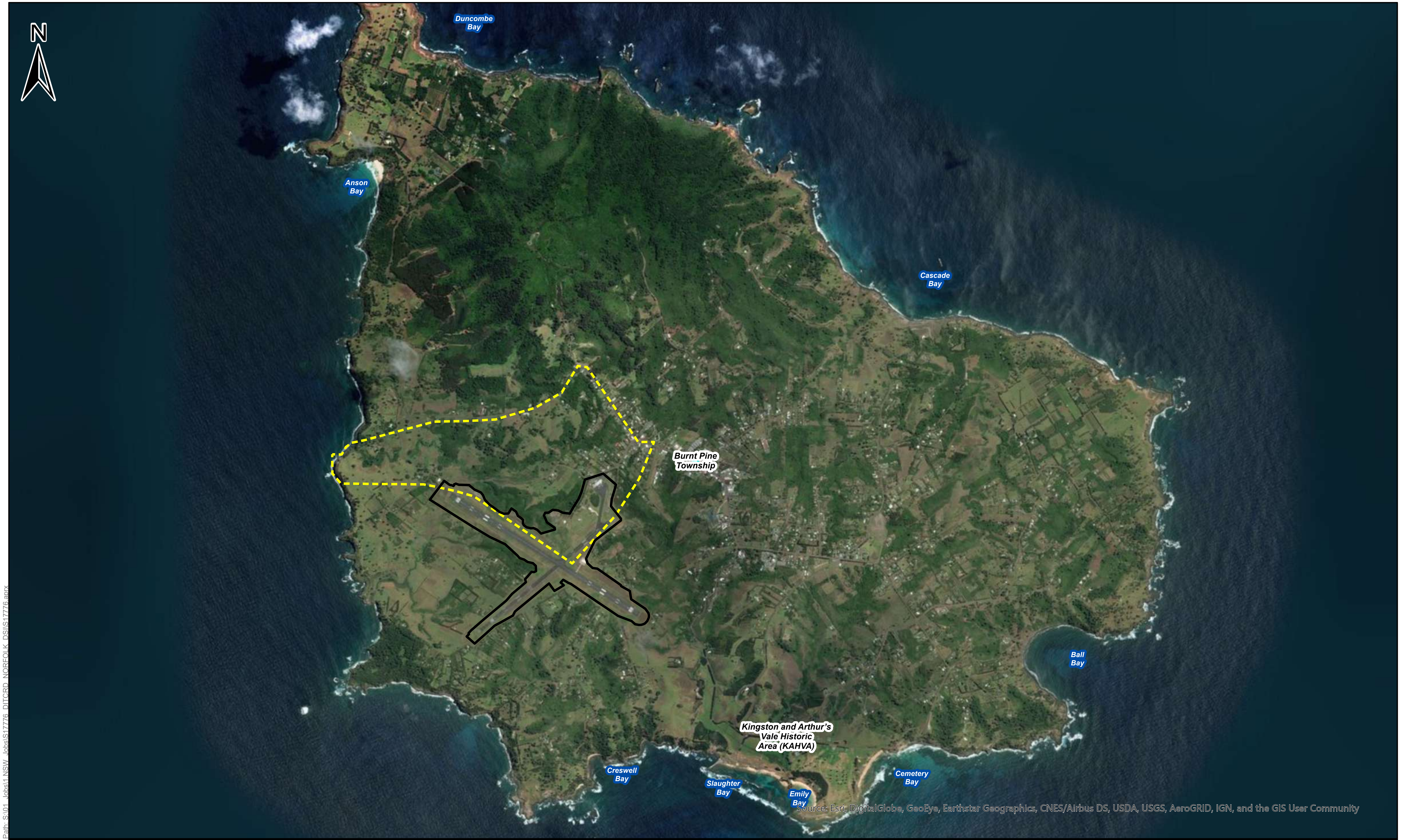
Figures



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Legend:

- Approximate Airport Boundary
- Approximate Extent of Mission Creek Catchment

Details:

Data Sources:
Aerial imagery: Nearmap Pty Ltd
Vector Datasets: Open Street Maps

Created:	S. Koroblitsas
PM:	C. Sandiford
Approved:	x
Date:	28/02/2020
Revision:	0

0 800 1,600 2,400 Metres

Datum/Projection: WGS 1984 Web Mercator Auxiliary Sphere Scale: 1:35,000 (A3)

Figure No:	**1**
Title:	**Site Location**
Project:	Preliminary Site Investigation
Location:	Norfolk Island International Airport
Client:	Department for Infrastructure, Transport, Regional Development and Communications

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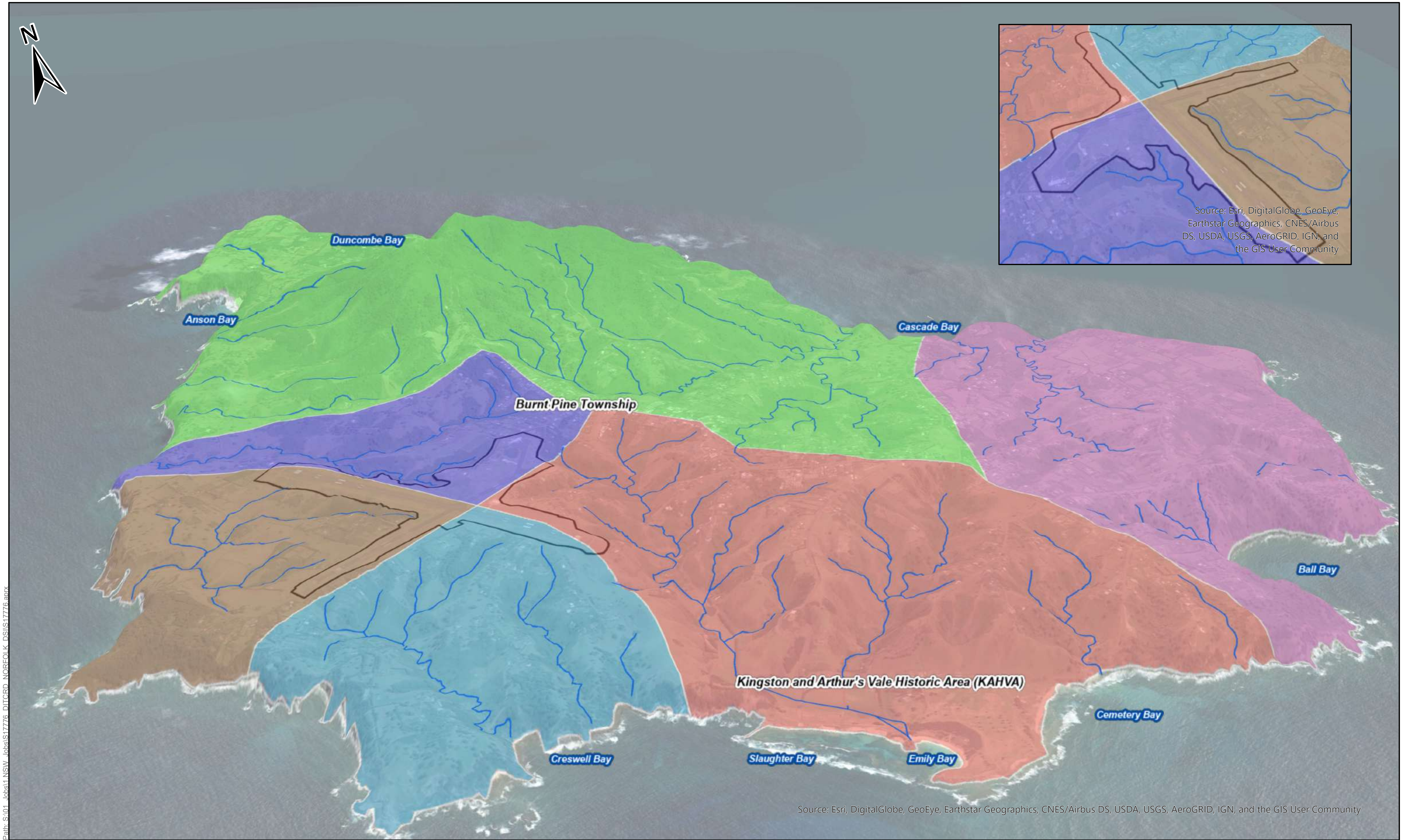
Last Edited by: Caitlin.Smith



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Legend:

- Creek

Approximate Extent of Surface Water Catchments

- Headstone Creek
- Mission Creek
- Mt Pitt / Broken Bridge Creek
- Rocky Point Creek
- Stockyard Creek
- Town Creek / Watermill Creek
- Approximate Airport Boundary

Details:

Data Sources:
Aerial imagery: Nearmap Pty Ltd
Vector Datasets: Open Street Maps

Created: S. Koroblitsas
PM: C. Sandiford
Approved: x
Date: 27/02/2020
Revision: 0

0 300 600 900 Metres

Datum/Projection: Scale1:10,875 (A3)

Figure No: 2

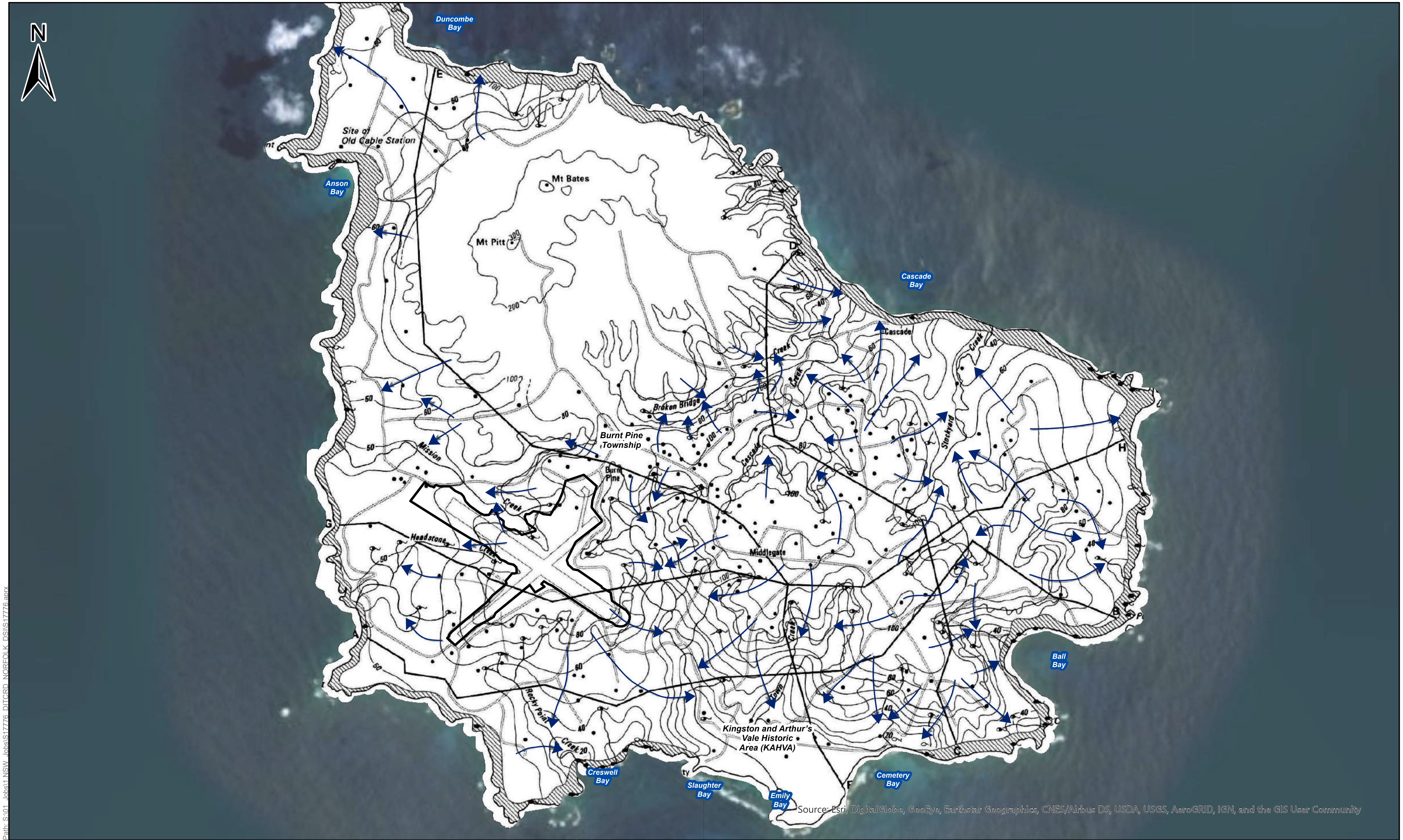
Title: Site Topography and Drainage

Project: Preliminary Site Investigation

Location: Norfolk Island International Airport

Client: Department for Infrastructure, Transport, Regional Development and Communications

Last Edited by: Stefanos.Koroblitsas



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Legend:

Approximate Airport Boundary

Historical Groundwater Flow Direction

Historical Groundwater Flow Regime (as measured in July – August 1974)". "Reference: Hydrogeology of Norfolk Island, South Pacific Ocean. BMR Bulletin 234

Details:

Data Sources:
Aerial imagery: Nearmap Pty Ltd
Vector Datasets: Open Street Maps

Created: S. Koroblitsas
PM: C. Sandiford
Approved: x
Date: 27/02/2020
Revision: 0

0 660 1,320 1,980 Metres

Datum/Projection:WGS 1984 Web Mercator Auxiliary Sphere Scale:1:35,000(A3)

Figure No: 3

Title: **Inferred Groundwater Flow Direction**

Project: Preliminary Site Investigation

Location: Norfolk Island International Airport

Client: Department for Infrastructure, Transport, Regional Development and Communications

Path: S:\01_Jobs\1_NSW_Jobs\S17776_DITCRD_NORFOLK_DSI\S17776.aprx

senversa

Legend:

- Group 1 Potential PFAS Primary Source Areas — *Source No.*
- Approximate Airport Boundary

Details:

Data Sources:
Aerial imagery: Nearmap Pty Ltd
Vector Datasets: Open Street Maps

Created: S. Koroblitsas
PM: C. Sandiford
Approved: x
Date: 27/02/2020
Revision: 0

0 200 400 600 Metres

Datum/Projection:NZGD 2000 NZ Continental Shelf 2000 Scale:1:7,000 (A3)

Figure No: 4

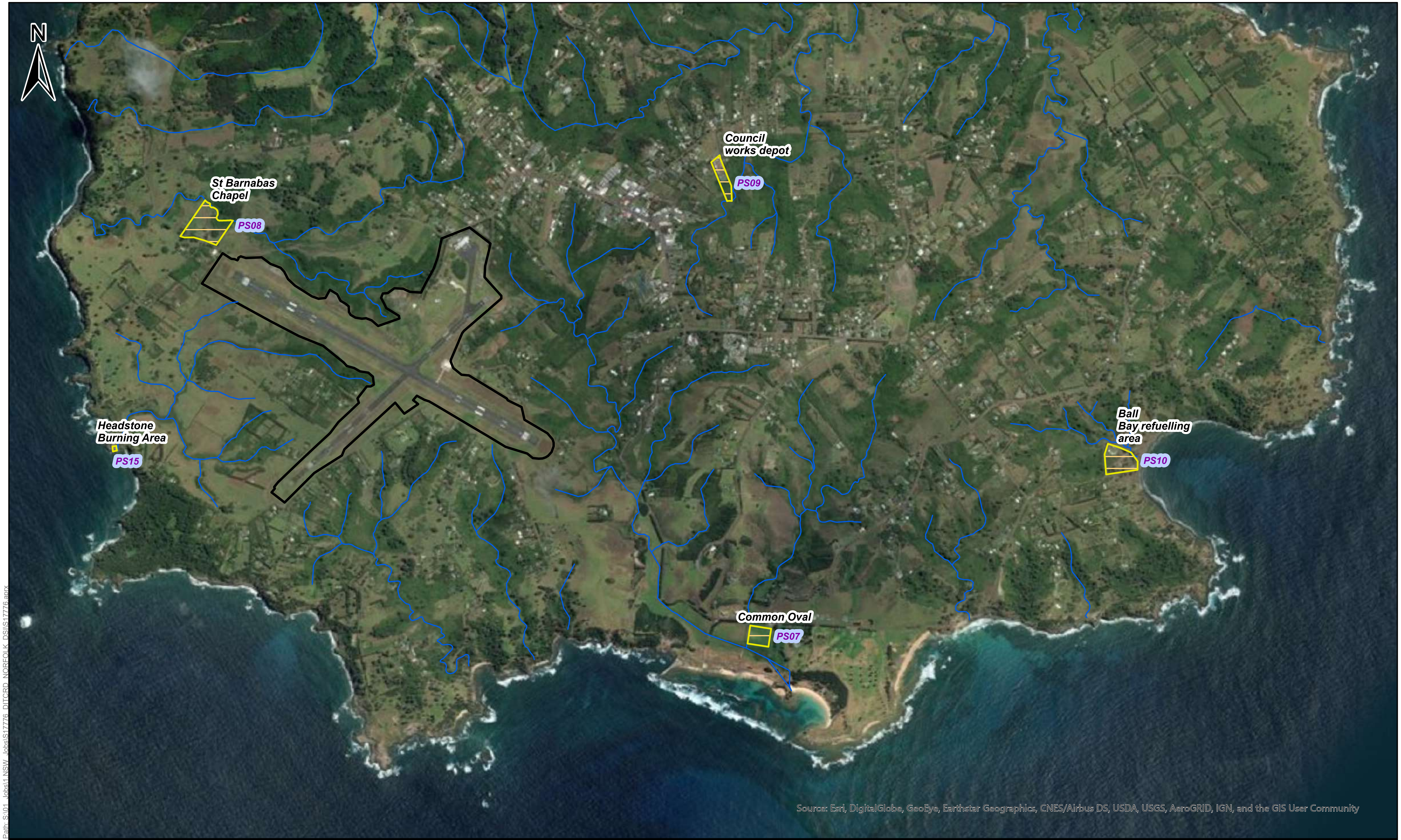
Title: **On-Site Features and Potential PFAS Sources Areas**

Project: Preliminary Site Investigation

Location: Norfolk Island International Airport

Client: Department for Infrastructure, Transport, Regional Development and Communications

Last Edited by: Stefanos.Koroblitsas



senversa

Legend:

- Potential PFAS Primary Source Areas
- Creek
- Approximate Airport Boundary

Details:

Data Sources:
Aerial imagery: Nearmap Pty Ltd
Vector Datasets: Open Street Maps

Created: S. Koroblitsas
PM: C. Sandiford
Approved: C. Sandiford
Date: 13/03/2020
Revision: 0

0 500 1,000 1,500 Metres

Datum/Projection:NZGD 2000 NZ Continental Shelf 2000 Scale:1:20,000(A3)

Figure No: 5

Title: **Off-Site Features and Potential PFAS Sources Areas**

Project: Preliminary Site Investigation

Location: Norfolk Island International Airport

Client: Department for Infrastructure, Transport, Regional Development and Communications

Last Edited by: Stefanos.Koroblitsas

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Legend:

Sum of PFHxS and PFOS results
- <LOR
- >LOR - 0.07 µg/L
- >0.07 µg/L (Drinking Water Quality Guideline)
- Approximate Extent of Surface Water Catchments
- Approximate Airport Boundary

- Creeks
- Borehole
- Surface Water Sample
- Tank
- Tap
- CSIRO Sample

Details:

Data Sources:
Aerial imagery: Nearmap Pty Ltd
Vector Datasets: Open Street Maps

Created: S. Koroblitsas
PM: C. Sandiford
Approved: x
Date: 27/02/2020
Revision: 0

0 500 1,000 1,500 Metres

Datum/Projection: Scale: (A3) 1:30,000

Figure No: 6

Title: **Island Wide PFAS Concentration Plan – Surface Water, Bore Water and Tanks**

Project: Preliminary Site Investigation

Location: Norfolk Island International Airport

Client: Department for Infrastructure, Transport, Regional Development and Communications

Last Edited by: Stefanos.Koroblitsas

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Legend:

Sum of PFHxS and PFOS results
- <LOR
- >LOR - 0.07 µg/L
- >0.07 µg/L (Drinking Water Quality Guideline)
- Creeks
- Approximate Airport Boundary
- Borehole
- Surface Water Sample
- Tank
- Tap
- CSIRO Sample
- Approximate Extent of Mission Creek Catchment
- Cross Sectional Alignment

Details:

Data Sources:
Aerial imagery: Nearmap Pty Ltd
Vector Datasets: Open Street Maps

Created: S. Koroblitsas
PM: C. Sandiford
Approved: x
Date: 28/02/2020
Revision: 0

0 140 280 420 Metres

Datum/Projection: WGS 1984 Web Mercator Auxiliary Sphere Scale: 1:7,500 (A3)

Figure No: 7

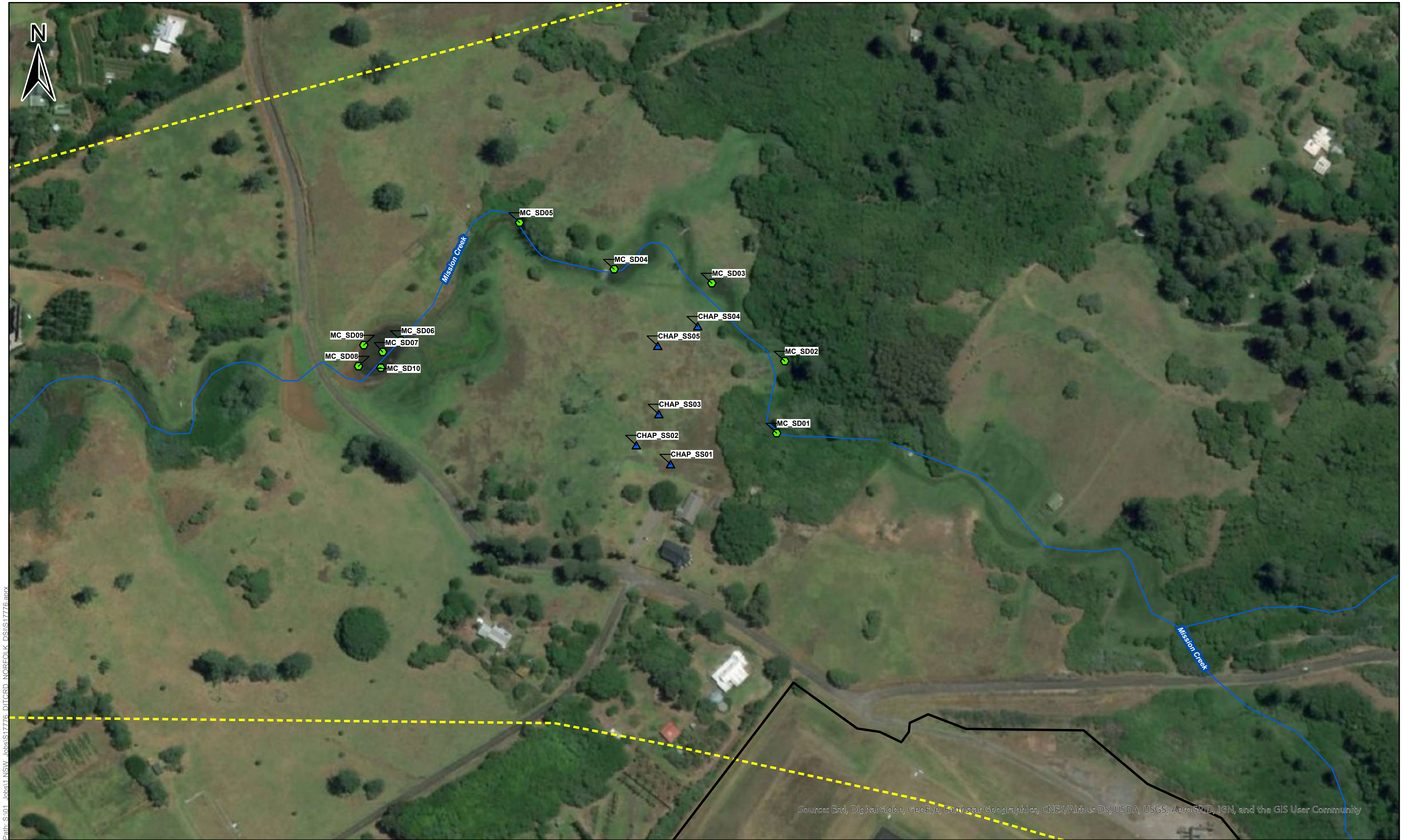
Title: **Mission Creek PFAS Concentration Plan – Surface Water, Bore Water and Tanks**

Project: Preliminary Site Investigation

Location: Norfolk Island International Airport

Client: Department for Infrastructure, Transport, Regional Development and Communications

Last Edited by: Caitlin.Smith



senversa

Legend:

- Creeks
- Approximate Airport Boundary
- Approximate Extent of Mission Creek Catchment

Sediment Results - Sum of PFHxS and PFOS (mg/kg)

- <LOR
- >LOR - 0.001 mg/kg
- >0.001 mg/kg
- >0.01 mg/kg
- >0.1 mg/kg

Soil Results - Sum of PFHxS and PFOS (mg/kg)

- <LOR
- >LOR - 0.001 mg/kg
- >0.001 mg/kg
- >0.01 mg/kg
- >0.1 mg/kg

Details:

Data Sources:
Aerial imagery: Nearmap Pty Ltd
Vector Datasets: Open Street Maps

Created: S. Koroblitsas
PM: C. Sandiford
Approved: x
Date: 27/02/2020
Revision: 0

0 80 160 240 Metres

Datum/Projection: WGS 1984 Web Mercator Auxiliary Sphere Scale: 1:3,000 (A3)

Figure No: 8

Title: Misison Creek PFAS Concentration Plan – Soil & Sediments

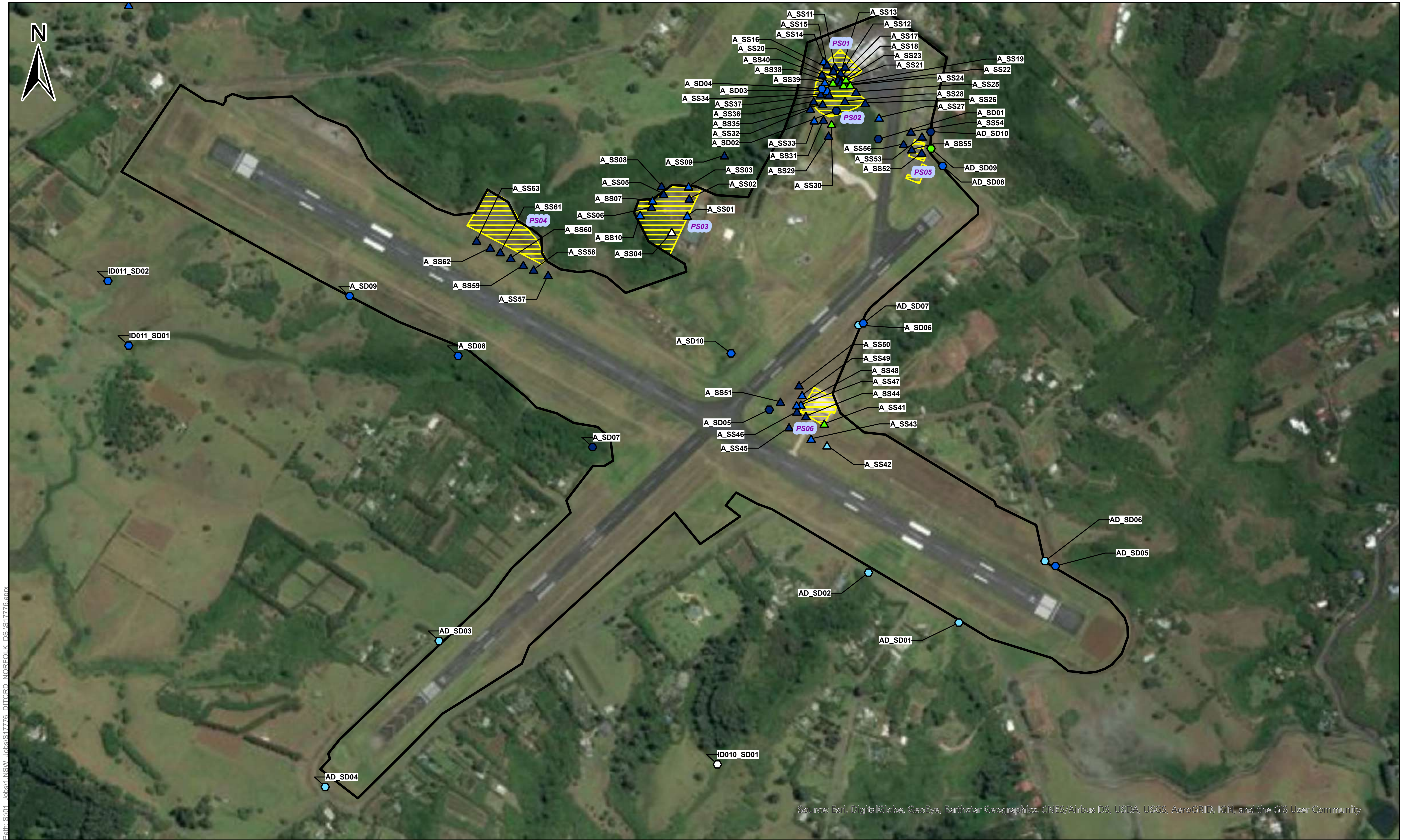
Project: Preliminary Site Investigation

Location: Norfolk Island International Airport

Client: Department for Infrastructure, Transport, Regional Development and Communications

Path: S:\01_Jobs\1.NSW_Jobs\S17776_DITCRD_NORFOLK_DSI\S17776.aprx

Last Edited by: Stefanos.Koroblitsas



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Legend:

Approximate Airport Boundary

Soil Results - Sum of PFHxS and PFOS (mg/kg)
- <LOR
- >LOR - 0.001 mg/kg
- >0.001 mg/kg
- >0.01 mg/kg
- >0.1 mg/kg

Sediment Results - Sum of PFHxS and PFOS (mg/kg)
- <LOR
- >LOR - 0.001 mg/kg
- >0.001 mg/kg
- >0.01 mg/kg
- >0.1 mg/kg

Group 1 Potential PFAS Primary Source Areas

Details:

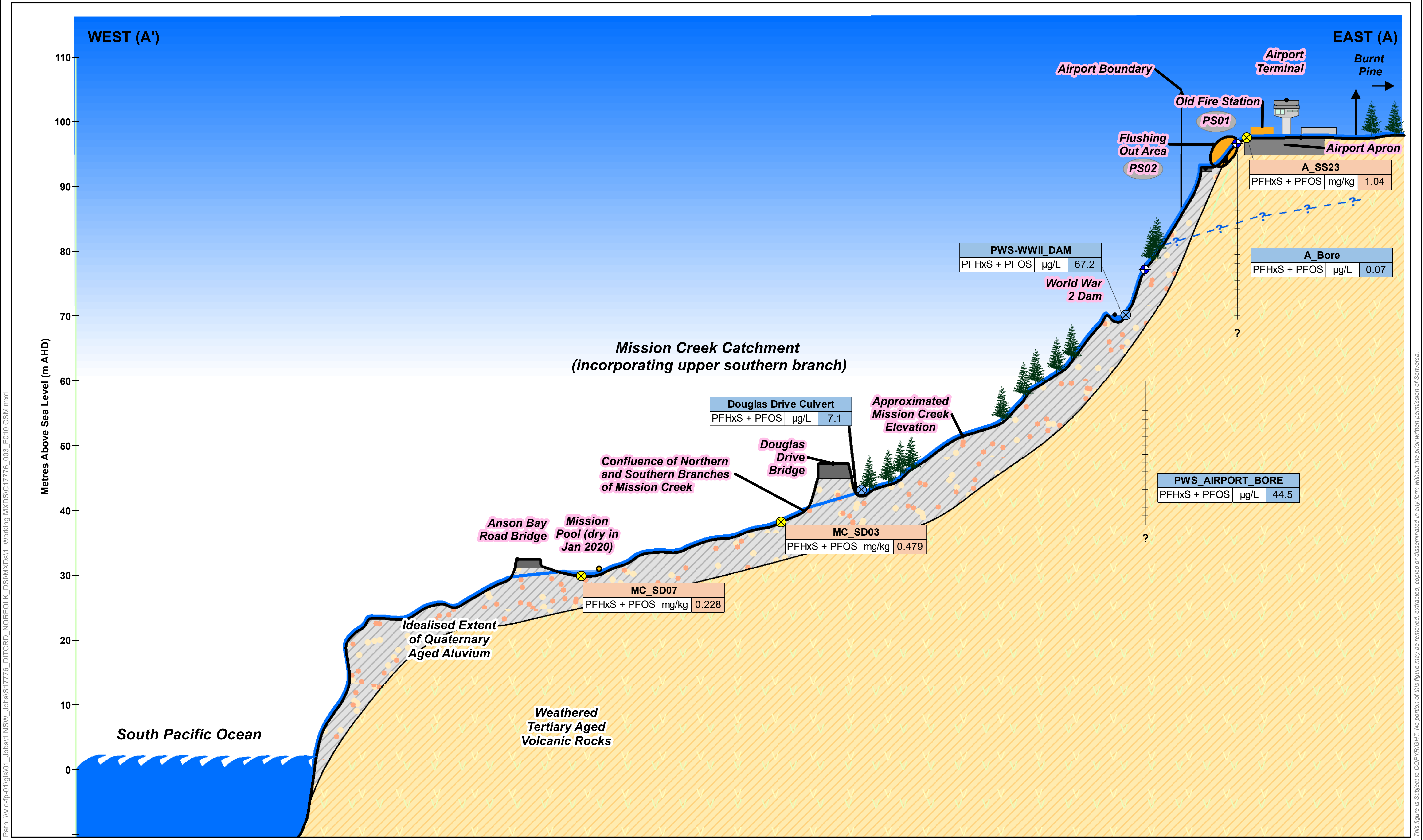
Data Sources:
Aerial imagery: Nearmap Pty Ltd
Vector Datasets: Open Street Maps

Created: S. Koroblitsas
PM: C. Sandiford
Approved: x
Date: 27/02/2020
Revision: 0

0 140 280 420 Metres

Datum/Projection:NZGD 2000 NZ Continental Shelf 2000 Scale:1:7,000 (A3)

Figure No:	**9**
Title:	**Airport PFAS Concentration Plan Soil & Sediments**
Project:	Preliminary Site Investigation
Location:	Norfolk Island International Airport
Client:	Department for Infrastructure, Transport, Regional Development and Communications



senversa

Address: Level 6, 15 William Street
Melbourne VIC 3000
Phone: (03) 9606 0070
Website: www.senversa.com.au

Legend

- Apron
- Idealised Extent of Quaternary Aged Aluvium
- Weathered Tertiary Aged Volcanic Rocks
- Inferred Water Table Aquifer
- Soil/Sediment Sample Location
- Surface Water Sample Location
- Groundwater Bore
- *Estimated Screen Length*
- PSXX Potential PFAS Source Area

Sample ID
Concentration of PFHxS + PFOS in Soil or Sediment - mg/kg (January 2020)

Sample ID
Concentration of PFHxS + PFOS in Surface or Groundwater - µg/L (January 2020)

Notes:
Cadastre and road data sourced from land.vic.gov.au (DELWP)
Aerial imagery sourced from Nearmap Pty Ltd

Designed:	C. Sandiford	Date:	13/03/2020
Drawn:	S. Koroblitsas	Revision:	0
Checked:	.	Scale:	1:110 (A3)
File:	C17776_003_F010 CSM		

0 1 2 4 6 8 Metres
Datum/Projection:GDA 1994 MGA Zone 55

Figure No:	**10**
Title:	**Conceptual Site Model – Airport & Mission Creek Catchment Hydrogeological Cross Section Plan**
Project:	Preliminary Site Investigation
Location:	Norfolk Island International Airport
Client:	Department for Infrastructure, Transport, Regional Development and Communications

Tables

Table 1 - Potential PFAS Source Areas
Preliminary Site Investigation
Norfolk Island Airport
17776

Potential Source Area Number (see Figure 3)	Name of Area	Source Type	Time of Use (re: AFFF)	Description of Activity	Description of Area / Infrastructure	Volumes of AFFF used/ stored/ lost	Regularity of Use / activity / testing	State of AFFF Product (Concentrate, Foam, Waste Water)	Potential for AFFF to enter Soil	Potential for AFFF to enter Surface Water	Potential for AFFF to enter Groundwater	Additional information
GROUP 1 SOURCE AREAS												
1	Former Fire Station and Foam Shed	Primary	Up until approximately 2009	The former fire station was located adjacent to the airport terminal and was the main fire station for the entire Island. The station was used to house fire trucks and fire fighting gear. A small wooden shed to the west of the station was used to store AFFF concentrate.	A number of small wooden buildings are still present near council facility. A portion of the freight storage facility. Buildings are still present and contain concrete hardstand both inside and surrounding the buildings.	Unknown	Daily	Concentrate, foam, waste water	Medium	Medium	Medium	The topography of the ground surface in these areas would allow drainage of any surface water run-off towards Mission Creek.
2	Former Flushing Out Area	Primary	Up until approximately 2009	Large area where fire trucks were washed out after each training session. Area was unsealed and runoff into a low point where infiltration into aquifer may have occurred.	Area to the south west of the former fire station. Unsealed, small concrete drain.	Unknown	Daily	Foam, waste water	High	High	High	
3	Former Drill Ground	Primary	Unknown - mid 1990s	Practice using AFFF to put out fires, mostly on cars that were used for 4 - 5 events then sent to tip (most often off the edge).	Former Drill Ground / Current Waste Management Centre	Unknown	Weekly	Foam, waste water	High	High	High	
4	Current Drill Ground	Primary	Mid-1990's to now	Training area for fire fighting. Anecdotal evidence that PCB oils and heavy metals were present and potentially pushed into the gully.	Fire Training area that is currently being used for the resurfacing of the airport.	220 KL of foam used (Mainly on Drill Ground) from 1997 to 2015	Weekly	Foam, waste water	High	High	High	
5	Maintenance Depot	Primary	Not confirmed.	Flushing out during maintenance of fire trucks.	L Shaped Building near runway.	Unknown	Weekly	Foam, waste water	Medium	Medium	Medium	Surface water run-off could potentially drain towards Watermill Creek.
6	Current Fire Station	Primary	Approx. 10 years	Storage and use of AFFF. Flushing out all around the station on unsealed ground.	Approximately 10 year old facility.	Unknown	Daily	Concentrate, foam, waste water	High	Medium	High	
GROUP 2 SOURCE AREAS												
7	The Common Oval	Primary	Not confirmed.	Area on Quality Row that was used to create snow at Christmas time.	Oval - unsealed.	Unknown	Historically done annually.	Unknown	High	Medium	Medium	Anedotal information suggests that AFFF may not have been used, potential for this to have occurred during Protein Foam use.
8	St Barnabus Chapel Paddock	Primary	Annual training. Specific times are unknown.	Aerodrome Emergency Plan (AEP Annual Training) - West of St Barnabus Chapel.	Unsealed cattle paddock to the west of the chapel. The area is steeply sloped from the chapel down to Mission Creek.	Unknown	Annual	Unknown	High	Medium	Medium	Anedotal information suggests that AFFF was used in this area to create slippery slides down the hill towards Mission Creek.
9	Works depot / Former fire truck storage	Secondary	Not confirmed.	Drains into Cascade Creek. New Cascade Road		Unknown	Unknown	Unknown	Low	Low	Low	
10	Ball Bay Refuelling Area	Primary	Not confirmed.	Council facility adjacent to Mobil		Unknown	Unknown	Unknown	Low	Low	Low	
11	Wastewater Treatment Plant / Stormwater Drains	Secondary	Not confirmed.	Wastewate treatment plant and stormwater drains likely to be have PFAS impacted water present.	Sewerage Treatment Plant is located on the airport land. Stormwater drains are located on and off the airport.	Unknown	NA	Waste water	Low	High - Discharges to Ocean	Low	Further information required.
GROUP 3 SOURCE AREAS												
12	Private residence - Webb Adams Road	Primary	Not confirmed.	AFFF used in backyard 3 times per year - (anacdotal report)		Unknown	Annual	Unknown	Medium	Low	Low	
13	Paradise hotel previous Norfolk/colonial other	Primary	Not confirmed.	Burnt down, 20 - 30 years ago unsure if foam was used		Unknown	Once	Unknown	Low	Low	Low	
14	Perfumery	Primary	Not confirmed.	Stored duty free goods (alcohol, perfume etc.) Burnt down 15 years ago and AFFF may have been used to fight the fire due to flammable goods / explosions		Unknown	Once	Unknown	Low	Low	Low	
15	Headstone Burning area	Primary	Not confirmed.			Unknown	Once	Unknown	Low	Low	Low	
GROUP 4 SOURCE AREAS												
16	Public toilets filled by airport bore	Secondary		Public toilets filled with airport bore water via truck. Potential PFAS contamination entering the septic tanks and associated flow fields.								
17	Hospital tank directly filled by Airport Bore	Secondary		Hospital tank was filled by the airport bore. At times the hose was connected and left to overfill causing overflow into Broken Bridge Creek.								

Table 2 - Senversa Water Results Summary Table
Norfolk Island PFAS Investigation
Department for Infrastructure, Transport, Regional Development and Communications
Senversa Job Number: C17776

Catchment	Media	Sample ID	Sum of PFOS and PFHxS (µg/L)	Ownership	Drinking Water Source?	Comment
Mission Creek Catchment	Groundwater	PWS_AIRPORT_BORE	**44.5**	Public (Airport land owned by Council)	Potentially	Sample collected from concrete tank adjacent to former fire station which was fed directly from bore.
		A_BORE1	0.07	Public (Airport land owned by Council)	Potentially	Unused well south of former fire station (on airport land)
		ID013_BORE	<0.01	Private	Yes	Sample collected from bore adjacent to house.
		ID015_BORE	**1.09**	Private	No	Sample collected from bore outlet entering poly tank. Understood to be used for stock watering (cattle).
		ID009_WELL	<0.01	Private (Church of England Trust)	Potentially	Sample collected from well on church property - Headstone Road.
		ID014_BORE	**3.13**	Private	No	Collected from a bore, however resident indicated that the bore pumps water up from Mission Creek. Understood to be used for stock watering (cattle).
	Surface Water	PWS_WWII_DAM	**67.2**	Public (Airport land owned by Council)	No	WWII dam south of airport bore.
		ID013_SW01	**4.5**	Private	No	Samples from a tap that pumps water up from Mission Creek. Water is understood to be used to irrigate vegetables and water chickens.
	Rainwater	ID004_TANK	<0.01	Private	Yes	Rainwater tank collected via house tap.
	Rainwater	CHAP_TAP1	<0.01	Private (Church of England Trust)	Potentially	Collected from the outside tap of the chapel, believed to be rainwater
	Rainwater	CHAP_TAP2	<0.01	Private (Church of England Trust)	Potentially	Collected from the outside tap of the cottage adjacent to the chapel, believed to be rainwater.
Broken Bridge Creek	Groundwater	PWS_HOSP_BORE	<0.01	Public	Potentially	Hospital bore located down near broken bridge creek and pumped up into tank used for laundry.
	Surface Water	BBC_SW01	<0.01	Public	Potentially	Broken Bridge Creek, Down-gradient of hospital. Accessed through private property
	Tank / Tap	PWS_HOSP_TAP1	**0.50**	Public	Potentially	Hospital Sample - Sample collected from tap post filtration. Analytical laboratory re-ran the sample and found PFOS+PFHxS to be between 0.41 µg/L and 0.40 µg/L.
		PWS_HOSP_TANK1	<0.01	Public	Potentially	Hospital Sample - Filled with Airport Bore Water (Historically). Poly tank.
		PWS_HOSP_TANK2	0.02	Public	Potentially	Hospital Sample - Filled with Airport Bore Water (Historically). Concrete tank.
		PWS_HOSP_TANK3	<0.01	Public	Potentially	Hospital Sample - Rain Water
		PWS_HOSP_TANK4	<0.01	Public	Potentially	Hospital Sample - Rain Water
		PWS_HOSP_TANK5	<0.01	Public	Potentially	Hospital Sample - Rain Water
		DEPOT_TANK1	<0.01	Public	Potentially	Works Depot - Underground tank potentially filled with airport bore water (historically).
		DEPOT_TANK2	**9.01**	Public	Potentially	Works Depot - Underground tank potentially filled with airport bore water (historically).
		DEPOT_TAP	**8.79**	Public	Potentially	Works Depot - Sample collected from kitchen tap. Tap understood not to have recently been used for as drinking water source but may been used for cooking / kettle.
		ID006_BORE1	<0.01	Private	Yes	Tap straight from bore
		ID006_BORE2	<0.01	Private	Yes	Tap straight from bore
		ID007_SPRING	<0.01	Private	Potentially	Man made spring, filled by creek before waterfall off of creek
		COCKPIT_SW01	0.04	Private	Potentially	Weir at reservoir.
		ID012_SW02	**0.18**	Private	No	Creek downgradient of council depot, accessed through private land.
Town Creek / Watermill Creek	Groundwater	WC01	<0.01	Private	Yes	WATER CARTER: Bore located on private residence.
		WC02	<0.01	Private	Yes	WATER CARTER: Bore - located in near Burnt Pine Township. Sample collected from truck.
		WC_03_BORE	<0.01	Private	Yes	WATER CARTER: Bore located on private residence.
		PWS_SCH_BORE	<0.01	Public	Potentially	Bore. Adjacent to oval
		PWS_POUND_BORE_A	<0.01	Public	Potentially	Bore located behind government building on Quality Row. Bore pumps to reservoir and sample collected from reservoir.
	Surface Water	TC_SW01	<0.01	Public (KAVHA- Commonwealth)	No	Watermill Creek, down gradient of perfumery fire and TV_SW02.
		PWS_HESSIES_RESER	0.01	Public	Potentially	Part rainwater and bore water
		PWS_DUCK_DAM	**0.12**	Public	No	Watermill Reservoir
	Tank / Tap	PWS_SCH_TANK1	<0.01	Public	Potentially	School - Rain Water, Potential historic filling from other sources.
		PWS_SCH_TAP	<0.01	Public	Potentially	School - Tap following filtrations
		FRE_TAP1	**8.63**	Public	Potentially	Fire Station - Sample collected from kitchen tap. Tap understood not to have recently been used for as drinking water source but may been used for cooking / kettle.
		FRE_TAP2	**22.3**	Public	No	Fire Station - Sample collected from outside hydrant. Water currently used to fill and flush out fire trucks.
		ID005_TANK	<0.01	Private	Yes	Collected from rainwater tank historically filled by water carter.
Headstone Creek	Groundwater	ID003_BORE	0.04	Private	Potentially	Bore adjacent to Creek
		ID003_WELL	<0.01	Private	Yes	Well adjacent to residence.
	Surface Water	PWS_HEAD_DAM	0.02	Private - NIRC agreement for access.	No	Large dam used to water cattle.
		BUMORAS_SW01	<0.01	Public (NIRC owned)	No	Bombora Reserve - Base of Rocky Point Creek.
		ID003_SW01	0.03	Private	Yes	Headstone Creek Sample accessed from private land.
		ID010_BORE	<0.01	Private	Yes	Bore adjacent to dry creek bed, pumped to house for drinking water.
Rocky Point Creek	Groundwater	ID001_BORE	<0.01	Private	Potentially	Bore located on private residence.
Mt Pitt	Groundwater	PWS_KINGFISH_BORE	<0.01	Private	Yes	Bore located on private residence. Potential to become public water supply (noting elevated salinity, with sodium and chloride above taste thresholds for drinking water)
	Tank / Tap	ID002_TANK	<0.01	Private	Yes	Rainwater used to supply drinking water across the island.

Table 3: Water Analytical Results vs Drinking Water Guidelines
Preliminary Site Investigation
Norfolk Island
DITCRD

			Location Code	A_BORE1	BBC_SW01	BUMORAS_SW01	CHAP_TAP1	CHAP_TAP2	Cockpit_SW01	Cockpit_SW01	Cockpit_SW01	DEPOT_TANK1	DEPOT_TANK1	DEPOT_TANK1	DEPOT_TANK2	DEPOT_TAP	FRE_TAP1	FRE_TAP2	ID001_BORE
			Field ID	A_BORE1	BBC_SW01	BUMORAS_SW01	CHAP_TAP1	CHAP_TAP2	Cockpit_SW01	QC104	QC204	DEPOT_TANK1	QC110	QC210	DEPOT_TANK2	DEPOT_TAP	FRE_TAP1	FRE_TAP2	ID001_BORE
			Date	14/01/2020	15/01/2020	14/01/2020	21/01/2020	21/01/2020	18/01/2020	18/01/2020	18/01/2020	21/01/2020	21/01/2020	21/01/2020	21/01/2020	21/01/2020	20/01/2020	20/01/2020	16/01/2020
			Sample Type	Normal	Normal	Normal	Normal	Normal	Normal	Field_D	Interlab_D	Normal	Field_D	Interlab_D	Normal	Normal	Normal	Normal	Normal
			Lab Report No.	ES2002626	ES2002626	ES2002626	ES2002810	ES2002810	ES2002808	ES2002803	699303	ES2002819	ES2002803	699303	ES2002819	ES2002819	ES2002817	ES2002817	ES2002615
	Unit	EQL	Drinking Water																
Major Ions																			
Calcium (filtered)	mg/L	1		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4
Chloride	mg/L	1	250#1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	118
Magnesium (filtered)	mg/L	1		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7
Potassium (filtered)	mg/L	1		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Sulfate (as SO4) (filtered)	mg/L	1	250#2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	36
Sodium (filtered)	mg/L	1	180#3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	72
Anions Total	meq/L	0.01		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.36
Cations Total	meq/L	0.01		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.93
Ionic Balance	%	0.01		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.12
Alkalinity																			
Bicarbonate Alkalinity (as CaCO3)	mg/L	1		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14
Carbonate Alkalinity (as CaCO3)	mg/L	1		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<1
Hydroxide Alkalinity (as CaCO3)	mg/L	1		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<1
Total Alkalinity (as CaCO3)	mg/L	1		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14
(n:2) Fluorotelomer Sulfonic Acids																			
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	µg/L	0.01		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.05	<0.05	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer Sulfonate (6:2 FtS)	µg/L	0.05		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	µg/L	0.01		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.05	<0.05	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	µg/L	0.01		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.05	<0.05	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05
Perfluoroalkane Carboxylic Acids																			
Perfluorohexanoic acid (PFHxA)	µg/L	0.01		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.01	0.38	0.37	0.37	1.07	<0.02
Perfluorododecanoic acid (PFDoDA)	µg/L	0.01		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorononanoic acid (PFNA)	µg/L	0.01		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoropentanoic acid (PFPeA)	µg/L	0.01		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.01	0.09	0.09	0.09	0.26	<0.02
Perfluorotetradecanoic acid (PFTeDA)	µg/L	0.01		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.05	<0.05	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05
Perfluoroheptanoic acid (PFHpA)	µg/L	0.01		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.01	0.07	0.07	0.07	0.21	<0.02
Perfluorobutanoic acid (PFBA)	µg/L	0.05		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1	<0.05	<0.1	<0.1	<0.1	0.2	<0.1
Perfluorodecanoic acid (PFDA)	µg/L	0.01		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTrDA)	µg/L	0.01		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	µg/L	0.01		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorooctanoic acid (PFOA)	µg/L	0.01	0.56#4	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.17	0.16	0.16	0.44	<0.01
Perfluoroalkane Sulfonic Acids																			
Perfluorononanesulfonic acid (PFNS)	µg/L	0.01		-	-	-	-	-	-	-	<0.01	-	-	<0.01	-	-	-	-	-
Perfluorooctanesulfonic acid (PFOS)	µg/L	0.01		<0.01	<0.01	<0.01	<0.01	<0.01	0.02	0.02	0.01	<0.01	<0.01	<0.01	5.54	5.46	5.49	15.0	<0.01
Perfluoropentane sulfonic acid (PFPeS)	µg/L	0.01		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.01	0.45	0.42	0.41	1.31	<0.02
Perfluorohexane sulfonic acid (PFHxS)	µg/L	0.01		0.07	<0.02	<0.02	<0.02	<0.02	0.02	0.02	<0.01	<0.02	<0.02	<0.01	3.47	3.33	3.14	7.30	<0.02
Perfluoroheptane sulfonic acid (PFHpS)	µg/L	0.01		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.01	0.24	0.23	0.23	0.74	<0.02
Perfluorodecanesulfonic acid (PFDS)	µg/L	0.01		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorobutane sulfonic acid (PFBS)	µg/L	0.01		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	0.01	0.35	0.34	0.31	0.94	<0.02
Perfluoropropanesulfonic acid (PFPrS)	µg/L	0.01		-	-	-	-	-	-	-	<0.01	-	-	<0.01	-	-	-	-	-
Sum of PFHxS and PFOS	µg/L	0.01	0.07#4	0.07	<0.01	<0.01	<0.01	<0.01	0.04	0.04	0.01	<0.01	<0.01	<0.01	9.01	8.79	8.63	22.3	<0.01
Perfluoroalkyl Sulfonamides																			
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	µg/L	0.05		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
N-methylperfluorooctane sulfonamidoacetic acid (NMeFOSAA)	µg/L	0.02		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.02	<0.02	<0.02	<0.02	<0.02
N-ethyl-perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	µg/L	0.02		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.02	<0.02	<0.02	<0.02	<0.02
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	µg/L	0.05		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamide (MeFOSA)	µg/L	0.05		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	µg/L	0.05		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Perfluorooctane sulfonamide (FOSA)	µg/L	0.02		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.02	<0.02	<0.02	<0.02	<0.02
PFAS																			
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	µg/L	0.01		-	-	-	-	-	-	-	0.01	-	-	<0.01	-	-	-	-	-
Sum of US EPA PFAS (PFOS + PFOA)*	µg/L	0.01		-	-	-	-	-	-	-	0.01	-	-	<0.01	-	-	-	-	-
Sum of PFAS	µg/L	0.01		0.07	<0.01	<0.01	<0.01	<0.01	0.04	0.04	<0.1	<0.01	<0.01	<0.1	10.8	10.5	10.3	27.5	<0.01

Comments
#1 NHMRC (2011) - Aesthetic. Taste threshold
#2 NHMRC (2011) - Aesthetic. Taste threshold. Health based value is 500 mg/L
#3 NHMRC (2011) - Aesthetic. Taste threshold. No health based value has been set
#4 PFAS National Environmental Management Plan (HEPA 2018)

Table 3: Water Analytical Results vs Drinking Water Guidelines
Preliminary Site Investigation
Norfolk Island
DITCRD

			Location Code	ID002_TANK	ID003_BORE	ID003_SW01	ID003_WELL	ID004_TANK	ID005_TANK	ID005_TANK	ID005_TANK	ID006_BORE1	ID006_BORE2	ID007_SPRING	ID009_Well	ID010_BORE	ID012_SW02	ID013_BORE	ID013_SW01	ID014_BORE	ID014_BORE
			Field ID	ID002_TANK	ID003_BORE	ID003_SW01	ID003_WELL	ID004_TANK	ID005_TANK	QC103	QC203	ID006_BORE1	ID006_BORE2	ID007_SPRING	ID009_Well	ID010_BORE	ID012_SW02	ID013_BORE	ID013_SW01	ID014_BORE	QC117
			Date	16/01/2020	16/01/2020	16/01/2020	16/01/2020	16/01/2020	16/01/2020	16/01/2020	16/01/2020	17/01/2020	17/01/2020	18/01/2020	20/01/2020	20/01/2020	21/01/2020	22/01/2020	22/01/2020	23/01/2020	21/01/2020
			Sample Type	Normal	Normal	Normal	Normal	Normal	Normal	Field_D	Interlab_D	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Field_D
			Lab Report No.	ES2002614	ES2002619	ES2002619	ES2002619	ES2002609	ES2002612	ES2002626	ES2002626	ES2002821	ES2002821	ES2002822	ES2002826	ES2002827	ES2002830	ES2002831	ES2002831	ES2002813	ES2002803
	Unit	EQL	Drinking Water																		
Major Ions																					
Calcium (filtered)	mg/L	1		-	8	-	-	-	-	-	-	7	5	6	-	8	-	16	-	-	-
Chloride	mg/L	1	250[#1]	-	110	-	-	-	-	-	-	136	170	160	-	124	-	237	-	-	-
Magnesium (filtered)	mg/L	1		-	10	-	-	-	-	-	-	11	10	13	-	12	-	22	-	-	-
Potassium (filtered)	mg/L	1		-	2	-	-	-	-	-	-	2	2	2	-	2	-	4	-	-	-
Sulfate (as SO4) (filtered)	mg/L	1	250[#2]	-	28	-	-	-	-	-	-	14	18	14	-	35	-	20	-	-	-
Sodium (filtered)	mg/L	1	180[#3]	-	75	-	-	-	-	-	-	76	87	91	-	83	-	114	-	-	-
Anions Total	meq/L	0.01		-	4.58	-	-	-	-	-	-	4.97	5.41	5.60	-	4.92	-	8.14	-	-	-
Cations Total	meq/L	0.01		-	4.54	-	-	-	-	-	-	4.61	4.91	5.38	-	5.05	-	7.67	-	-	-
Ionic Balance	%	0.01		-	0.54	-	-	-	-	-	-	3.71	4.86	2.05	-	1.23	-	2.98	-	-	-
Alkalinity																					
Bicarbonate Alkalinity (as CaCO3)	mg/L	1		-	45	-	-	-	-	-	-	42	12	40	-	35	-	52	-	-	-
Carbonate Alkalinity (as CaCO3)	mg/L	1		-	<1	-	-	-	-	-	-	<1	<1	<1	-	<1	-	<1	-	-	-
Hydroxide Alkalinity (as CaCO3)	mg/L	1		-	<1	-	-	-	-	-	-	<1	<1	<1	-	<1	-	<1	-	-	-
Total Alkalinity (as CaCO3)	mg/L	1		-	45	-	-	-	-	-	-	42	12	40	-	35	-	52	-	-	-
(n:2) Fluorotelomer Sulfonic Acids																					
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	µg/L	0.01		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer Sulfonate (6:2 FtS)	µg/L	0.05		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	µg/L	0.01		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	µg/L	0.01		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Perfluoroalkane Carboxylic Acids																					
Perfluorohexanoic acid (PFHxA)	µg/L	0.01		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.14	0.15	0.14
Perfluorododecanoic acid (PFDoDA)	µg/L	0.01		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorononanoic acid (PFNA)	µg/L	0.01		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoropentanoic acid (PFPeA)	µg/L	0.01		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.03	0.04	0.04
Perfluorotetradecanoic acid (PFTeDA)	µg/L	0.01		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Perfluoroheptanoic acid (PFHpA)	µg/L	0.01		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.03	0.02	<0.02
Perfluorobutanoic acid (PFBA)	µg/L	0.05		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluorodecanoic acid (PFDA)	µg/L	0.01		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTrDA)	µg/L	0.01		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	µg/L	0.01		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorooctanoic acid (PFOA)	µg/L	0.01	0.56[#4]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.07	0.05	0.04
Perfluoroalkane Sulfonic Acids																					
Perfluorononanesulfonic acid (PFNS)	µg/L	0.01		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Perfluorooctanesulfonic acid (PFOS)	µg/L	0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.10	<0.01	2.78	1.93	1.73
Perfluoropentane sulfonic acid (PFPeS)	µg/L	0.01		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.17	0.17	0.14
Perfluorohexane sulfonic acid (PFHxS)	µg/L	0.01		<0.02	0.04	0.03	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.08	<0.02	1.72	1.20	1.02
Perfluoroheptane sulfonic acid (PFHpS)	µg/L	0.01		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.14	0.08	0.07
Perfluorodecanesulfonic acid (PFDS)	µg/L	0.01		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorobutane sulfonic acid (PFBS)	µg/L	0.01		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.14	0.16	0.14
Perfluoropropanesulfonic acid (PFPrS)	µg/L	0.01		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sum of PFHxS and PFOS	µg/L	0.01	0.07[#4]	<0.01	0.04	0.03	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.18	<0.01	4.50	3.13	2.75
Perfluoroalkyl Sulfonamides																					
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	µg/L	0.05		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
N-methylperfluorooctane sulfonamidoacetic acid (NMeFOSAA)	µg/L	0.02		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
N-ethyl-perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	µg/L	0.02		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	µg/L	0.05		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamide (MeFOSA)	µg/L	0.05		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	µg/L	0.05		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Perfluorooctane sulfonamide (FOSA)	µg/L	0.02		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
PFAS																					
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	µg/L	0.01		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sum of US EPA PFAS (PFOS + PFOA)*	µg/L	0.01		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sum of PFAS	µg/L	0.01		<0.01	0.04	0.03	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.18	<0.01	5.22	3.80	3.32

Comments
#1 NHMRC (2011) - Aesthetic. Taste threshold
#2 NHMRC (2011) - Aesthetic. Taste threshold. Health based value is 500 mg/L
#3 NHMRC (2011) - Aesthetic. Taste threshold. No health based value has been set
#4 PFAS National Environmental Management Plan (HEPA 2018)

Table 3: Water Analytical Results vs Drinking Water Guidelines
Preliminary Site Investigation
Norfolk Island
DITCRD

	Unit	EQL	Location Code	ID014_BORE	ID015_BORE	PSW_POUND_BORE A	PWS_AIRPORT_BORE	PWS_AIRPORT_BORE	PWS_AIRPORT_BORE	PWS_DUCK_DAM	PWS_HEAD_DAM	PWS_HEAD_DAM	PWS_HEAD_DAM	PWS_HESSIES_RESV
			Field ID	QC217	ID015_BORE	PSW_POUND_BORE A	PWS_AIRPORT_BORE	QC101	QC201	PWS_DUCK_DAM	PWS_HEAD_DAM	QC100	QC200	PWS_HESSIES_RESERVOIR
			Date	23/01/2020	23/01/2020	14/01/2020	14/01/2020	14/01/2020	14/01/2020	14/01/2020	14/01/2020	14/01/2020	14/01/2020	14/01/2020
			Sample Type	Interlab_D	Normal	Normal	Normal	Field_D	Interlab_D	Normal	Normal	Field_D	Interlab_D	Normal
			Lab Report No.	699303	ES2002814	ES2002626	ES2002626	ES2002626	699266	ES2002626	ES2002626	ES2002626	699266	ES2002626
	Unit	EQL	Drinking Water											
Major Ions														
Calcium (filtered)	mg/L	1		-	-	-	8	-	-	-	8	-	-	7
Chloride	mg/L	1	250[#1]	-	-	-	104	-	-	-	191	-	-	122
Magnesium (filtered)	mg/L	1		-	-	-	9	-	-	-	12	-	-	11
Potassium (filtered)	mg/L	1		-	-	-	2	-	-	-	3	-	-	2
Sulfate (as SO4) (filtered)	mg/L	1	250[#2]	-	-	-	26	-	-	-	27	-	-	32
Sodium (filtered)	mg/L	1	180[#3]	-	-	-	73	-	-	-	102	-	-	85
Anions Total	meq/L	0.01		-	-	-	4.27	-	-	-	6.51	-	-	4.95
Cations Total	meq/L	0.01		-	-	-	4.37	-	-	-	5.90	-	-	5.00
Ionic Balance	%	0.01		-	-	-	1.07	-	-	-	4.91	-	-	0.56
Alkalinity														
Bicarbonate Alkalinity (as CaCO3)	mg/L	1		-	-	-	40	-	-	-	28	-	-	42
Carbonate Alkalinity (as CaCO3)	mg/L	1		-	-	-	<1	-	-	-	<1	-	-	<1
Hydroxide Alkalinity (as CaCO3)	mg/L	1		-	-	-	<1	-	-	-	<1	-	-	<1
Total Alkalinity (as CaCO3)	mg/L	1		-	-	-	40	-	-	-	28	-	-	42
(n:2) Fluorotelomer Sulfonic Acids														
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	µg/L	0.01		<0.01	<0.05	<0.05	<0.05	<0.05	<0.01	<0.05	<0.05	<0.05	<0.01	<0.05
6:2 Fluorotelomer Sulfonate (6:2 FtS)	µg/L	0.05		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	µg/L	0.01		<0.01	<0.05	<0.05	<0.05	<0.05	<0.01	<0.05	<0.05	<0.05	<0.01	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	µg/L	0.01		<0.01	<0.05	<0.05	<0.05	<0.05	<0.01	<0.05	<0.05	<0.05	<0.01	<0.05
Perfluoroalkane Carboxylic Acids														
Perfluorohexanoic acid (PFHxA)	µg/L	0.01		0.11	0.09	<0.02	1.35	1.34	1.2	<0.02	<0.02	<0.02	<0.01	<0.02
Perfluorododecanoic acid (PFDoDA)	µg/L	0.01		<0.01	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.01	<0.02
Perfluorononanoic acid (PFNA)	µg/L	0.01		<0.01	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.01	<0.02
Perfluoropentanoic acid (PFPeA)	µg/L	0.01		0.03	0.02	<0.02	0.33	0.33	0.27	<0.02	<0.02	<0.02	<0.01	<0.02
Perfluorotetradecanoic acid (PFTeDA)	µg/L	0.01		<0.01	<0.05	<0.05	<0.05	<0.05	<0.01	<0.05	<0.05	<0.05	<0.01	<0.05
Perfluoroheptanoic acid (PFHpA)	µg/L	0.01		0.02	<0.02	<0.02	0.28	0.27	0.25	<0.02	<0.02	<0.02	<0.01	<0.02
Perfluorobutanoic acid (PFBA)	µg/L	0.05		<0.05	<0.1	<0.1	0.2	0.2	0.15	<0.1	<0.1	<0.1	<0.05	<0.1
Perfluorodecanoic acid (PFDA)	µg/L	0.01		<0.01	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.01	<0.02
Perfluorotridecanoic acid (PFTrDA)	µg/L	0.01		<0.01	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.01	<0.02
Perfluoroundecanoic acid (PFUnDA)	µg/L	0.01		<0.01	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.01	<0.02
Perfluorooctanoic acid (PFOA)	µg/L	0.01	0.56[#4]	0.03	0.02	<0.01	0.57	0.57	0.57	<0.01	<0.01	<0.01	<0.01	<0.01
Perfluoroalkane Sulfonic Acids														
Perfluorononanesulfonic acid (PFNS)	µg/L	0.01		<0.01	-	-	-	-	0.10	-	-	-	<0.01	-
Perfluorooctanesulfonic acid (PFOS)	µg/L	0.01		1.5	0.46	<0.01	33.1	20.6	22	0.03	0.02	0.02	<0.01	0.01
Perfluoropentane sulfonic acid (PFPeS)	µg/L	0.01		0.10	0.10	<0.02	1.62	1.47	1.2	<0.02	<0.02	<0.02	<0.01	<0.02
Perfluorohexane sulfonic acid (PFHxS)	µg/L	0.01		0.74	0.63	<0.02	11.4	8.24	10	0.09	<0.02	<0.02	<0.01	<0.02
Perfluoroheptane sulfonic acid (PFHpS)	µg/L	0.01		0.05	0.03	<0.02	0.92	0.89	0.62	<0.02	<0.02	<0.02	<0.01	<0.02
Perfluorodecanesulfonic acid (PFDS)	µg/L	0.01		<0.01	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.01	<0.02
Perfluorobutane sulfonic acid (PFBS)	µg/L	0.01		0.11	0.11	<0.02	1.27	1.23	1.1	<0.02	<0.02	<0.02	<0.01	<0.02
Perfluoropropanesulfonic acid (PFPrS)	µg/L	0.01		0.04	-	-	-	-	0.50	-	-	-	<0.01	-
Sum of PFHxS and PFOS	µg/L	0.01	0.07[#4]	2.24	1.09	<0.01	44.5	28.8	32	0.12	0.02	0.02	<0.01	0.01
Perfluoroalkyl Sulfonamides														
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	µg/L	0.05		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
N-methylperfluorooctane sulfonamidoacetic acid (NMeFOSAA)	µg/L	0.02		<0.05	<0.02	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.02	<0.05	<0.02
N-ethyl-perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	µg/L	0.02		<0.05	<0.02	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.02	<0.05	<0.02
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	µg/L	0.05		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamide (MeFOSA)	µg/L	0.05		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	µg/L	0.05		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Perfluorooctane sulfonamide (FOSA)	µg/L	0.02		<0.05	<0.02	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.02	<0.05	<0.02
PFAS														
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	µg/L	0.01		2.27	-	-	-	-	32.57	-	-	-	<0.01	-
Sum of US EPA PFAS (PFOS + PFOA)*	µg/L	0.01		1.53	-	-	-	-	22.57	-	-	-	<0.01	-
Sum of PFAS	µg/L	0.01		2.73	1.46	<0.01	51.0	35.1	37.96	0.12	0.02	0.02	<0.1	0.01

Comments
#1 NHMRC (2011) - Aesthetic. Taste threshold
#2 NHMRC (2011) - Aesthetic. Taste threshold. Health based value is 500 mg/L
#3 NHMRC (2011) - Aesthetic. Taste threshold. No health based value has been set
#4 PFAS National Environmental Management Plan (HEPA 2018)

Table 3: Water Analytical Results vs Drinking Water Guidelines
Preliminary Site Investigation
Norfolk Island
DITCRD

	Unit	EQL	Drinking Water	PWS_HOSP_BORE	PWS_HOSP_TANK 1	PWS_HOSP_TANK 2	PWS_HOSP_TANK 3	PWS_HOSP_TANK 4	PWS_HOSP_TANK 5	PWS_HOSP_TAP1	PWS_HOSP_TAP1	PWS_HOSP_TAP1	PWS_HOSP_TAP1	PWS_HOSP_TAP2	PWS_HOSP_TAP3
Location Code				PWS_HOSP_BORE	PWS_HOSP_TANK 1	PWS_HOSP_TANK 2	PWS_HOSP_TANK 3	PWS_HOSP_TANK 4	PWS_HOSP_TANK 5	PWS_HOSP_TAP1	PWS_HOSP_TAP1	PWS_HOSP_TAP1	PWS_HOSP_TAP1	PWS_HOSP_TAP2	PWS_HOSP_TAP3
Field ID				PWS_HOSP_BORE	PWS_HOSP_TANK 1	PWS_HOSP_TANK 2	PWS_HOSP_TANK 3	PWS_HOSP_TANK 4	PWS_HOSP_TANK 5	PWS_HOSP_TAP1	PWS_HOSP_TAP1	QC118	QC218	PWS_HOSP_TAP2	PWS_HOSP_TAP3
Date				15/01/2020	15/01/2020	15/01/2020	15/01/2020	15/01/2020	15/01/2020	15/01/2020	13/02/2020	13/02/2020	13/02/2020	13/02/2020	13/02/2020
Sample Type				Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Field_D	Interlab_D	Normal	Normal
Lab Report No.				ES2002622	ES2002622	ES2002622	ES2002622	ES2002622	ES2002622	ES2002622	EM2002483	EM2002483	702421	EM2002483	EM2002483
Major Ions															
Calcium (filtered)	mg/L	1		5	-	-	-	-	-	-	-	-	-	-	-
Chloride	mg/L	1	250[#1]	107	-	-	-	-	-	-	-	-	-	-	-
Magnesium (filtered)	mg/L	1		7	-	-	-	-	-	-	-	-	-	-	-
Potassium (filtered)	mg/L	1		2	-	-	-	-	-	-	-	-	-	-	-
Sulfate (as SO4) (filtered)	mg/L	1	250[#2]	19	-	-	-	-	-	-	-	-	-	-	-
Sodium (filtered)	mg/L	1	180[#3]	54	-	-	-	-	-	-	-	-	-	-	-
Anions Total	meq/L	0.01		3.51	-	-	-	-	-	-	-	-	-	-	-
Cations Total	meq/L	0.01		3.22	-	-	-	-	-	-	-	-	-	-	-
Ionic Balance	%	0.01		4.28	-	-	-	-	-	-	-	-	-	-	-
Alkalinity															
Bicarbonate Alkalinity (as CaCO3)	mg/L	1		5	-	-	-	-	-	-	-	-	-	-	-
Carbonate Alkalinity (as CaCO3)	mg/L	1		<1	-	-	-	-	-	-	-	-	-	-	-
Hydroxide Alkalinity (as CaCO3)	mg/L	1		<1	-	-	-	-	-	-	-	-	-	-	-
Total Alkalinity (as CaCO3)	mg/L	1		5	-	-	-	-	-	-	-	-	-	-	-
(n:2) Fluorotelomer Sulfonic Acids															
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	µg/L	0.01		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.05	<0.05
6:2 Fluorotelomer Sulfonate (6:2 FtS)	µg/L	0.05		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	µg/L	0.01		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	µg/L	0.01		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.05	<0.05
Perfluoroalkane Carboxylic Acids															
Perfluorohexanoic acid (PFHxA)	µg/L	0.01		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	µg/L	0.01		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02
Perfluorononanoic acid (PFNA)	µg/L	0.01		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02
Perfluoropentanoic acid (PFPeA)	µg/L	0.01		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	µg/L	0.01		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.05	<0.05
Perfluoroheptanoic acid (PFHpA)	µg/L	0.01		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02
Perfluorobutanoic acid (PFBA)	µg/L	0.05		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1
Perfluorodecanoic acid (PFDA)	µg/L	0.01		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02
Perfluorotridecanoic acid (PFTrDA)	µg/L	0.01		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	µg/L	0.01		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02
Perfluorooctanoic acid (PFOA)	µg/L	0.01	0.56[#4]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Perfluoroalkane Sulfonic Acids															
Perfluorononanesulfonic acid (PFNS)	µg/L	0.01		-	-	-	-	-	-	-	-	-	<0.01	-	-
Perfluorooctanesulfonic acid (PFOS)	µg/L	0.01		<0.01	<0.01	0.02	<0.01	<0.01	<0.01	0.45	0.46	0.48	0.54	<0.01	0.30
Perfluoropentane sulfonic acid (PFPeS)	µg/L	0.01		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02
Perfluorohexane sulfonic acid (PFHxS)	µg/L	0.01		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.05	0.04	0.04	0.04	<0.02	0.04
Perfluoroheptane sulfonic acid (PFHpS)	µg/L	0.01		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02
Perfluorodecanesulfonic acid (PFDS)	µg/L	0.01		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02
Perfluorobutane sulfonic acid (PFBS)	µg/L	0.01		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02
Perfluoropropanesulfonic acid (PFPrS)	µg/L	0.01		-	-	-	-	-	-	-	-	-	<0.01	-	-
Sum of PFHxS and PFOS	µg/L	0.01	0.07[#4]	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	0.50	0.50	0.52	0.58	<0.01	0.34
Perfluoroalkyl Sulfonamides															
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	µg/L	0.05		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
N-methylperfluorooctane sulfonamidoacetic acid (NMeFOSAA)	µg/L	0.02		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02
N-ethyl-perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	µg/L	0.02		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	µg/L	0.05		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamide (MeFOSA)	µg/L	0.05		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	µg/L	0.05		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Perfluorooctane sulfonamide (FOSA)	µg/L	0.02		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02
PFAS															
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	µg/L	0.01		-	-	-	-	-	-	-	-	-	0.58	-	-
Sum of US EPA PFAS (PFOS + PFOA)*	µg/L	0.01		-	-	-	-	-	-	-	-	-	0.54	-	-
Sum of PFAS	µg/L	0.01		<0.01	<0.01	0.02	<0.01	<0.01	<0.01	0.50	0.50	0.52	0.58	<0.01	0.34

Comments
#1 NHMRC (2011) - Aesthetic. Taste threshold
#2 NHMRC (2011) - Aesthetic. Taste threshold. Health based value is 500 mg/L
#3 NHMRC (2011) - Aesthetic. Taste threshold. No health based value has been set
#4 PFAS National Environmental Management Plan (HEPA 2018)

Table 3: Water Analytical Results vs Drinking Water Guidelines
Preliminary Site Investigation
Norfolk Island
DITCRD

			Location Code	PWS_HOSP_TAP4	PWS_KINGFISH_BORE B	PWS_SCH_BORE	PWS_SCH_BORE	PWS_SCH_BORE	PWS_SCH_TANK 1	PWS_SCH_TAP	PWS-WWII_DAM	TC_SW01	TC_SW02	WC-01	WC-02	WC-03_BORE
			Field ID	PWS_HOSP_TAP4	PWS_KINGFISH_BORE B	PWS_SCH_BORE	QC102	QC202	PWS_SCH_TANK 1	PWS_SCH_TAP	PWS-WWII_DAM	TC_SW01	TC_SW02	WC-01	WC-02	WC-03_BORE
			Date	13/02/2020	14/01/2020	16/01/2020	16/01/2020	16/01/2020	16/01/2020	16/01/2020	13/01/2020	14/01/2020	16/01/2020	15/01/2020	16/01/2020	17/01/2020
			Sample Type	Normal	Normal	Normal	Field_D	Interlab_D	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal
			Lab Report No.	EM2002483	ES2002626	ES2002620	ES2002620	699263	ES2002620	ES2002620	ES2002626	ES2002626	ES2002626	ES2002617	ES2002616	ES2002618
	Unit	EQL	Drinking Water													
Major Ions																
Calcium (filtered)	mg/L	1		-	12	4	-	-	-	-	-	-	-	2	6	4
Chloride	mg/L	1	250[#1]	-	524	57	-	-	-	-	-	-	-	170	48	44
Magnesium (filtered)	mg/L	1		-	30	5	-	-	-	-	-	-	-	9	4	5
Potassium (filtered)	mg/L	1		-	7	1	-	-	-	-	-	-	-	1	1	1
Sulfate (as SO4) (filtered)	mg/L	1	250[#2]	-	34	22	-	-	-	-	-	-	-	16	4	16
Sodium (filtered)	mg/L	1	180[#3]	-	245	50	-	-	-	-	-	-	-	90	28	35
Anions Total	meq/L	0.01		-	15.6	2.50	-	-	-	-	-	-	-	5.29	1.66	2.09
Cations Total	meq/L	0.01		-	13.9	2.81	-	-	-	-	-	-	-	4.78	1.87	2.16
Ionic Balance	%	0.01		-	5.65	-	-	-	-	-	-	-	-	5.04	-	-
Alkalinity																
Bicarbonate Alkalinity (as CaCO3)	mg/L	1		-	4	22	-	-	-	-	-	-	-	8	11	26
Carbonate Alkalinity (as CaCO3)	mg/L	1		-	<1	<1	-	-	-	-	-	-	-	<1	<1	<1
Hydroxide Alkalinity (as CaCO3)	mg/L	1		-	<1	<1	-	-	-	-	-	-	-	<1	<1	<1
Total Alkalinity (as CaCO3)	mg/L	1		-	4	22	-	-	-	-	-	-	-	8	11	26
(n:2) Fluorotelomer Sulfonic Acids																
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	µg/L	0.01		<0.05	<0.05	<0.05	<0.05	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer Sulfonate (6:2 FtS)	µg/L	0.05		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	µg/L	0.01		<0.05	<0.05	<0.05	<0.05	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	µg/L	0.01		<0.05	<0.05	<0.05	<0.05	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Perfluoroalkane Carboxylic Acids																
Perfluorohexanoic acid (PFHxA)	µg/L	0.01		<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	2.68	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	µg/L	0.01		<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorononanoic acid (PFNA)	µg/L	0.01		<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoropentanoic acid (PFPeA)	µg/L	0.01		<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	0.65	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	µg/L	0.01		<0.05	<0.05	<0.05	<0.05	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Perfluoroheptanoic acid (PFHpA)	µg/L	0.01		<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	0.51	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorobutanoic acid (PFBA)	µg/L	0.05		<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1	0.4	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluorodecanoic acid (PFDA)	µg/L	0.01		<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTrDA)	µg/L	0.01		<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	µg/L	0.01		<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorooctanoic acid (PFOA)	µg/L	0.01	0.56[#4]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	1.13	<0.01	<0.01	<0.01	<0.01	<0.01
Perfluoroalkane Sulfonic Acids																
Perfluorononanesulfonic acid (PFNS)	µg/L	0.01		-	-	-	-	<0.01	-	-	-	-	-	-	-	-
Perfluorooctanesulfonic acid (PFOS)	µg/L	0.01		0.43	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	44.6	<0.01	0.03	<0.01	<0.01	<0.01
Perfluoropentane sulfonic acid (PFPeS)	µg/L	0.01		<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	2.97	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexane sulfonic acid (PFHxS)	µg/L	0.01		0.04	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	22.6	<0.02	0.06	<0.02	<0.02	<0.02
Perfluoroheptane sulfonic acid (PFHpS)	µg/L	0.01		<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	2.05	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorodecanesulfonic acid (PFDS)	µg/L	0.01		<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorobutane sulfonic acid (PFBS)	µg/L	0.01		<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	2.30	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoropropanesulfonic acid (PFPrS)	µg/L	0.01		-	-	-	-	<0.01	-	-	-	-	-	-	-	-
Sum of PFHxS and PFOS	µg/L	0.01	0.07[#4]	0.47	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	67.2	<0.01	0.09	<0.01	<0.01	<0.01
Perfluoroalkyl Sulfonamides																
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	µg/L	0.05		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
N-methylperfluorooctane sulfonamidoacetic acid (NMeFOSAA)	µg/L	0.02		<0.02	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
N-ethyl-perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	µg/L	0.02		<0.02	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	µg/L	0.05		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamide (MeFOSA)	µg/L	0.05		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	µg/L	0.05		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Perfluorooctane sulfonamide (FOSA)	µg/L	0.02		<0.02	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
PFAS																
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	µg/L	0.01		-	-	-	-	<0.01	-	-	-	-	-	-	-	-
Sum of US EPA PFAS (PFOS + PFOA)*	µg/L	0.01		-	-	-	-	<0.01	-	-	-	-	-	-	-	-
Sum of PFAS	µg/L	0.01		0.47	<0.01	<0.01	<0.01	<0.1	<0.01	<0.01	79.9	<0.01	0.09	<0.01	<0.01	<0.01

Comments
#1 NHMRC (2011) - Aesthetic. Taste threshold
#2 NHMRC (2011) - Aesthetic. Taste threshold. Health based value is 500 mg/L
#3 NHMRC (2011) - Aesthetic. Taste threshold. No health based value has been set
#4 PFAS National Environmental Management Plan (HEPA 2018)

Table 4a: On-Site Soil and Sediment Analytical Results
Preliminary Site Investigation
Norfolk Island
Department for Infrastructure, Transport, Regional Development and Communications

senversa

	Unit	EQL	Human health - Industrial / Commercial																	
Location				On-site	On-site	On-site	On-site	On-site	On-site	On-site	On-site	On-site	On-site	On-site	On-site	On-site	On-site	On-site	On-site	On-site
Location Code				A_SS01	A_SS02	A_SS03	A_SS03	A_SS03	A_SS04	A_SS05	A_SS06	A_SS07	A_SS08	A_SS09	A_SS10	A_SS11	A_SS12	A_SS13	A_SS14	A_SS15
Field ID				A_SS01	A_SS02	A_SS03	QC108	QC208	A_SS04	A_SS05	A_SS06	A_SS07	A_SS08	A_SS09	A_SS10	A_SS11	A_SS12	A_SS13	A_SS14	A_SS15
Date				21/01/2020	21/01/2020	21/01/2020	20/01/2020	21/01/2020	21/01/2020	21/01/2020	21/01/2020	21/01/2020	21/01/2020	21/01/2020	21/01/2020	22/01/2020	22/01/2020	22/01/2020	22/01/2020	22/01/2020
Sample Type				Normal	Normal	Normal	Field_D	Interlab_D	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal
Catchment				Mission	Mission	Mission	Mission	Mission	Mission	Mission	Mission	Mission	Mission	Mission	Mission	Mission	Mission	Mission	Mission	Mission
Media				Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Lab Report No.				ES2002806	ES2002806	ES2002806	ES2002803	699303	ES2002806	ES2002806	ES2002806	ES2002806	ES2002806	ES2002806	ES2002806	ES2002806	ES2002806	ES2002806	ES2002806	ES2002806
Physical Parameters																				
Moisture Content	%	0.1		2.7	3.0	1.8	3.8	2.7	10.6	4.4	10.0	9.8	10.5	13.7	10.0	9.0	7.2	15.8	9.5	8.4
(n:2) Fluorotelomer Sulfonic Acids																				
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	mg/kg	0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
6:2 Fluorotelomer Sulfonate (6:2 FtS)	mg/kg	0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.01	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	mg/kg	0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	mg/kg	0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Perfluoroalkane Carboxylic Acids																				
Perfluorohexanoic acid (PFHxA)	mg/kg	0.0002		<0.0002	0.0004	<0.0002	<0.0002	<0.005	<0.0002	0.0003	0.0003	<0.0002	0.0002	0.0008	<0.0002	0.0016	0.0008	0.0022	<0.0002	0.0004
Perfluorododecanoic acid (PFDoDA)	mg/kg	0.0002		<0.0002	<0.0002	<0.0002	<0.0002	<0.005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0011	0.0002	0.0004	<0.0002	<0.0002
Perfluorononanoic acid (PFNA)	mg/kg	0.0002		<0.0002	<0.0002	<0.0002	<0.0002	<0.005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0007	0.0006	<0.0002	<0.0002
Perfluoropentanoic acid (PFPeA)	mg/kg	0.0002		<0.0002	<0.0002	<0.0002	<0.0002	<0.005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0003	<0.0002	0.0011	0.0008	0.0058	<0.0002	0.0004
Perfluorotetradecanoic acid (PFTeDA)	mg/kg	0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0009	<0.0005	<0.0005	<0.0005	<0.0005
Perfluoroheptanoic acid (PFHpA)	mg/kg	0.0002		<0.0002	<0.0002	<0.0002	<0.0002	<0.005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0003	0.0005	0.0008	<0.0002	<0.0002
Perfluorobutanoic acid (PFBA)	mg/kg	0.001		<0.001	<0.001	<0.001	<0.001	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	<0.001	0.001	0.001	0.013	<0.001	<0.001
Perfluorodecanoic acid (PFDA)	mg/kg	0.0002		<0.0002	<0.0002	<0.0002	<0.0002	<0.005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0005	0.0003	0.0003	<0.0002	<0.0002
Perfluorotridecanoic acid (PFTrDA)	mg/kg	0.0002		<0.0002	<0.0002	<0.0002	<0.0002	<0.005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroundecanoic acid (PFUnDA)	mg/kg	0.0002		<0.0002	<0.0002	<0.0002	<0.0002	<0.005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0008	0.0005	<0.0002	<0.0002
Perfluorooctanoic acid (PFOA)	mg/kg	0.0002	50#1	<0.0002	0.0002	<0.0002	<0.0002	<0.005	<0.0002	<0.0002	0.0004	<0.0002	<0.0002	<0.0002	<0.0002	0.0005	0.0009	0.0008	<0.0002	0.0002
Perfluoroalkane Sulfonic Acids																				
Perfluorononanesulfonic acid (PFNS)	mg/kg	0.005		-	-	-	-	<0.005	-	-	-	-	-	-	-	-	-	-	-	-
Perfluorooctanesulfonic acid (PFOS)	mg/kg	0.0002		0.0040	0.0092	0.0068	0.0068	<0.005	0.0002	0.0160	0.0295	0.0063	0.0108	0.0123	0.0028	0.0274	0.0423	0.0391	0.0067	0.0228
Perfluoropentane sulfonic acid (PFPeS)	mg/kg	0.0002		<0.0002	<0.0002	<0.0002	<0.0002	<0.005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0019	<0.0002	0.0012	<0.0002	<0.0002
Perfluorohexane sulfonic acid (PFHxS)	mg/kg	0.0002		0.0002	0.0028	0.0004	0.0003	<0.005	<0.0002	0.0015	0.0009	0.0003	0.0004	0.0021	<0.0002	0.0254	0.0012	0.0121	0.0002	0.0010
Perfluoroheptane sulfonic acid (PFHpS)	mg/kg	0.0002		<0.0002	<0.0002	0.0003	0.0002	<0.005	<0.0002	<0.0002	0.0008	<0.0002	<0.0002	<0.0002	<0.0002	0.0012	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorodecanesulfonic acid (PFDS)	mg/kg	0.0002		<0.0002	<0.0002	<0.0002	<0.0002	<0.005	<0.0002	0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0025	0.0042	0.0082	0.0004	0.0025
Perfluorobutane sulfonic acid (PFBS)	mg/kg	0.0002		<0.0002	<0.0002	<0.0002	<0.0002	<0.005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0002	<0.0002	0.0012	<0.0002	0.0011	<0.0002	<0.0002
Perfluoropropanesulfonic acid (PFPrS)	mg/kg	0.005		-	-	-	-	<0.005	-	-	-	-	-	-	-	-	-	-	-	-
Sum of PFHxS and PFOS	mg/kg	0.0002	20#1	0.0042	0.0120	0.0072	0.0071	<0.005	0.0002	0.0175	0.0304	0.0066	0.0112	0.0144	0.0028	0.0528	0.0435	0.0512	0.0069	0.0238
Perfluoroalkyl Sulfonamides																				
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	mg/kg	0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-methylperfluorooctane sulfonamidoacetic acid (NMeFOSAA)	mg/kg	0.0002		<0.0002	<0.0002	<0.0002	<0.0002	<0.01	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
N-ethyl-perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	mg/kg	0.0002		<0.0002	<0.0002	<0.0002	<0.0002	<0.01	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0031	<0.0002	<0.0002	<0.0002	<0.0002
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	mg/kg	0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamide (MeFOSA)	mg/kg	0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	mg/kg	0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Perfluorooctane sulfonamide (FOSA)	mg/kg	0.0002		<0.0002	<0.0002	<0.0002	<0.0002	<0.005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0031	0.0002	0.0006	<0.0002	0.0003
PFAS																				
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	mg/kg	0.005		-	-	-	-	<0.005	-	-	-	-	-	-	-	-	-	-	-	-
Sum of US EPA PFAS (PFOS + PFOA)*	mg/kg	0.005		-	-	-	-	<0.005	-	-	-	-	-	-	-	-	-	-	-	-
Sum of PFAS	mg/kg	0.0002		0.0042	0.0126	0.0075	0.0073	<0.05	0.0002	0.0180	0.0319	0.0066	0.0114	0.0177	0.0028	0.0728	0.0539	0.0867	0.0073	0.0276

Comments
#1 Based on 20% of FSANZ TDI, i.e. up to 80% of exposure is assumed to come from other pathways.

Table 4a: On-Site Soil and Sediment Analytical Results
Preliminary Site Investigation
Norfolk Island
Department for Infrastructure, Transport, Regional Development and Communications

			Location	On-site	On-site	On-site	On-site	On-site	On-site	On-site	On-site	On-site	On-site	On-site	On-site	On-site	On-site	On-site	On-site	On-site
			Location Code	A_SS16	A_SS17	A_SS18	A_SS19	A_SS20	A_SS20	A_SS21	A_SS22	A_SS23	A_SS24	A_SS25	A_SS26	A_SS27	A_SS28	A_SS29	A_SS30	A_SS30
			Field ID	A_SS16	A_SS17	A_SS18	A_SS19	A_SS20	QC111	A_SS21	A_SS22	A_SS23	A_SS24	A_SS25	A_SS26	A_SS27	A_SS28	A_SS29	A_SS30	QC112
			Date	22/01/2020	22/01/2020	22/01/2020	22/01/2020	22/01/2020	22/01/2020	22/01/2020	22/01/2020	22/01/2020	22/01/2020	22/01/2020	22/01/2020	22/01/2020	22/01/2020	22/01/2020	22/01/2020	22/01/2020
			Sample Type	Normal	Normal	Normal	Normal	Normal	Field_D	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Field_D
			Catchment	Mission	Mission	Mission	Mission	Mission	Mission	Mission	Mission	Mission	Mission	Mission	Mission	Mission	Mission	Mission	Mission	Mission
			Media	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
			Lab Report No.	ES2002806	ES2002806	ES2002806	ES2002806	ES2002806	ES2002803	ES2002806	ES2002806	ES2002806	ES2002806	ES2002806	ES2002806	ES2002806	ES2002806	ES2002806	ES2002806	ES2002803
	Unit	EQL	Human health - Industrial / Commercial																	
Physical Parameters																				
Moisture Content	%	0.1		11.1	7.2	9.2	5.4	10.4	8.6	9.6	8.3	5.2	5.7	12.6	6.6	13.5	8.6	11.3	10.8	13.1
(n:2) Fluorotelomer Sulfonic Acids																				
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	mg/kg	0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
6:2 Fluorotelomer Sulfonate (6:2 FtS)	mg/kg	0.0005		<0.0005	<0.0005	<0.0005	0.0022	<0.0005	<0.0005	<0.0005	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	mg/kg	0.0005		<0.0005	0.0018	0.0039	0.106	0.0016	0.0017	0.0024	0.0228	0.0104	0.0191	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0117	0.0130
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	mg/kg	0.0005		<0.0005	<0.0005	0.0006	0.0196	<0.0005	<0.0005	<0.0005	0.0027	0.0008	0.0051	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0006	0.0009
Perfluoroalkane Carboxylic Acids																				
Perfluorohexanoic acid (PFHxA)	mg/kg	0.0002		0.0026	0.0027	0.0033	0.0068	0.0028	0.0032	0.0032	0.0024	0.0094	0.0064	0.0006	0.0007	0.0004	0.0043	0.0008	0.0048	0.0049
Perfluorododecanoic acid (PFDoDA)	mg/kg	0.0002		0.0008	0.0036	0.0051	0.0364	0.0024	0.0023	0.0014	0.0156	0.0128	0.0207	0.0015	<0.0002	<0.0002	0.0010	<0.0002	0.0056	0.0051
Perfluorononanoic acid (PFNA)	mg/kg	0.0002		0.0002	0.0012	0.0019	0.0058	0.0016	0.0015	0.0023	0.0017	0.0031	0.0022	<0.0005	0.0003	<0.0002	0.0002	<0.0002	0.0153	0.0179
Perfluoropentanoic acid (PFPeA)	mg/kg	0.0002		0.0016	0.0030	0.0049	0.0033	0.0033	0.0021	0.0076	0.0032	0.0041	0.0033	0.0006	0.0005	0.0005	0.0047	0.0005	0.0088	0.0058
Perfluorotetradecanoic acid (PFTeDA)	mg/kg	0.0005		0.0007	0.0021	0.0021	0.0067	0.0015	<0.0005	<0.0005	0.0037	0.0015	0.0062	<0.0012	<0.0005	<0.0005	<0.0005	<0.0005	0.0007	0.0006
Perfluoroheptanoic acid (PFHpA)	mg/kg	0.0002		0.0004	0.0009	0.0015	0.0024	0.0013	0.0010	0.0014	0.0011	0.0019	0.0018	<0.0005	0.0003	<0.0002	0.0004	<0.0002	0.0029	0.0030
Perfluorobutanoic acid (PFBA)	mg/kg	0.001		0.003	0.004	0.005	0.003	0.004	0.002	0.007	0.003	<0.001	<0.001	<0.001	<0.001	<0.001	0.006	0.001	0.010	0.006
Perfluorodecanoic acid (PFDA)	mg/kg	0.0002		0.0004	0.0022	0.0045	0.0431	0.0026	0.0023	0.0044	0.0056	0.0074	0.0033	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002	0.0075	0.0070
Perfluorotridecanoic acid (PFTrDA)	mg/kg	0.0002		<0.0002	0.0005	0.0008	0.0055	0.0003	0.0004	0.0002	0.0023	0.0023	0.0049	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002	0.0012	0.0014
Perfluoroundecanoic acid (PFUnDA)	mg/kg	0.0002		0.0007	0.0080	0.0080	0.0487	0.0067	0.0032	0.0049	0.0521	0.0165	0.0243	0.0021	0.0004	<0.0002	0.0009	<0.0002	0.0081	0.0044
Perfluorooctanoic acid (PFOA)	mg/kg	0.0002	50[#1]	0.0006	0.0027	0.0024	0.0064	0.0029	0.0029	0.0026	0.0024	0.0060	0.0043	<0.0005	0.0006	<0.0002	0.0013	0.0002	0.0170	0.0198
Perfluoroalkane Sulfonic Acids																				
Perfluorononanesulfonic acid (PFNS)	mg/kg	0.005		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Perfluorooctanesulfonic acid (PFOS)	mg/kg	0.0002		0.0219	0.0383	0.0392	0.571	0.0338	0.0548	0.0570	0.0985	0.986	0.246	0.0277	0.0109	0.0069	0.0453	0.0159	0.137	0.124
Perfluoropentane sulfonic acid (PFPeS)	mg/kg	0.0002		0.0013	0.0011	0.0015	0.0019	0.0008	0.0006	0.0007	0.0010	0.0048	0.0037	<0.0005	<0.0002	<0.0002	0.0006	<0.0002	0.0014	0.0010
Perfluorohexane sulfonic acid (PFHxS)	mg/kg	0.0002		0.0186	0.0130	0.0154	0.0204	0.0097	0.0091	0.0088	0.0117	0.0533	0.0296	0.0031	0.0010	<0.0002	0.0136	0.0005	0.0190	0.0214
Perfluoroheptane sulfonic acid (PFHpS)	mg/kg	0.0002		0.0008	0.0007	0.0010	0.0018	0.0006	0.0005	0.0006	0.0009	0.0047	0.0020	<0.0005	<0.0002	<0.0002	0.0008	<0.0002	0.0015	0.0015
Perfluorodecanesulfonic acid (PFDS)	mg/kg	0.0002		0.0028	0.0404	0.0405	0.0626	0.0277	0.0210	0.0313	0.0519	0.0433	0.0206	0.0008	0.0018	<0.0002	0.0301	<0.0002	0.0103	0.0145
Perfluorobutane sulfonic acid (PFBS)	mg/kg	0.0002		0.0008	0.0007	0.0012	0.0018	0.0006	0.0007	0.0007	0.0009	0.0036	0.0035	<0.0005	<0.0002	<0.0002	0.0005	<0.0002	0.0009	0.0011
Perfluoropropanesulfonic acid (PFPrS)	mg/kg	0.005		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sum of PFHxS and PFOS	mg/kg	0.0002	20[#1]	0.0405	0.0513	0.0546	0.591	0.0435	0.0639	0.0658	0.110	1.04	0.276	0.0308	0.0119	0.0069	0.0589	0.0164	0.156	0.145
Perfluoroalkyl Sulfonamides																				
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	mg/kg	0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0012	<0.0012	<0.0012	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-methylperfluorooctane sulfonamidoacetic acid (NMeFOSAA)	mg/kg	0.0002		<0.0002	<0.0002	<0.0002	0.0005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
N-ethyl-perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	mg/kg	0.0002		0.0011	<0.0002	<0.0002	0.0008	<0.0002	<0.0002	<0.0002	<0.0002	0.0009	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	mg/kg	0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0012	<0.0012	<0.0012	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamide (MeFOSA)	mg/kg	0.0005		<0.0005	<0.0005	<0.0005	0.0007	<0.0005	<0.0005	<0.0005	0.0006	<0.0012	<0.0012	<0.0012	<0.0005	<0.0005	<0.0005	<0.0005	0.0012	0.0014
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	mg/kg	0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0014	0.0013	<0.0012	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Perfluorooctane sulfonamide (FOSA)	mg/kg	0.0002		0.0018	0.0032	0.0039	0.0318	0.0025	0.0021	0.0016	0.0105	0.0144	0.0114	0.0007	0.0004	<0.0002	0.0045	<0.0002	0.0075	0.0063
PFAS																				
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	mg/kg	0.005		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sum of US EPA PFAS (PFOS + PFOA)*	mg/kg	0.005		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sum of PFAS	mg/kg	0.0002		0.0601	0.130	0.147	0.989	0.107	0.111	0.138	0.295	1.19	0.420	0.0371	0.0169	0.0078	0.114	0.0189	0.273	0.261

Comments
#1 Based on 20% of FSANZ TDI, i.e. up to 80% of exposure is assumed to come from other pathways.

Table 4a: On-Site Soil and Sediment Analytical Results
Preliminary Site Investigation
Norfolk Island
Department for Infrastructure, Transport, Regional Development and Communications

Location				On-site	On-site	On-site	On-site	On-site	On-site	On-site	On-site	On-site	On-site	On-site	On-site	On-site	On-site	On-site	On-site	On-site
Location Code				A_SS30	A_SS31	A_SS32	A_SS33	A_SS34	A_SS35	A_SS36	A_SS37	A_SS38	A_SS39	A_SS40	A_SS41	A_SS42	A_SS43	A_SS44	A_SS45	A_SS46
Field ID				QC212	A_SS31	A_SS32	A_SS33	A_SS34	A_SS35	A_SS36	A_SS37	A_SS38	A_SS39	A_SS40	A_SS41	A_SS42	A_SS43	A_SS44	A_SS45	A_SS46
Date				22/01/2020	22/01/2020	22/01/2020	22/01/2020	22/01/2020	22/01/2020	22/01/2020	22/01/2020	22/01/2020	22/01/2020	22/01/2020	22/01/2020	22/01/2020	22/01/2020	22/01/2020	22/01/2020	22/01/2020
Sample Type				Interlab_D	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal
Catchment				Mission	Mission	Mission	Mission	Mission	Mission	Mission	Mission	Mission	Mission	Mission	Town/Watermill	Town/Watermill	Town/Watermill	Town/Watermill	Town/Watermill	Town/Watermill
Media				Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Lab Report No.				699303	ES2002806	ES2002806	ES2002806	ES2002806	ES2002806	ES2002806	ES2002806	ES2002806	ES2002806	ES2002806	ES2002806	ES2002806	ES2002806	ES2002806	ES2002806	ES2002806
	Unit	EQL	Human health - Industrial / Commercial																	
Physical Parameters																				
Moisture Content	%	0.1		12	8.7	10.1	15.3	13.2	14.5	11.0	15.0	23.6	22.4	8.2	13.7	7.4	9.0	7.7	10.7	8.1
(n:2) Fluorotelomer Sulfonic Acids																				
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	mg/kg	0.0005		<0.005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
6:2 Fluorotelomer Sulfonate (6:2 FtS)	mg/kg	0.0005		<0.01	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0008	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	mg/kg	0.0005		0.012	0.0032	0.0025	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0023	<0.0005	<0.0005	0.323	<0.0005	<0.0005	0.0046	0.0106	<0.0005
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	mg/kg	0.0005		<0.005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0098	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Perfluoroalkane Carboxylic Acids																				
Perfluorohexanoic acid (PFHxA)	mg/kg	0.0002		<0.005	0.0022	0.0005	<0.0002	0.0010	0.0003	0.0005	0.0008	0.0055	0.0006	0.0008	0.0040	<0.0002	0.0004	0.0005	0.0018	<0.0002
Perfluorododecanoic acid (PFDoDA)	mg/kg	0.0002		<0.005	0.0063	0.0029	<0.0002	0.0002	<0.0002	<0.0002	<0.0002	0.0021	<0.0002	<0.0002	0.0305	<0.0002	<0.0002	0.0006	0.0030	<0.0002
Perfluorononanoic acid (PFNA)	mg/kg	0.0002		0.021	0.0020	0.0003	<0.0002	<0.0002	0.0002	<0.0002	<0.0002	0.0037	<0.0002	<0.0002	0.0095	<0.0002	0.0003	0.0019	0.0037	0.0004
Perfluoropentanoic acid (PFPeA)	mg/kg	0.0002		0.0053	0.0053	0.0006	0.0002	0.0010	0.0008	0.0003	0.0008	0.0123	0.0008	0.0010	0.0037	<0.0002	<0.0002	0.0007	0.0027	<0.0002
Perfluorotetradecanoic acid (PFTeDA)	mg/kg	0.0005		<0.005	0.0009	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0057	<0.0005	<0.0005	<0.0005	0.0006	<0.0005
Perfluoroheptanoic acid (PFHpA)	mg/kg	0.0002		<0.005	0.0010	0.0003	<0.0002	<0.0002	0.0002	<0.0002	0.0002	0.0024	<0.0002	<0.0002	0.0049	<0.0002	0.0003	0.0004	0.0013	<0.0002
Perfluorobutanoic acid (PFBA)	mg/kg	0.001		<0.005	0.005	<0.001	<0.001	0.004	<0.001	<0.001	<0.001	0.014	<0.001	0.001	0.001	<0.001	<0.001	<0.001	0.001	<0.001
Perfluorodecanoic acid (PFDA)	mg/kg	0.0002		0.0099	0.0024	0.0013	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0018	<0.0002	<0.0002	0.0347	<0.0002	<0.0002	0.0012	0.0055	<0.0002
Perfluorotridecanoic acid (PFTrDA)	mg/kg	0.0002		<0.005	0.0012	0.0005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0004	<0.0002	<0.0002	0.0069	<0.0002	<0.0002	<0.0002	0.0008	<0.0002
Perfluoroundecanoic acid (PFUnDA)	mg/kg	0.0002		0.0053	0.0078	0.0043	<0.0002	0.0003	<0.0002	<0.0002	<0.0002	0.0011	<0.0002	<0.0002	0.0175	<0.0002	<0.0002	0.0007	0.0024	<0.0002
Perfluorooctanoic acid (PFOA)	mg/kg	0.0002	50[#1]	0.025	0.0017	0.0007	<0.0002	0.0004	0.0002	0.0007	0.0004	0.0056	<0.0002	0.0004	0.0182	<0.0002	0.0005	0.0009	0.0048	<0.0002
Perfluoroalkane Sulfonic Acids																				
Perfluorononanesulfonic acid (PFNS)	mg/kg	0.005		<0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Perfluorooctanesulfonic acid (PFOS)	mg/kg	0.0002		0.16	0.0449	0.0451	0.0024	0.0249	0.0124	0.0228	0.0177	0.205	0.0040	0.0313	0.119	0.0010	0.0070	0.0213	0.0480	0.0242
Perfluoropentane sulfonic acid (PFPeS)	mg/kg	0.0002		<0.005	0.0010	<0.0002	<0.0002	0.0002	<0.0002	<0.0002	<0.0002	0.0017	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorohexane sulfonic acid (PFHxS)	mg/kg	0.0002		0.01	0.0102	0.0020	<0.0002	0.0037	<0.0002	0.0023	0.0008	0.0336	0.0018	0.0007	0.0010	<0.0002	0.0004	0.0004	0.0033	<0.0002
Perfluoroheptane sulfonic acid (PFHpS)	mg/kg	0.0002		<0.005	0.0007	0.0004	<0.0002	0.0003	<0.0002	0.0003	<0.0002	0.0029	<0.0002	<0.0002	0.0004	<0.0002	<0.0002	<0.0002	0.0003	<0.0002
Perfluorodecanesulfonic acid (PFDS)	mg/kg	0.0002		0.014	0.0084	0.0077	<0.0002	0.0028	0.0003	0.0010	0.0004	0.0115	0.0003	0.0015	0.0017	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorobutane sulfonic acid (PFBS)	mg/kg	0.0002		<0.005	0.0009	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0012	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoropropanesulfonic acid (PFPrS)	mg/kg	0.005		<0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sum of PFHxS and PFOS	mg/kg	0.0002	20[#1]	0.17	0.0551	0.0471	0.0024	0.0286	0.0124	0.0251	0.0185	0.239	0.0058	0.0320	0.120	0.0010	0.0074	0.0217	0.0513	0.0242
Perfluoroalkyl Sulfonamides																				
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	mg/kg	0.0005		<0.005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-methylperfluorooctane sulfonamidoacetic acid (NMeFOSAA)	mg/kg	0.0002		<0.01	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
N-ethyl-perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	mg/kg	0.0002		<0.01	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	mg/kg	0.0005		<0.005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamide (MeFOSA)	mg/kg	0.0005		<0.005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	mg/kg	0.0005		<0.005	<0.0005	0.0010	<0.0005	<0.0005	<0.0005	<0.0005	0.0006	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Perfluorooctane sulfonamide (FOSA)	mg/kg	0.0002		0.0053	0.0075	0.0026	<0.0002	0.0012	<0.0002	0.0003	<0.0002	0.0047	<0.0002	<0.0002	0.0006	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
PFAS																				
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	mg/kg	0.005		0.195	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sum of US EPA PFAS (PFOS + PFOA)*	mg/kg	0.005		0.185	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sum of PFAS	mg/kg	0.0002		0.2678	0.113	0.0727	0.0026	0.0400	0.0144	0.0282	0.0217	0.312	0.0075	0.0367	0.593	0.0010	0.0089	0.0332	0.0898	0.0246

Comments
#1 Based on 20% of FSANZ TDI, i.e. up to 80% of exposure is assumed to come from other pathways.

Table 4a: On-Site Soil and Sediment Analytical Results
Preliminary Site Investigation
Norfolk Island
Department for Infrastructure, Transport, Regional Development and Communications

	Unit	EQL	Human health - Industrial / Commercial																	
Location				On-site	On-site	On-site	On-site	On-site	On-site	On-site	On-site	On-site	On-site	On-site	On-site	On-site	On-site	On-site	On-site	On-site
Location Code				A_SS47	A_SS48	A_SS49	A_SS50	A_SS50	A_SS50	A_SS51	A_SS52	A_SS52	A_SS52	A_SS53	A_SS54	A_SS55	A_SS56	A_SS57	A_SS58	A_SS59
Field ID				A_SS47	A_SS48	A_SS49	A_SS50	QC114	QC214	A_SS51	A_SS52	QC115	QC215	A_SS53	A_SS54	A_SS55	A_SS56	A_SS57	A_SS58	A_SS59
Date				22/01/2020	22/01/2020	22/01/2020	22/01/2020	22/01/2020	22/01/2020	22/01/2020	22/01/2020	22/01/2020	22/01/2020	22/01/2020	22/01/2020	22/01/2020	22/01/2020	23/01/2020	23/01/2020	23/01/2020
Sample Type				Normal	Normal	Normal	Normal	Field_D	Interlab_D	Normal	Normal	Field_D	Interlab_D	Normal	Normal	Normal	Normal	Normal	Normal	Normal
Catchment				Town/Watermill	Town/Watermill	Town/Watermill	Town/Watermill	Town/Watermill	Town/Watermill	Town/Watermill	Town/Watermill	Town/Watermill	Town/Watermill	Town/Watermill	Town/Watermill	Town/Watermill	Town/Watermill	Mission	Mission	Mission
Media				Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Lab Report No.				ES2002806	ES2002806	ES2002806	ES2002806	ES2002803	699303	ES2002806	ES2002806	ES2002803	699303	ES2002806	ES2002806	ES2002806	ES2002806	ES2002806	ES2002806	ES2002806
Physical Parameters																				
Moisture Content	%	0.1		12.2	10.5	9.1	9.1	9.5	7.2	12.4	5.2	4.5	4.1	7.6	1.6	3.6	4.1	12.5	10.2	10.8
(n:2) Fluorotelomer Sulfonic Acids																				
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	mg/kg	0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.005	<0.0005	<0.0005	<0.0005	<0.005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
6:2 Fluorotelomer Sulfonate (6:2 FtS)	mg/kg	0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.01	<0.0005	<0.0005	<0.0005	<0.01	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	mg/kg	0.0005		0.0007	<0.0005	<0.0005	<0.0005	<0.0005	<0.005	<0.0005	<0.0005	<0.0005	<0.005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	mg/kg	0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.005	<0.0005	<0.0005	<0.0005	<0.005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Perfluoroalkane Carboxylic Acids																				
Perfluorohexanoic acid (PFHxA)	mg/kg	0.0002		0.0009	0.0003	0.0003	0.0004	0.0004	<0.005	0.0006	0.0010	0.0011	<0.005	0.0007	0.0131	0.0007	<0.0005	0.0005	0.0008	0.0008
Perfluorododecanoic acid (PFDoDA)	mg/kg	0.0002		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.005	<0.0002	<0.0005	0.0004	<0.005	0.0003	0.0004	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002
Perfluorononanoic acid (PFNA)	mg/kg	0.0002		0.0048	<0.0002	<0.0002	<0.0002	<0.0002	<0.005	<0.0002	<0.0005	0.0005	<0.005	0.0004	0.0002	0.0007	<0.0005	<0.0002	0.0002	0.0005
Perfluoropentanoic acid (PFPeA)	mg/kg	0.0002		0.0010	0.0003	<0.0002	<0.0002	<0.0002	<0.005	<0.0002	<0.0005	0.0003	<0.005	0.0002	0.0013	<0.0005	<0.0005	0.0003	0.0004	0.0006
Perfluorotetradecanoic acid (PFTeDA)	mg/kg	0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.005	<0.0005	<0.0012	<0.0005	<0.005	<0.0005	<0.0005	<0.0012	<0.0012	<0.0005	<0.0005	<0.0005
Perfluoroheptanoic acid (PFHpA)	mg/kg	0.0002		0.0004	<0.0002	<0.0002	<0.0002	<0.0002	<0.005	<0.0002	<0.0005	0.0004	<0.005	0.0003	0.0016	<0.0005	<0.0005	0.0002	0.0003	0.0006
Perfluorobutanoic acid (PFBA)	mg/kg	0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.005	<0.001	<0.001	0.003	<0.005	0.001	0.001	<0.001	<0.001	0.001	0.002	0.002
Perfluorodecanoic acid (PFDA)	mg/kg	0.0002		0.0003	<0.0002	<0.0002	<0.0002	<0.0002	<0.005	<0.0002	<0.0005	0.0005	<0.005	<0.0002	<0.0002	0.0011	<0.0005	<0.0002	<0.0002	<0.0002
Perfluorotridecanoic acid (PFTrDA)	mg/kg	0.0002		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.005	<0.0002	<0.0005	<0.0002	<0.005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002
Perfluoroundecanoic acid (PFUnDA)	mg/kg	0.0002		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.005	<0.0002	<0.0005	0.0004	<0.005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002
Perfluorooctanoic acid (PFOA)	mg/kg	0.0002	50[#1]	0.0012	0.0002	<0.0002	0.0004	0.0004	<0.005	0.0004	<0.0005	0.0004	<0.005	0.0008	0.0037	<0.0005	<0.0005	0.0004	0.0004	0.0008
Perfluoroalkane Sulfonic Acids																				
Perfluorononanesulfonic acid (PFNS)	mg/kg	0.005		-	-	-	-	-	<0.005	-	-	-	<0.005	-	-	-	-	-	-	-
Perfluorooctanesulfonic acid (PFOS)	mg/kg	0.0002		0.0086	0.0073	0.0042	0.0222	0.0102	0.018	0.0386	0.0492	0.0515	0.037	0.0285	0.0194	0.0853	0.0231	0.0146	0.0214	0.0250
Perfluoropentane sulfonic acid (PFPeS)	mg/kg	0.0002		<0.0002	<0.0002	<0.0002	0.0002	0.0002	<0.005	0.0003	<0.0005	0.0005	<0.005	<0.0002	0.0076	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002
Perfluorohexane sulfonic acid (PFHxS)	mg/kg	0.0002		0.0010	0.0008	<0.0002	0.0028	0.0038	<0.005	0.0039	0.0029	0.0056	<0.005	0.0010	0.0746	0.0042	0.0034	0.0004	0.0008	0.0007
Perfluoroheptane sulfonic acid (PFHpS)	mg/kg	0.0002		0.0004	<0.0002	<0.0002	0.0005	0.0003	<0.005	0.0006	<0.0005	0.0005	<0.005	<0.0002	0.0050	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002
Perfluorodecanesulfonic acid (PFDS)	mg/kg	0.0002		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.005	<0.0002	0.0078	0.0092	<0.005	0.0096	0.0003	0.0060	<0.0005	<0.0002	0.0004	0.0007
Perfluorobutane sulfonic acid (PFBS)	mg/kg	0.0002		<0.0002	<0.0002	<0.0002	<0.0002	0.0003	<0.005	<0.0002	<0.0005	0.0004	<0.005	<0.0002	0.0018	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002
Perfluoropropanesulfonic acid (PFPrS)	mg/kg	0.005		-	-	-	-	-	<0.005	-	-	-	<0.005	-	-	-	-	-	-	-
Sum of PFHxS and PFOS	mg/kg	0.0002	20[#1]	0.0096	0.0081	0.0042	0.0250	0.0140	0.018	0.0425	0.0521	0.0571	0.037	0.0295	0.0940	0.0895	0.0265	0.0150	0.0222	0.0257
Perfluoroalkyl Sulfonamides																				
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	mg/kg	0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.005	<0.0005	<0.0012	<0.0005	<0.005	<0.0005	<0.0005	<0.0012	<0.0012	<0.0005	<0.0005	<0.0005
N-methylperfluorooctane sulfonamidoacetic acid (NMeFOSAA)	mg/kg	0.0002		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.01	<0.0002	<0.0005	<0.0002	<0.01	<0.0002	<0.0002	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002
N-ethyl-perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	mg/kg	0.0002		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.01	<0.0002	<0.0005	<0.0002	<0.01	<0.0002	<0.0002	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	mg/kg	0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.005	<0.0005	<0.0012	<0.0005	<0.005	<0.0005	<0.0005	<0.0012	<0.0012	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamide (MeFOSA)	mg/kg	0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.005	<0.0005	<0.0012	<0.0005	<0.005	<0.0005	<0.0005	<0.0012	<0.0012	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	mg/kg	0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.005	<0.0005	<0.0012	<0.0005	<0.005	<0.0005	<0.0005	<0.0012	<0.0012	<0.0005	<0.0005	<0.0005
Perfluorooctane sulfonamide (FOSA)	mg/kg	0.0002		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.005	<0.0002	<0.0005	0.0004	<0.005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002
PFAS																				
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	mg/kg	0.005		-	-	-	-	-	0.018	-	-	-	0.037	-	-	-	-	-	-	-
Sum of US EPA PFAS (PFOS + PFOA)*	mg/kg	0.005		-	-	-	-	-	0.018	-	-	-	0.037	-	-	-	-	-	-	-
Sum of PFAS	mg/kg	0.0002		0.0193	0.0089	0.0045	0.0265	0.0156	<0.05	0.0444	0.0609	0.0751	<0.05	0.0428	0.130	0.0980	0.0265	0.0174	0.0267	0.0317

Comments
#1 Based on 20% of FSANZ TDI, i.e. up to 80% of exposure is assumed to come from other pathways.

Table 4a: On-Site Soil and Sediment Analytical Results
Preliminary Site Investigation
Norfolk Island
Department for Infrastructure, Transport, Regional Development and Communications

			Location	On-site	On-site	On-site	On-site	On-site	On-site
			Location Code	A_SS60	A_SS60	A_SS60	A_SS61	A_SS62	A_SS63
			Field ID	A_SS60	QC116	QC216	A_SS61	A_SS62	A_SS63
			Date	23/01/2020	22/01/2020	23/01/2020	23/01/2020	23/01/2020	23/01/2020
			Sample Type	Normal	Field_D	Interlab_D	Normal	Normal	Normal
			Catchment	Mission	Mission	Mission	Mission	Mission	Mission
			Media	Soil	Soil	Soil	Soil	Soil	Soil
			Lab Report No.	ES2002806	ES2002803	699303	ES2002806	ES2002806	ES2002806
	Unit	EQL	Human health - Industrial / Commercial						
Physical Parameters									
Moisture Content	%	0.1		15.2	13.2	14	10.1	12.3	14.6
(n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	mg/kg	0.0005		<0.0005	<0.0005	<0.005	<0.0005	<0.0005	<0.0005
6:2 Fluorotelomer Sulfonate (6:2 FtS)	mg/kg	0.0005		<0.0005	<0.0005	<0.01	<0.0005	<0.0005	<0.0005
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	mg/kg	0.0005		<0.0005	<0.0005	<0.005	<0.0005	<0.0005	<0.0005
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	mg/kg	0.0005		<0.0005	<0.0005	<0.005	<0.0005	<0.0005	<0.0005
Perfluoroalkane Carboxylic Acids									
Perfluorohexanoic acid (PFHxA)	mg/kg	0.0002		0.0007	0.0007	<0.005	0.0016	0.0022	0.0014
Perfluorododecanoic acid (PFDoDA)	mg/kg	0.0002		<0.0002	<0.0002	<0.005	<0.0002	<0.0002	<0.0002
Perfluorononanoic acid (PFNA)	mg/kg	0.0002		0.0002	0.0004	<0.005	0.0005	0.0004	0.0004
Perfluoropentanoic acid (PFPeA)	mg/kg	0.0002		0.0009	0.0006	<0.005	0.0013	0.0015	0.0030
Perfluorotetradecanoic acid (PFTeDA)	mg/kg	0.0005		<0.0005	<0.0005	<0.005	<0.0005	<0.0005	<0.0005
Perfluoroheptanoic acid (PFHpA)	mg/kg	0.0002		0.0004	0.0004	<0.005	0.0010	0.0008	0.0008
Perfluorobutanoic acid (PFBA)	mg/kg	0.001		0.002	0.001	<0.005	0.002	0.002	0.003
Perfluorodecanoic acid (PFDA)	mg/kg	0.0002		<0.0002	<0.0002	<0.005	<0.0002	<0.0002	<0.0002
Perfluorotridecanoic acid (PFTrDA)	mg/kg	0.0002		<0.0002	<0.0002	<0.005	<0.0002	<0.0002	<0.0002
Perfluoroundecanoic acid (PFUnDA)	mg/kg	0.0002		<0.0002	<0.0002	<0.005	<0.0002	<0.0002	<0.0002
Perfluorooctanoic acid (PFOA)	mg/kg	0.0002	50#1	0.0005	0.0006	<0.005	0.0017	0.0014	0.0010
Perfluoroalkane Sulfonic Acids									
Perfluorononanesulfonic acid (PFNS)	mg/kg	0.005		-	-	<0.005	-	-	-
Perfluorooctanesulfonic acid (PFOS)	mg/kg	0.0002		0.0274	0.0299	0.031	0.0335	0.0373	0.0301
Perfluoropentane sulfonic acid (PFPeS)	mg/kg	0.0002		<0.0002	<0.0002	<0.005	<0.0002	<0.0002	<0.0002
Perfluorohexane sulfonic acid (PFHxS)	mg/kg	0.0002		0.0008	0.0011	<0.005	0.0010	0.0010	0.0015
Perfluoroheptane sulfonic acid (PFHpS)	mg/kg	0.0002		<0.0002	<0.0002	<0.005	<0.0002	<0.0002	<0.0002
Perfluorodecanesulfonic acid (PFDS)	mg/kg	0.0002		0.0004	0.0007	<0.005	0.0006	0.0003	0.0004
Perfluorobutane sulfonic acid (PFBS)	mg/kg	0.0002		<0.0002	<0.0002	<0.005	<0.0002	<0.0002	<0.0002
Perfluoropropanesulfonic acid (PFPrS)	mg/kg	0.005		-	-	<0.005	-	-	-
Sum of PFHxS and PFOS	mg/kg	0.0002	20#1	0.0282	0.0310	0.031	0.0345	0.0383	0.0316
Perfluoroalkyl Sulfonamides									
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	mg/kg	0.0005		<0.0005	<0.0005	<0.005	<0.0005	<0.0005	<0.0005
N-methylperfluorooctane sulfonamidoacetic acid (NMeFOSAA)	mg/kg	0.0002		<0.0002	<0.0002	<0.01	<0.0002	<0.0002	<0.0002
N-ethyl-perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	mg/kg	0.0002		<0.0002	<0.0002	<0.01	<0.0002	<0.0002	<0.0002
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	mg/kg	0.0005		<0.0005	<0.0005	<0.005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamide (MeFOSA)	mg/kg	0.0005		<0.0005	<0.0005	<0.005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	mg/kg	0.0005		<0.0005	<0.0005	<0.005	<0.0005	<0.0005	<0.0005
Perfluorooctane sulfonamide (FOSA)	mg/kg	0.0002		<0.0002	<0.0002	<0.005	<0.0002	<0.0002	<0.0002
PFAS									
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	mg/kg	0.005		-	-	0.031	-	-	-
Sum of US EPA PFAS (PFOS + PFOA)*	mg/kg	0.005		-	-	0.031	-	-	-
Sum of PFAS	mg/kg	0.0002		0.0333	0.0354	<0.05	0.0432	0.0469	0.0416

Comments
#1 Based on 20% of FSANZ TDI, i.e. up to 80% of exposure is assumed to come from other pathways.

			Location	Off-site	Off-site	Off-site	Off-site	Off-site	Off-site	Off-site	Off-site	Off-site	Off-site	Off-site	Off-site	Off-site	Off-site	Off-site	Off-site	Off-site
			Location Code	BALL_SS01	BALL_SS02	CHAP_SS01	CHAP_SS01	CHAP_SS01	CHAP_SS02	CHAP_SS03	CHAP_SS04	CHAP_SS05	ID008_SS01	ID008_SS02	ID008_SS03	AD_SD01	AD_SD02	AD_SD03	AD_SD04	AD_SD04
			Field ID	BALL_SS01	BALL_SS02	CHAP_SS01	QC105	QC205	CHAP_SS02	CHAP_SS03	CHAP_SS04	CHAP_SS05	ID008_SS01	ID008_SS02	ID008_SS03	AD_SD01	AD_SD02	AD_SD03	AD_SD04	QC107
			Date	21/01/2020	21/01/2020	20/01/2020	20/01/2020	20/01/2020	20/01/2020	20/01/2020	20/01/2020	20/01/2020	20/01/2020	20/01/2020	20/01/2020	20/01/2020	20/01/2020	20/01/2020	20/01/2020	20/01/2020
			Sample Type	Normal	Normal	Normal	Field_D	Interlab_D	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Field_D
			Catchment	Stockyard	Stockyard	Mission	Mission	Mission	Mission	Mission	Mission	Mission	Town/Watermil	Town/Watermil	Town/Watermil	Rocky Point	Rocky Point	Headstone	Headstone	Headstone
			Media	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Sediment	Sediment	Sediment	Sediment	Sediment
			Lab Report No.	ES2002808	ES2002808	ES2002810	ES2002803	699303	ES2002810	ES2002810	ES2002810	ES2002810	ES2002824	ES2002824	ES2002824	ES2002812	ES2002812	ES2002812	ES2002812	ES2002803
	Unit	EQL	Human health - Residential with garden/accessible soil																	
Physical Parameters																				
Moisture Content	%	0.1		5.6	8.4	11.4	12.0	11	21.2	18.8	13.6	12.8	8.6	11.0	4.8	5.1	7.2	12.2	6.1	10.0
(n:2) Fluorotelomer Sulfonic Acids																				
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	mg/kg	0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
6:2 Fluorotelomer Sulfonate (6:2 FtS)	mg/kg	0.0005		0.0007	<0.0005	<0.0005	<0.0005	<0.01	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	mg/kg	0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	mg/kg	0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Perfluoroalkane Carboxylic Acids																				
Perfluorohexanoic acid (PFHxA)	mg/kg	0.0002		0.0007	0.0003	0.0002	0.0002	<0.005	0.0005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorododecanoic acid (PFDoDA)	mg/kg	0.0002		<0.0002	<0.0002	<0.0002	<0.0002	<0.005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorononanoic acid (PFNA)	mg/kg	0.0002		0.0002	<0.0002	<0.0002	<0.0002	<0.005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoropentanoic acid (PFPeA)	mg/kg	0.0002		0.0014	0.0004	<0.0002	<0.0002	<0.005	0.0003	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorotetradecanoic acid (PFTeDA)	mg/kg	0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Perfluoroheptanoic acid (PFHpA)	mg/kg	0.0002		0.0002	<0.0002	<0.0002	<0.0002	<0.005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorobutanoic acid (PFBA)	mg/kg	0.001		0.002	<0.001	0.001	<0.001	<0.005	0.002	0.002	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Perfluorodecanoic acid (PFDA)	mg/kg	0.0002		<0.0002	<0.0002	<0.0002	<0.0002	<0.005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorotridecanoic acid (PFTrDA)	mg/kg	0.0002		<0.0002	<0.0002	<0.0002	<0.0002	<0.005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroundecanoic acid (PFUnDA)	mg/kg	0.0002		<0.0002	<0.0002	<0.0002	<0.0002	<0.005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorooctanoic acid (PFOA)	mg/kg	0.0002	0.3[#1]	<0.0002	<0.0002	<0.0002	<0.0002	<0.005	<0.0002	<0.0002	<0.0002	<0.0002	0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroalkane Sulfonic Acids																				
Perfluorononanesulfonic acid (PFNS)	mg/kg	0.005		-	-	-	-	<0.005	-	-	-	-	-	-	-	-	-	-	-	-
Perfluorooctanesulfonic acid (PFOS)	mg/kg	0.0002		0.0024	0.0021	0.0021	0.0020	<0.005	0.0039	0.0021	0.0021	0.0014	0.0015	<0.0002	0.0003	0.0004	0.0010	0.0006	0.0010	0.0008
Perfluoropentane sulfonic acid (PFPeS)	mg/kg	0.0002		<0.0002	<0.0002	<0.0002	<0.0002	<0.005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorohexane sulfonic acid (PFHxS)	mg/kg	0.0002		<0.0002	<0.0002	0.0003	0.0003	<0.005	0.0007	0.0005	0.0004	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroheptane sulfonic acid (PFHpS)	mg/kg	0.0002		<0.0002	<0.0002	<0.0002	<0.0002	<0.005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorodecanesulfonic acid (PFDS)	mg/kg	0.0002		<0.0002	<0.0002	<0.0002	<0.0002	<0.005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorobutane sulfonic acid (PFBS)	mg/kg	0.0002		<0.0002	<0.0002	<0.0002	<0.0002	<0.005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoropropanesulfonic acid (PFPrS)	mg/kg	0.005		-	-	-	-	<0.005	-	-	-	-	-	-	-	-	-	-	-	-
Sum of PFHxS and PFOS	mg/kg	0.0002	0.01[#1]	0.0024	0.0021	0.0024	0.0023	<0.005	0.0046	0.0026	0.0025	0.0014	0.0015	<0.0002	0.0003	0.0004	0.0010	0.0006	0.0010	0.0008
Perfluoroalkyl Sulfonamides																				
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	mg/kg	0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-methylperfluorooctane sulfonamidoacetic acid (NMeFOSAA)	mg/kg	0.0002		<0.0002	<0.0002	<0.0002	<0.0002	<0.01	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
N-ethyl-perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	mg/kg	0.0002		<0.0002	<0.0002	<0.0002	<0.0002	<0.01	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	mg/kg	0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamide (MeFOSA)	mg/kg	0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	mg/kg	0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Perfluorooctane sulfonamide (FOSA)	mg/kg	0.0002		<0.0002	<0.0002	<0.0002	<0.0002	<0.005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
PFAS																				
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	mg/kg	0.005		-	-	-	-	<0.005	-	-	-	-	-	-	-	-	-	-	-	-
Sum of US EPA PFAS (PFOS + PFOA)*	mg/kg	0.005		-	-	-	-	<0.005	-	-	-	-	-	-	-	-	-	-	-	-
Sum of PFAS	mg/kg	0.0002		0.0076	0.0028	0.0036	0.0025	<0.05	0.0074	0.0046	0.0035	0.0014	0.0017	<0.0002	0.0003	0.0004	0.0010	0.0006	0.0010	0.0008

Comments
#1 Based on 20% of FSANZ TDI, i.e. up to 80% of exposure is assumed to come from other pathways. Does not include home-grown poultry /egg.

Table 4b: Off-Site Soil and Sediment Analytical Results
Preliminary Site Investigation
Norfolk Island
Department for Infrastructure, Transport, Regional Development and Communications

	Unit	EQL	Location	Off-site	Off-site	Off-site	Off-site	Off-site	Off-site	Off-site	Off-site	Off-site	Off-site	Off-site	Off-site	Off-site	Off-site	Off-site	Off-site	Off-site
			Location Code	AD_SD04	AD_SD05	AD_SD06	AD_SD07	AD_SD08	AD_SD09	AD_SD10	ID010_SD01	ID011_SD01	ID011_SD02	ID012_SD01	ID012_SD01	ID012_SD01	ID012_SD02	MC_SD01	MC_SD02	MC_SD03
			Field ID	QC207	AD_SD05	AD_SD06	AD_SD07	AD_SD08	AD_SD09	AD_SD10	ID010_SD01	ID011_SD01	ID011_SD02	ID012_SD01	QC109	QC209	ID012_SD02	MC_SD01	MC_SD02	MC_SD03
			Date	20/01/2020	20/01/2020	20/01/2020	20/01/2020	20/01/2020	20/01/2020	20/01/2020	20/01/2020	21/01/2020	21/01/2020	21/01/2020	21/01/2020	21/01/2020	21/01/2020	20/01/2020	20/01/2020	20/01/2020
			Sample Type	Interlab_D	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Field_D	Interlab_D	Normal	Normal	Normal	Normal
			Catchment	Headstone	Town/Watermill	Town/Watermill	Town/Watermill	Town/Watermill	Town/Watermill	Town/Watermill	Rocky Point	Headstone	Headstone	Town/Watermill	Town/Watermill	Town/Watermill	Town/Watermill	Mission	Mission	Mission
			Media	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment
			Lab Report No.	699303	ES2002812	ES2002812	ES2002812	ES2002812	ES2002812	ES2002812	ES2002827	ES2002829	ES2002829	ES2002830	ES2002803	699303	ES2002830	ES2002810	ES2002810	ES2002810
	Unit	EQL	Human health - Residential with garden/accessible soil																	
Physical Parameters																				
Moisture Content	%	0.1		9.4	9.7	9.9	10.1	9.9	18.0	13.0	25.5	15.5	4.0	84.1	84.9	84	81.8	55.5	47.1	50.7
(n:2) Fluorotelomer Sulfonic Acids																				
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	mg/kg	0.0005		<0.005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.005	<0.0005	<0.0005	<0.0005	<0.0005
6:2 Fluorotelomer Sulfonate (6:2 FtS)	mg/kg	0.0005		<0.01	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.01	<0.0005	<0.0005	<0.0005	<0.0005
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	mg/kg	0.0005		<0.005	<0.0005	<0.0005	<0.0005	<0.0005	0.0077	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.005	<0.0005	<0.0005	<0.0005	<0.0005
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	mg/kg	0.0005		<0.005	<0.0005	<0.0005	<0.0005	<0.0005	0.0016	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.005	<0.0005	<0.0005	<0.0005	<0.0005
Perfluoroalkane Carboxylic Acids																				
Perfluorohexanoic acid (PFHxA)	mg/kg	0.0002		<0.005	<0.0002	<0.0002	<0.0002	<0.0002	0.0025	0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.005	<0.0002	0.0026	0.0042	0.0028
Perfluorododecanoic acid (PFDoDA)	mg/kg	0.0002		<0.005	<0.0002	<0.0002	<0.0002	<0.0002	0.0055	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.005	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorononanoic acid (PFNA)	mg/kg	0.0002		<0.005	<0.0002	<0.0002	<0.0002	<0.0002	0.0054	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.005	<0.0002	0.0003	0.0004	0.0005
Perfluoropentanoic acid (PFPeA)	mg/kg	0.0002		<0.005	<0.0002	<0.0002	<0.0002	<0.0002	0.0016	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0003	0.0060	<0.0002	0.0007	0.0011	0.0008
Perfluorotetradecanoic acid (PFTeDA)	mg/kg	0.0005		<0.005	<0.0005	<0.0005	<0.0005	<0.0005	0.0006	<0.0005	<0.0005	<0.0005	<0.0005	<0.0006	<0.0006	<0.005	<0.0006	<0.0005	<0.0005	<0.0005
Perfluoroheptanoic acid (PFHpA)	mg/kg	0.0002		<0.005	<0.0002	<0.0002	<0.0002	<0.0002	0.0027	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0003	<0.005	<0.0002	0.0006	0.0008	0.0006
Perfluorobutanoic acid (PFBA)	mg/kg	0.001		<0.005	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	<0.005	0.001	0.002	0.002	0.002
Perfluorodecanoic acid (PFDA)	mg/kg	0.0002		<0.005	<0.0002	<0.0002	<0.0002	<0.0002	0.0055	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.005	<0.0002	0.0003	0.0002	0.0004
Perfluorotridecanoic acid (PFTrDA)	mg/kg	0.0002		<0.005	<0.0002	<0.0002	<0.0002	<0.0002	0.0010	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.005	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroundecanoic acid (PFUnDA)	mg/kg	0.0002		<0.005	<0.0002	<0.0002	<0.0002	<0.0002	0.0047	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.005	<0.0002	0.0003	<0.0002	0.0003
Perfluorooctanoic acid (PFOA)	mg/kg	0.0002	0.3[#1]	<0.005	<0.0002	<0.0002	<0.0002	<0.0002	0.0058	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.005	<0.0002	0.0018	0.0028	0.0025
Perfluoroalkane Sulfonic Acids																				
Perfluorononanesulfonic acid (PFNS)	mg/kg	0.005		<0.005	-	-	-	-	-	-	-	-	-	-	-	<0.005	-	-	-	-
Perfluorooctanesulfonic acid (PFOS)	mg/kg	0.0002		<0.005	0.0020	<0.0002	0.0032	0.0033	0.134	0.0104	<0.0002	0.0008	0.0051	0.0167	0.0195	0.0083	0.0090	0.283	0.316	0.418
Perfluoropentane sulfonic acid (PFPeS)	mg/kg	0.0002		<0.005	<0.0002	<0.0002	<0.0002	<0.0002	0.0003	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0024	<0.005	<0.0002	0.0028	0.0032	0.0041
Perfluorohexane sulfonic acid (PFHxS)	mg/kg	0.0002		<0.005	<0.0002	0.0003	0.0002	0.0002	0.0070	0.0025	<0.0002	0.0003	0.0005	0.0041	0.0060	<0.005	0.0020	0.0466	0.0502	0.0609
Perfluoroheptane sulfonic acid (PFHpS)	mg/kg	0.0002		<0.005	<0.0002	<0.0002	<0.0002	<0.0002	0.0010	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0016	<0.005	<0.0002	0.0050	0.0050	0.0068
Perfluorodecanesulfonic acid (PFDS)	mg/kg	0.0002		<0.005	<0.0002	<0.0002	<0.0002	0.0014	0.0105	0.0004	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.005	<0.0002	0.0021	0.0008	0.0019
Perfluorobutane sulfonic acid (PFBS)	mg/kg	0.0002		<0.005	<0.0002	<0.0002	<0.0002	<0.0002	0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0003	<0.005	<0.0002	0.0022	0.0018	0.0032
Perfluoropropanesulfonic acid (PFPrS)	mg/kg	0.005		<0.005	-	-	-	-	-	-	-	-	-	-	-	<0.005	-	-	-	-
Sum of PFHxS and PFOS	mg/kg	0.0002	0.01[#1]	<0.005	0.0020	0.0003	0.0034	0.0035	0.141	0.0129	<0.0002	0.0011	0.0056	0.0208	0.0255	0.0083	0.0110	0.330	0.366	0.479
Perfluoroalkyl Sulfonamides																				
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	mg/kg	0.0005		<0.005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0006	<0.0006	0.0092	<0.0006	<0.0005	<0.0005	<0.0005
N-methylperfluorooctane sulfonamidoacetic acid (NMeFOSAA)	mg/kg	0.0002		<0.01	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.01	<0.0002	<0.0002	<0.0002	<0.0002
N-ethyl-perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	mg/kg	0.0002		<0.01	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.01	<0.0002	<0.0002	<0.0002	<0.0002
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	mg/kg	0.0005		<0.005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0006	<0.0006	<0.005	<0.0006	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamide (MeFOSA)	mg/kg	0.0005		<0.005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0006	<0.0006	<0.005	<0.0006	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	mg/kg	0.0005		<0.005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0006	<0.0006	0.0057	<0.0006	<0.0005	<0.0005	<0.0005
Perfluorooctane sulfonamide (FOSA)	mg/kg	0.0002		<0.005	<0.0002	<0.0002	<0.0002	<0.0002	0.0006	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.005	<0.0002	0.0003	0.0005	0.0004
PFAS																				
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	mg/kg	0.005		<0.005	-	-	-	-	-	-	-	-	-	-	-	0.0083	-	-	-	-
Sum of US EPA PFAS (PFOS + PFOA)*	mg/kg	0.005		<0.005	-	-	-	-	-	-	-	-	-	-	-	0.0083	-	-	-	-
Sum of PFAS	mg/kg	0.0002		<0.05	0.0020	0.0003	0.0034	0.0049	0.199	0.0135	<0.0002	0.0011	0.0056	0.0208	0.0324	<0.05	0.0120	0.351	0.389	0.505

Comments

#1 Based on 20% of FSANZ TDI, i.e. up to 80% of exposure is assumed to come from other pathways.

Table 4b: Off-Site Soil and Sediment Analytical Results

Preliminary Site Investigation

Norfolk Island

Department for Infrastructure, Transport, Regional Development and Communications

senversa

			Location	Off-site	Off-site	Off-site	Off-site	Off-site	Off-site	Off-site	Off-site	Off-site
			Location Code	MC_SD04	MC_SD05	MC_SD06	MC_SD07	MC_SD08	MC_SD08	MC_SD08	MC_SD09	MC_SD10
			Field ID	MC_SD04	MC_SD05	MC_SD06	MC_SD07	MC_SD08	QC106	QC206	MC_SD09	MC_SD10
			Date	20/01/2020	20/01/2020	20/01/2020	20/01/2020	20/01/2020	20/01/2020	20/01/2020	20/01/2020	20/01/2020
			Sample Type	Normal	Normal	Normal	Normal	Normal	Field_D	Interlab_D	Normal	Normal
			Catchment	Mission	Mission	Mission	Mission	Mission	Mission	Mission	Mission	Mission
			Media	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment
			Lab Report No.	ES2002810	ES2002810	ES2002810	ES2002810	ES2002810	ES2002803	699303	ES2002810	ES2002810
	Unit	EQL	Human health - Residential with garden/accessible soil									
Physical Parameters												
Moisture Content	%	0.1		73.4	52.4	32.1	37.5	18.7	18.7	19	17.8	21.0
(n:2) Fluorotelomer Sulfonic Acids												
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	mg/kg	0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.005	<0.0005	<0.0005
6:2 Fluorotelomer Sulfonate (6:2 FtS)	mg/kg	0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.01	<0.0005	<0.0005
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	mg/kg	0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.005	<0.0005	<0.0005
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	mg/kg	0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.005	<0.0005	<0.0005
Perfluoroalkane Carboxylic Acids												
Perfluorohexanoic acid (PFHxA)	mg/kg	0.0002		0.0025	0.0032	0.0010	0.0023	0.0018	0.0016	<0.005	0.0021	0.0015
Perfluorododecanoic acid (PFDoDA)	mg/kg	0.0002		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.005	<0.0002	<0.0002
Perfluorononanoic acid (PFNA)	mg/kg	0.0002		0.0002	0.0005	0.0002	0.0003	0.0005	0.0003	<0.005	0.0002	0.0003
Perfluoropentanoic acid (PFPeA)	mg/kg	0.0002		0.0006	0.0008	0.0002	0.0004	0.0004	0.0004	<0.005	0.0005	0.0003
Perfluorotetradecanoic acid (PFTeDA)	mg/kg	0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.005	<0.0005	<0.0005
Perfluoroheptanoic acid (PFHpA)	mg/kg	0.0002		0.0005	0.0007	0.0002	0.0005	0.0004	0.0004	<0.005	0.0005	0.0003
Perfluorobutanoic acid (PFBA)	mg/kg	0.001		0.003	0.002	0.002	0.002	0.001	<0.001	<0.005	<0.001	0.001
Perfluorodecanoic acid (PFDA)	mg/kg	0.0002		<0.0002	0.0003	<0.0002	<0.0002	0.0003	0.0002	<0.005	<0.0002	0.0002
Perfluorotridecanoic acid (PFTrDA)	mg/kg	0.0002		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.005	<0.0002	<0.0002
Perfluoroundecanoic acid (PFUnDA)	mg/kg	0.0002		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.005	<0.0002	<0.0002
Perfluorooctanoic acid (PFOA)	mg/kg	0.0002	0.3[#1]	0.0021	0.0030	0.0007	0.0014	0.0011	0.0009	<0.005	0.0012	0.0010
Perfluoroalkane Sulfonic Acids												
Perfluorononanesulfonic acid (PFNS)	mg/kg	0.005		-	-	-	-	-	-	<0.005	-	-
Perfluorooctanesulfonic acid (PFOS)	mg/kg	0.0002		0.456	0.386	0.152	0.182	0.172	0.174	0.13	0.148	0.141
Perfluoropentane sulfonic acid (PFPeS)	mg/kg	0.0002		0.0040	0.0043	0.0012	0.0035	0.0015	0.0011	<0.005	0.0011	0.0025
Perfluorohexane sulfonic acid (PFHxS)	mg/kg	0.0002		0.0652	0.0692	0.0205	0.0462	0.0219	0.0202	0.014	0.0187	0.0310
Perfluoroheptane sulfonic acid (PFHpS)	mg/kg	0.0002		0.0083	0.0071	0.0022	0.0038	0.0024	0.0016	<0.005	0.0022	0.0026
Perfluorodecanesulfonic acid (PFDS)	mg/kg	0.0002		0.0015	0.0017	0.0012	0.0010	0.0009	0.0007	<0.005	0.0007	0.0006
Perfluorobutane sulfonic acid (PFBS)	mg/kg	0.0002		0.0031	0.0031	0.0010	0.0023	0.0016	0.0013	<0.005	0.0008	0.0021
Perfluoropropanesulfonic acid (PFPrS)	mg/kg	0.005		-	-	-	-	-	-	<0.005	-	-
Sum of PFHxS and PFOS	mg/kg	0.0002	0.01[#1]	0.521	0.455	0.172	0.228	0.194	0.194	0.144	0.167	0.172
Perfluoroalkyl Sulfonamides												
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	mg/kg	0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.005	<0.0005	<0.0005
N-methylperfluorooctane sulfonamidoacetic acid (NMeFOSAA)	mg/kg	0.0002		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.01	<0.0002	<0.0002
N-ethyl-perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	mg/kg	0.0002		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.01	<0.0002	<0.0002
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	mg/kg	0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamide (MeFOSA)	mg/kg	0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	mg/kg	0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.005	<0.0005	<0.0005
Perfluorooctane sulfonamide (FOSA)	mg/kg	0.0002		0.0009	0.0003	<0.0002	<0.0002	0.0002	<0.0002	<0.005	<0.0002	<0.0002
PFAS												
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	mg/kg	0.005		-	-	-	-	-	-	0.144	-	-
Sum of US EPA PFAS (PFOS + PFOA)*	mg/kg	0.005		-	-	-	-	-	-	0.13	-	-
Sum of PFAS	mg/kg	0.0002		0.548	0.482	0.182	0.246	0.206	0.203	0.144	0.176	0.184

Comments

#1 Based on 20% of FSANZ TDI, i.e. up to 80% of exposure is assumed to come from other pathways.

senversa

Location Code	Unit	EQL	Human health - Drinking water (Leachable)	A_SD01	A_SS02	A_SS06	A_SS11	A_SS13	A_SS19	A_SS20	A_SS22	A_SS23	A_SS24	A_SS28	A_SS30	A_SS30	A_SS30	A_SS34	A_SS38	A_SS45	A_SS54	A_SS58
Field ID				A_SD01	A_SS02	A_SS06	A_SS11	A_SS13	A_SS19	A_SS20	A_SS22	A_SS23	A_SS24	A_SS28	A_SS30	QC112	QC212	A_SS34	A_SS38	A_SS45	A_SS54	A_SS58
Date				22/01/2020	21/01/2020	21/01/2020	22/01/2020	22/01/2020	22/01/2020	22/01/2020	22/01/2020	22/01/2020	22/01/2020	22/01/2020	22/01/2020	22/01/2020	22/01/2020	22/01/2020	22/01/2020	22/01/2020	22/01/2020	23/01/2020
Sample Type				Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Field_D	Interlab_D	Normal	Normal	Normal	Normal	Normal
Catchment				Mission	Mission	Mission	Mission	Mission	Mission	Mission	Mission	Mission	Mission	Mission	Mission	Mission	Mission	Mission	Mission	Town/Watermil	Town/Watermil	Mission
Media				Sediment	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Lab Report No.				ES2005692	ES2005692	ES2005692	ES2005692	ES2005692	ES2005692	ES2005692	ES2005692	ES2005692	ES2005692	ES2005692	ES2005692	ES2005692	702872	ES2005692	ES2005692	ES2005692	ES2005692	ES2005692
Physical Parameters																						
Leachate Fluid	-			-	-	-	-	-	-	-	-	-	-	-	-	-	1.0	-	-	-	-	-
pH (Initial)	pH Units	0.1		-	-	-	-	-	-	-	-	-	-	-	-	-	5.0	-	-	-	-	-
pH of Leaching Fluid	pH Units	0.1		-	-	-	-	-	-	-	-	-	-	-	-	-	5.0	-	-	-	-	-
pH (Final)	pH Units	0.1		8.4	8.0	7.2	6.8	7.8	7.5	7.8	8.0	7.8	7.4	7.3	7.2	7.5	5.0	7.1	7.2	7.0	8.0	7.9
(n:2) Fluorotelomer Sulfonic Acids																						
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	µg/L	0.01		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer Sulfonate (6:2 FtS)	µg/L	0.05		<0.05	<0.05	<0.05	<0.05	<0.05	0.20	<0.05	<0.05	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.28	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	µg/L	0.01		<0.05	<0.05	<0.05	<0.05	<0.05	3.02	0.08	0.69	0.15	1.30	<0.05	0.22	0.22	0.12	<0.05	<0.05	0.14	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	µg/L	0.01		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05
Perfluoroalkane Carboxylic Acids																						
Perfluorohexanoic acid (PFHxA)	µg/L	0.01		<0.02	<0.02	<0.02	0.06	0.09	0.45	0.08	0.11	0.47	0.63	0.14	0.17	0.17	0.17	0.04	0.15	0.04	0.62	0.02
Perfluorododecanoic acid (PFDoDA)	µg/L	0.01		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.02	0.11	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorononanoic acid (PFNA)	µg/L	0.01		<0.02	<0.02	<0.02	<0.02	0.02	0.30	0.05	0.08	0.32	0.38	<0.02	0.69	0.70	0.35	<0.02	0.10	0.09	<0.02	<0.02
Perfluoropentanoic acid (PFPeA)	µg/L	0.01		<0.02	0.02	<0.02	0.03	0.20	0.18	0.09	0.12	0.29	0.28	0.16	0.24	0.27	0.24	<0.02	0.27	0.05	0.07	<0.02
Perfluorotetradecanoic acid (PFTeDA)	µg/L	0.01		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05
Perfluoroheptanoic acid (PFHpA)	µg/L	0.01		<0.02	<0.02	<0.02	<0.02	0.03	0.12	0.03	0.04	0.13	0.22	<0.02	0.12	0.13	0.13	<0.02	0.07	0.04	0.06	<0.02
Perfluorobutanoic acid (PFBA)	µg/L	0.05		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	0.21	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluorodecanoic acid (PFDA)	µg/L	0.01		<0.02	<0.02	<0.02	<0.02	<0.02	0.48	0.03	0.10	0.22	0.29	<0.02	0.12	0.17	0.06	<0.02	0.02	0.03	<0.02	<0.02
Perfluorotridecanoic acid (PFTrDA)	µg/L	0.01		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	µg/L	0.01		<0.02	<0.02	<0.02	<0.02	<0.02	0.06	<0.02	0.09	0.09	0.30	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorooctanoic acid (PFOA)	µg/L	0.01	**0.56**[#1]	0.01	0.01	0.02	0.02	0.04	0.41	0.08	0.13	0.43	**0.68**	0.06	**0.88**	**0.99**	**0.65**	0.03	0.16	0.17	0.17	0.02
Perfluoroalkane Sulfonic Acids																						
Perfluorononanesulfonic acid (PFNS)	µg/L	0.01		-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-
Perfluorooctanesulfonic acid (PFOS)	µg/L	0.01		0.11	0.28	0.80	0.14	0.26	10.6	0.68	1.90	10.1	9.12	0.71	1.52	2.10	0.81	0.24	1.80	0.52	0.70	0.23
Perfluoropentane sulfonic acid (PFPeS)	µg/L	0.01		<0.02	<0.02	<0.02	<0.02	0.04	0.04	<0.02	<0.02	0.18	0.24	<0.02	<0.02	<0.02	0.02	<0.02	0.03	<0.02	0.28	<0.02
Perfluorohexane sulfonic acid (PFHxS)	µg/L	0.01		0.02	0.06	<0.02	0.20	0.45	0.40	0.20	0.22	2.42	2.03	0.24	0.33	0.31	0.26	0.13	0.60	0.12	4.84	0.03
Perfluoroheptane sulfonic acid (PFHpS)	µg/L	0.01		<0.02	<0.02	0.02	<0.02	<0.02	0.04	<0.02	<0.02	0.14	0.14	0.02	0.03	0.02	0.01	<0.02	0.04	<0.02	0.18	<0.02
Perfluorodecanesulfonic acid (PFDS)	µg/L	0.01		<0.02	<0.02	<0.02	<0.02	<0.02	0.04	0.02	0.04	0.34	0.22	0.05	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorobutane sulfonic acid (PFBS)	µg/L	0.01		<0.02	<0.02	<0.02	<0.02	0.04	0.04	<0.02	<0.02	0.14	0.24	<0.02	<0.02	<0.02	0.02	<0.02	0.02	<0.02	0.08	<0.02
Perfluoropropanesulfonic acid (PFPrS)	µg/L	0.01		-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-
Sum of PFHxS and PFOS	µg/L	0.01	**0.07**[#1]	0.13	0.34	**0.80**	0.34	**0.71**	**11.0**	**0.88**	**2.12**	**12.5**	**11.2**	**0.95**	**1.85**	**2.41**	**1.07**	0.37	**2.40**	0.64	**5.54**	0.26
Perfluoroalkyl Sulfonamides																						
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	µg/L	0.05		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
N-methylperfluorooctane sulfonamidoacetic acid (NMeFOSAA)	µg/L	0.02		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.02	<0.02	<0.02
N-ethyl-perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	µg/L	0.02		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.02	<0.02	<0.02
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	µg/L	0.05		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamide (MeFOSA)	µg/L	0.05		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	µg/L	0.05		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Perfluorooctane sulfonamide (FOSA)	µg/L	0.02		<0.02	<0.02	<0.02	<0.02	<0.02	0.07	0.02	0.04	0.25	0.09	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.02	<0.02	<0.02
PFAS																						
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	µg/L	0.01		-	-	-	-	-	-	-	-	-	-	-	-	-	1.72	-	-	-	-	-
Sum of US EPA PFAS (PFOS + PFOA)*	µg/L	0.01		-	-	-	-	-	-	-	-	-	-	-	-	-	1.46	-	-	-	-	-
Sum of PFAS	µg/L	0.01		0.14	0.37	0.84	0.45	1.17	16.4	1.36	3.56	15.7	16.3	1.38	4.32	5.28	3.05	0.44	3.26	1.20	7.28	0.30

Comments

#1 Australian Government Department of Health 2017

#2 Australian and New Zealand Guidelines for Fresh and Marine Water Quality – technical draft default guideline values.

Table 5: Soil and Sediment Leachability Results
Preliminary Site Investigation
Norfolk Island
DITCRD

	Unit	EQL	Location Code	A_SS62	AD_SD09	AD_SD10	CHAP_SS02	ID011_SD02	ID012_SD01	MC_SD03	MC_SD04	MC_SD08	MC_SD08	MC_SD08
			Field ID	A_SS62	AD_SD09	AD_SD10	CHAP_SS02	ID011_SD02	ID012_SD01	MC_SD03	MC_SD04	MC_SD08	QC106	QC206
			Date	23/01/2020	20/01/2020	20/01/2020	20/01/2020	21/01/2020	21/01/2020	20/01/2020	20/01/2020	20/01/2020	20/01/2020	20/01/2020
			Sample Type	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Field_D	Interlab_D
			Catchment	Mission	Town/Watermil	Town/Watermil	Mission	Headstone	Town/Watermil	Mission	Mission	Mission	Mission	Mission
			Media	Soil	Sediment	Sediment	Soil	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment
			Lab Report No.	ES2005692	ES2005692	ES2005692	ES2005692	ES2005692	ES2005692	ES2005692	ES2005692	ES2005692	ES2005692	702872
	Unit	EQL	Human health - Drinking water (Leachable)											
Physical Parameters														
Leachate Fluid	-			-	-	-	-	-	-	-	-	-	-	1.0
pH (Initial)	pH Units	0.1		-	-	-	-	-	-	-	-	-	-	5.0
pH of Leaching Fluid	pH Units	0.1		-	-	-	-	-	-	-	-	-	-	5.0
pH (Final)	pH Units	0.1		8.0	8.0	8.2	7.4	6.8	3.1	3.4	3.2	6.6	7.6	5.0
(n:2) Fluorotelomer Sulfonic Acids														
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	µg/L	0.01		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01
6:2 Fluorotelomer Sulfonate (6:2 FtS)	µg/L	0.05		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	µg/L	0.01		<0.05	0.10	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	µg/L	0.01		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01
Perfluoroalkane Carboxylic Acids														
Perfluorohexanoic acid (PFHxA)	µg/L	0.01		0.08	0.08	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.06	0.06	0.05
Perfluorododecanoic acid (PFDoDA)	µg/L	0.01		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01
Perfluorononanoic acid (PFNA)	µg/L	0.01		<0.02	0.22	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01
Perfluoropentanoic acid (PFPeA)	µg/L	0.01		0.07	0.04	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01
Perfluorotetradecanoic acid (PFTeDA)	µg/L	0.01		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01
Perfluoroheptanoic acid (PFHpA)	µg/L	0.01		0.03	0.12	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.02
Perfluorobutanoic acid (PFBA)	µg/L	0.05		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05
Perfluorodecanoic acid (PFDA)	µg/L	0.01		<0.02	0.10	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01
Perfluorotridecanoic acid (PFTrDA)	µg/L	0.01		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01
Perfluoroundecanoic acid (PFUnDA)	µg/L	0.01		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01
Perfluorooctanoic acid (PFOA)	µg/L	0.01	0.56[#1]	0.07	0.24	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	0.04	0.04	0.03
Perfluoroalkane Sulfonic Acids														
Perfluorononanesulfonic acid (PFNS)	µg/L	0.01		-	-	-	-	-	-	-	-	-	-	<0.01
Perfluorooctanesulfonic acid (PFOS)	µg/L	0.01		0.33	2.44	0.14	0.12	0.22	<0.01	0.18	0.11	3.73	3.47	2.3
Perfluoropentane sulfonic acid (PFPeS)	µg/L	0.01		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.02	<0.02	0.04	0.04	0.04
Perfluorohexane sulfonic acid (PFHxS)	µg/L	0.01		0.02	0.14	0.03	0.02	<0.02	<0.02	0.19	0.08	0.54	0.50	0.46
Perfluoroheptane sulfonic acid (PFHpS)	µg/L	0.01		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.06	0.06	0.04
Perfluorodecanesulfonic acid (PFDS)	µg/L	0.01		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01
Perfluorobutane sulfonic acid (PFBS)	µg/L	0.01		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.04	<0.02	0.06	0.05	0.04
Perfluoropropanesulfonic acid (PFPrS)	µg/L	0.01		-	-	-	-	-	-	-	-	-	-	0.02
Sum of PFHxS and PFOS	µg/L	0.01	0.07[#1]	0.35	**2.58**	0.17	0.14	0.22	<0.01	0.37	0.19	**4.27**	**3.97**	**2.76**
Perfluoroalkyl Sulfonamides														
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	µg/L	0.05		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
N-methylperfluorooctane sulfonamidoacetic acid (NMeFOSAA)	µg/L	0.02		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.05
N-ethyl-perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	µg/L	0.02		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	µg/L	0.05		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamide (MeFOSA)	µg/L	0.05		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	µg/L	0.05		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Perfluorooctane sulfonamide (FOSA)	µg/L	0.02		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.05
PFAS														
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	µg/L	0.01		-	-	-	-	-	-	-	-	-	-	2.79
Sum of US EPA PFAS (PFOS + PFOA)*	µg/L	0.01		-	-	-	-	-	-	-	-	-	-	2.33
Sum of PFAS	µg/L	0.01		0.60	3.48	0.17	0.14	0.22	<0.01	0.44	0.19	4.53	4.22	3

Comments
#1 Australian Government Department of Health 2017
#2 Australian and New Zealand Guidelines for Fresh and Marine Water Quality – technical draft default guide

Appendix A: PFAS Fact Sheets

Australian Government

Department of Infrastructure, Transport, Cities and Regional Development

PFAS – Norfolk Island Fact Sheet

Background

Elevated levels of per- and poly-fluoroalkyl substances (PFAS) have been detected in water samples from three sites on public land within the headwaters of the Mission Creek catchment directly below the aviation fire services training drill ground, adjacent to Norfolk Island International Airport.

About per- and poly-fluoroalkyl substances (PFAS)

Per- and polyfluoroalkyl substances (PFAS) are manufactured chemicals used in a wide range of industrial and household applications globally. Some types of PFAS have been used in fire-fighting foams, particularly at places like airports, fuel storage facilities, and Defence bases, because they are very effective at extinguishing liquid fuel fires.

PFAS were also used across Australia and internationally in a range of common household products and specialty applications, including in the manufacture of non-stick cookware; fabric, furniture and carpet stain protection applications; food packaging and in some industrial processes. As a result, most people living in the developed world will have levels of PFAS in their body.

PFAS are emerging as a concern around the world because they are persistent and highly mobile in the environment.

Currently there is limited evidence of significant impacts on human health from exposure to PFAS chemicals. Research in Australia and overseas continues to be undertaken.

Next steps

These three initial sample results were collected by the CSIRO on public land as part of the Norfolk Island Water Resource Assessment project. While samples were being collected to assess general water chemistry for the project, PFAS testing was included to determine any water or soil contamination. The Department of Infrastructure, Transport, Cities and Regional Development (the Department) is now commencing an environmental investigation, which will include a Human Health Risk Assessment (HHRA) for Norfolk Island. This will identify the nature and extent of PFAS in the local environment (including soil, sediment, surface water and groundwater) related to the historical use of firefighting foams at Norfolk Island International Airport, and any potential exposure risks to people or the environment.

We commit to working closely with Norfolk Island Regional Council and the community as we gather further information to determine how this needs to be managed. We will keep the community informed and engaged at every step.

Using groundwater for drinking

As a precaution, the Department recommends not drinking water from any underground or creek sources within the Mission Creek catchment around the airport or using bore water taken from that catchment to re-fill rainwater tanks that supply drinking water, until further notice.

The Department will ensure those people in nearby properties whose water supply will require further testing have access to alternative drinking water supplies. Landholders and residents within the investigation area, who use groundwater for drinking water or household use, should contact the Department to discuss possible management strategies. Each household's drinking water requirements will be assessed on a case-by-case basis to select the most appropriate assistance.

About the environmental investigation, including the Human Health Risk Assessment

The Department is undertaking an environmental investigation and assessment of the groundwater including targeted sampling and testing of local water bores. We are exploring expansion of the CSIRO water project to ensure sampling and testing commences as soon as possible. It is anticipated the investigation will take a number of months to complete. The purpose of the investigation is to understand how groundwater may have been impacted by legacy fire-fighting foams containing PFAS, used as part of training activities. The information collected will assist the Australian Government to understand the groundwater impacts and contribute to developing appropriate management strategies in relation to any potential human health and ecological risks.

Investigations are undertaken by independent and experienced environmental services providers and are done in accordance with the National Environmental Protection (Assessment of Site Contamination) Measure (NEPM) framework and PFAS National Environmental Management Plan (NEMP).

The investigation will include:

• sampling and analysis of soil, sediment, surface water and groundwater to identify PFAS exposure in the vicinity

• identifying pathways and receptors of PFAS. A 'receptor' is a person or thing (e.g. plant or animal) that can be exposed to these compounds. A 'pathway' is the way in which they can be exposed (e.g. drinking water or eating food containing these compounds);

• community and stakeholder engagement, including a water-use survey

• a Human Health Risk Assessment, which will evaluate potential risks to the human population and ecology, and inform future action to mitigate risks.

Investigation outcomes

When environmental investigation reports are finalised and publicly released, the Government will consult with residents, businesses and local stakeholders on the findings.

The Australian Government takes this environmental investigation very seriously and is committed to implementing appropriate management responses based on the advice of independent scientific experts in this field.

Government guidance

The Australian Government, led by the Department of Environment and Energy, has developed a comprehensive whole-of-government response to PFAS contamination and is working to prevent or reduce environmental and human PFAS exposure wherever possible. For more information on this and on PFAS generally, visit PFAS.gov.au

On 7 May 2018, an independent expert health panel concluded there is mostly limited, or in some cases no evidence, that human exposure to PFAS is linked with human disease. The panel also advised that the evidence does not support any specific health or disease screening or other health interventions for highly exposed groups in Australia, except for research purposes; and decisions and advice by public health officials about regulating or avoiding specific PFAS chemicals should be mainly based on scientific evidence about the persistence and build-up of PFAS.

The Panel's Report is available at https://www1.health.gov.au/internet/main/publishing.nsf/Content/ohp-pfas-expert-panel.htm

Support

The Department will rely on Department of Health advice and the enHealth Guidance Statements available on the Department of Health website.

Accordingly, it has adopted a precautionary approach and is providing alternative sources of drinking water to eligible residents located in close proximity to the initial investigation area.

Residents are welcome to contact the Department's on-Island team on 23315 or NIPFAS@infrastructure.gov.au to discuss eligibility for water assistance and possible management strategies. Each household's drinking water requirements will be assessed on a case-by-case basis.

Keeping the community informed

The Department is committed to regularly updating the community throughout the investigation. The Department website will be updated as the investigation progresses. Community information sessions, direct mail and information sheets will occur as needed. Enquiries or requests relating to individual properties will be assessed on a case-by-case basis.

Where can I get more information?

https://www.pfas.gov.au/

https://www1.health.gov.au/internet/main/publishing.nsf/Content/ohp-pfas.htm#pfas

Environmental investigation PFAS – Norfolk Island Fact Sheet 2

Background

Elevated levels of per- and poly-fluoroalkyl substances (PFAS) have been detected in water samples from three sites on public land within the headwaters of the Mission Creek catchment directly below the aviation fire services training drill ground, adjacent to Norfolk Island International Airport. Please see PFAS – Norfolk Island Fact Sheet for further background information.

Further, detailed environmental investigation and assessment is now required to identify the nature and extent of PFAS in the local environment related to the historical use of firefighting foams at Norfolk Island International Airport for training activities, and identify potential exposure pathways to people or the environment.

The detailed environmental investigation

The Department of Infrastructure, Transport, Cities and Regional Development (the Department) has engaged Senversa to conduct the environmental investigation, which will likely include a Human Health Risk Assessment (HHRA) for Norfolk Island. The purpose of this investigation, which will take a number of months to complete, is to understand how the environment may have been affected by legacy fire-fighting foams containing PFAS. The information collected will assist the Australian Government to understand the environmental exposure and contribute to developing appropriate management strategies in relation to any potential human and environmental exposure pathways.

The CSIRO's Norfolk Island Water Resource Assessment (NIWRA) project scope was expanded to ensure sampling and testing commenced as soon as possible. CSIRO conducted additional testing of a number of properties within the Mission Creek catchment on 21 to 23 December, with a focus on drinking water, specifically taps and tanks on the properties, along with some bores. The analysis from this sampling will allow for initial advice to those property owners as well as contributing to the overall investigation. The CSIRO's NIWRA project has now returned to an exclusive focus on an assessment of hydrology and hydrogeology and options for increasing the community's water security, while Senversa focuses on PFAS.

Senversa is experienced in undertaking PFAS preliminary and detailed site investigations and human health risk assessments and has worked on numerous Defence and airport sites across Australia. The investigations are done in accordance with the National Environmental Protection (Assessment of Site Contamination) Measure (NEPM) framework and PFAS National Environmental Management Plan (NEMP).

The investigation will include:

•sampling of soil, sediment, surface water and groundwater and analysis to understand PFAS concentrations in various locations across Norfolk Island, including the Mission Creek catchment

• identifying pathways and receptors of PFAS. A 'receptor' is a person or thing (e.g. plant or animal) that can be exposed to these compounds. A 'pathway' is the way in which they can be exposed (e.g. drinking water or eating food containing these compounds)

• community and stakeholder engagement, including completing water-use surveys with members of the community to help identify how people could be exposed

Should the preliminary or detailed investigation confirm concentrations of PFAS exceed appropriate screening levels, a Human Health and/or Ecological Risk Assessment will be undertaken. The risk assessment will evaluate potential risks to the human population and ecology, and inform future action to mitigate risks.

Senversa's initial on-Island field work from 13–24 January will involve collection of a range of samples from various locations across Norfolk Island. Testing on private land will only occur with property owners' consent. These samples will then be returned to the mainland for laboratory analysis, after which the results will be analysed and interpreted by Senversa.

The interpretation of the data collected through this initial analysis will inform more detailed health advice, while also determining if further investigation is required and, if so, what that would involve.

During the sample collection, there will be community information sessions to provide details on the investigation process, including likely timelines for further information, and to answer questions.

Investigation outcomes

When environmental investigation reports are finalised, they will be publicly released and the Government will consult with residents, businesses and local stakeholders on the findings.

Using Mission Creek catchment water for drinking

As consuming water containing above guidance levels of PFAS is not recommended, as a precaution, the Department recommends not drinking water from any underground or creek sources within the Mission Creek catchment around the airport or using bore water taken from that catchment to re-fill rainwater tanks that supply drinking water, until further notice. Alternative water is available to residents in the catchment by contacting the Department's on-Island team on 23315 or NIPFAS@infrastructure.gov.au.

About per- and poly-fluoroalkyl substances (PFAS)

Per- and polyfluoroalkyl substances (PFAS) are manufactured chemicals which were used historically in a wide range of industrial and household applications globally. Some types of PFAS have been used in fire-fighting foams, particularly at places like airports, fuel storage facilities, and Defence bases, because they are very effective at extinguishing liquid fuel fires. PFAS were also used across Australia and internationally in a range of common household products and specialty applications, including in the manufacture of non-stick cookware;

fabric, furniture and carpet stain protection applications; food packaging and in some industrial processes. As a result, most people living in the developed world will have levels of PFAS in their body.

PFAS are emerging as a concern around the world because they are persistent and highly mobile in the environment. Currently there is limited evidence of significant impacts on human health from exposure to PFAS chemicals. Research in Australia and overseas continues to be undertaken.

Where can I get more information?

Residents are welcome to contact the Department's on-Island team on 23315 or NIPFAS@infrastructure.gov.au

For more information on PFAS generally, visit PFAS.gov.au.

9 January 2020

Australian Government

Department of Infrastructure, Transport, Cities and Regional Development

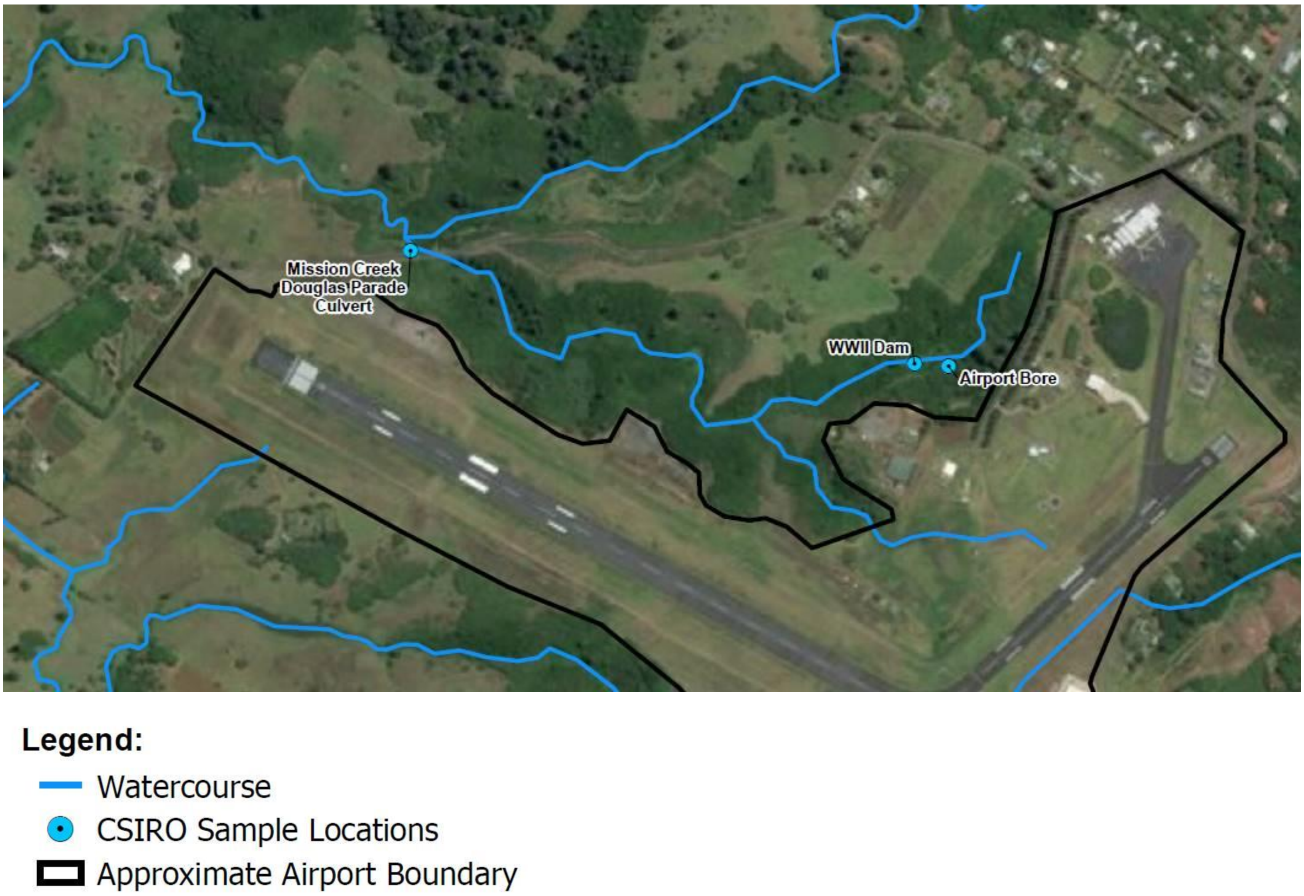
Preliminary test results from initial sample sites PFAS – Norfolk Island Fact Sheet 3

Background

Results from the CSIRO's preliminary screening conducted in November 2019 on Norfolk Island identified elevated levels of per- and poly-fluoroalkyl substances (PFAS) from three test sites on public land. These sites were located within the headwaters of the Mission Creek catchment directly below the aviation fire services training drill ground, adjacent to Norfolk Island International Airport. Water samples were taken from three public locations, the World War II Dam in the headwaters of Mission Creek, the nearby airport groundwater bore and a surface water sample where Mission Creek crosses Douglas Drive.

Please see PFAS – Norfolk Island Fact Sheet for further background information.

Sample locations:



Health based guidance values

The Department of Health, Food Standards Australia New Zealand (FSANZ) and the National Medical Research Council (NHMRC) have developed health based guidance values (HBGVs) for perfluorooctane sulfonate (PFOS), perfluorooctanoic acid (PFOA) and perfluorohexane sulfonate (PFHxS), which belong to the group of chemicals known as PFAS. These values aim to protect the general community from exposure to PFAS from food, drinking water and recreational water. The guidance values for drinking water and recreational water quality are available in NHMRC's Australian Drinking Water Guidelines (2011) and Guidance on per- and poly-fluoroalkyl substances (PFAS) in recreational water.

HBGVs indicate the amount of a chemical in food or drinking water that a person can consume on a regular basis over a lifetime without any significant risk to health. Both the recreational water and the drinking water guideline values are precautionary and protective of human health. The guideline values include a wide safety margin and are expected to be well below the level at which any negative effects could occur.

It is important to note that as a precaution, it is recommended exposure to PFAS be minimised wherever possible while further research is undertaken on the potential health effects of PFAS exposure. However, PFAS have not been proven to cause disease in humans. To date there is not enough information available to definitively say what, if any, health effects may be caused by exposure to PFAS.

The HBGVs for drinking water quality and recreational water quality for use in site investigations in Australia are:

Health based guidance value	**Total PFOS+ PFHxS (µg/L)**	**PFOA (µg/L)**
Drinking water quality guideline value (µg /L)	0.07	0.56
Recreational water quality guideline value (µg /L)	2.0	10.0
Note: µg = micrograms. One microgram is one millionth of a gram. L = litres.		

Results of preliminary testing on Norfolk Island

The table over the page summarises the test results for the three PFAS compounds that have guidance values – PFOS, PFOA and PFHxS. These results are from preliminary sampling only. Further testing is under way as part of a detailed environmental investigation and results could vary. The higher readings of PFOS and PFHxS are similar to some of the results seen across other sites in Australia (which include residential areas) and appear consistent with the historic use of the legacy firefighting foam as the main source.

Sample location	Sample Results			
	PFOS+ PFHxS (µg/L)	Comparison against applicable guidance values	PFOA (µg/L)	Comparison against applicable guidance values
World War II Dam surface water	20.98 + 15.13 = 36.11	This test result is above HBGVs for drinking water (0.07) and recreational water quality (2.0)	0.90	This test result is above HBGVs for drinking water (0.56), and below for recreational water quality (10.0)
Airport bore groundwater	10.85 + 7.44 = 18.29	This test result is above HBGVs for drinking water (0.07) and recreational water quality (2.0)	0.45	This test result is below HBGVs for drinking water (0.56), and well below recreational water quality (10.0)
Mission Creek surface water	3.76 + 3.34 = 7.1	This test result is above HBGVs for drinking water (0.07) and recreational water quality (2.0)	0.17	This test result is below HBGVs for drinking water (0.56), and recreational water quality (10.0)

The measured concentrations of PFOS+PFHxS are elevated above the guidance values in all three samples, while the concentration of PFOA only marginally exceeds the drinking water guidance value in one sample (from the World War II Dam surface water). The elevated concentrations of PFOS + PFHxS indicate that people who drink or use this water regularly (i.e. every day) over a lifetime could have elevated exposure to PFOS+PFHxS when compared with the precautionary guidance values.

It is emphasised that these concentrations are preliminary results, and were measured in only three sample locations in proximity to the aviation fire services training drill ground (the potential source). Concentrations of PFAS can decrease as they migrate through groundwater and surface water, and concentrations elsewhere in the Mission Creek catchment may be lower than these measured concentrations. Investigations are under way to better understand the extent of these impacts, and the PFAS concentrations in water which people may drink and use (e.g. in domestic bores and water tanks), as described below.

Next steps

The CSIRO's Norfolk Island Water Resource Assessment (NIWRA) project scope was expanded temporarily to ensure further sampling and testing for PFAS commenced as soon as possible in the Mission Creek catchment area. CSIRO conducted testing of a number of properties within the Mission Creek catchment on 21 to 23 December, with a focus on drinking water, specifically taps and tanks on the properties, along with some bores. Those samples have been returned to accredited laboratories for analysis. The Department will be able to provide advice to those properties once results are available, which is expected to be by the end of January 2020.

The Department has engaged environmental consultants Senversa to undertake the detailed environmental investigation to determine the nature and extent of PFAS in the local environment and the potential exposure pathways for people and the environment. Senversa has extensive experience in delivering these complex PFAS investigations for Defence at mainland sites. The investigation findings will inform future action to mitigate risks. Senversa's initial on-Island field work from 13–24 January will involve collection of a range of samples from various locations across Norfolk Island. Testing on private land will only occur with property owners' consent. These samples will then be returned to the mainland for laboratory analysis, after which the results will be analysed and interpreted by Senversa. The interpretation of the data collected through this initial analysis will inform more detailed health advice, while also determining if further investigation is required and, if so, what that would involve. See Norfolk Island PFAS fact sheet 2 for further information.

The data collected from CSIRO's December testing in the Mission Creek catchment will form part of Senversa's island-wide environmental investigation. The CSIRO's NIWRA project has now returned to an exclusive focus on an assessment of hydrology and hydrogeology and options for enhancing the community's water security (see more information here.

Using Mission Creek catchment water for drinking

As consuming water containing above guidance levels of PFAS is not recommended, as a precaution, the Department recommends not drinking water from any underground or creek sources within the Mission Creek catchment around the airport or using bore water taken from that catchment to re-fill rainwater tanks that supply drinking water, until further notice. Alternative water is available to residents in the catchment by contacting the Department's on-Island team on 23315 or NIPFAS@infrastructure.gov.au.

Where can I get more information?

Residents are welcome to contact the Department's on-Island team on 23315 or NIPFAS@infrastructure.gov.au.

https://www.pfas.gov.au/

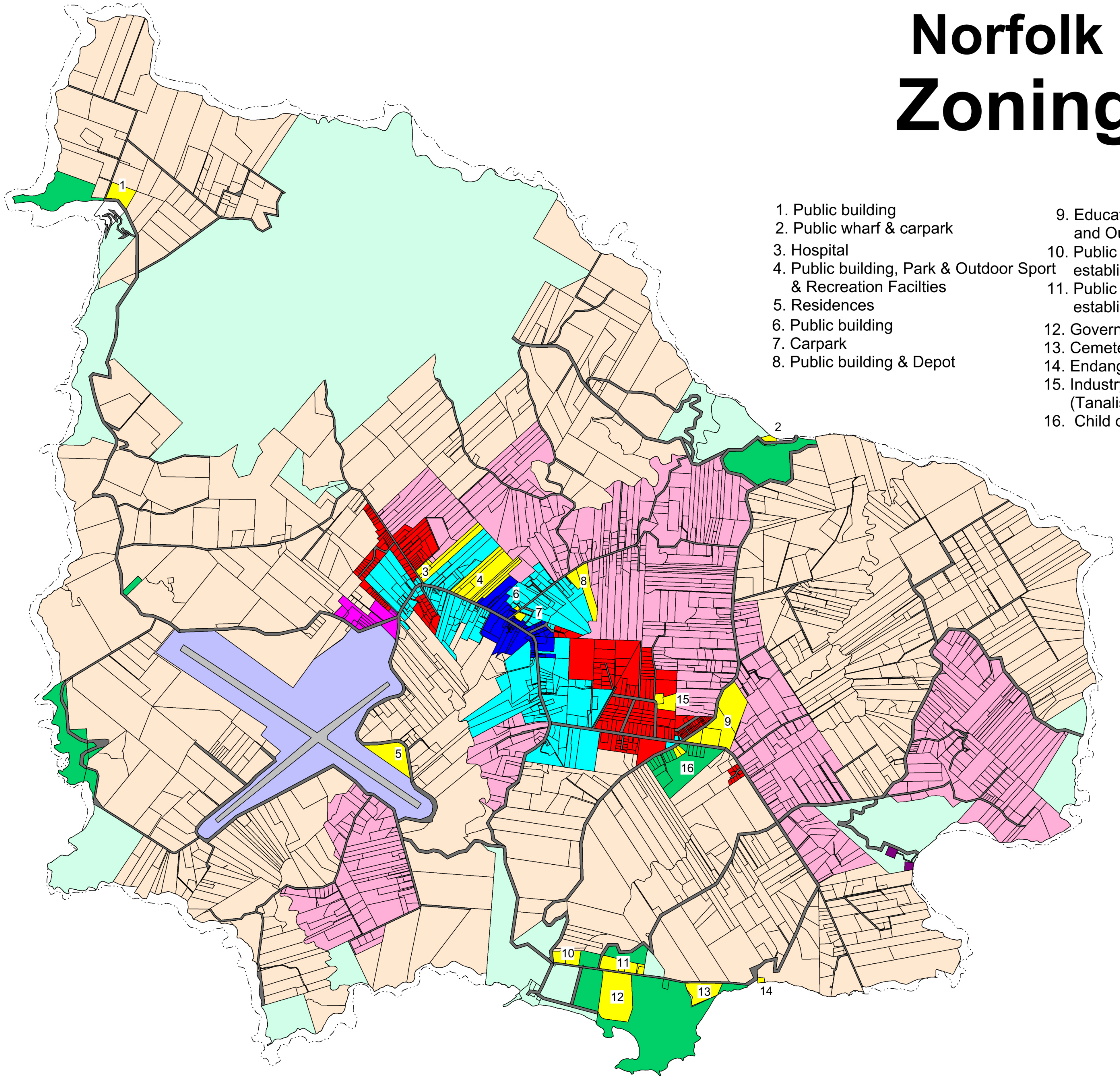
https://www1.health.gov.au/internet/main/publishing.nsf/Content/ohp-pfas.htm#pfas

15 January 2020

Appendix B: Norfolk Island Zoning Map

NORFOLK ISLAND
REGIONAL COUNCIL

Norfolk Island
Zoning Map



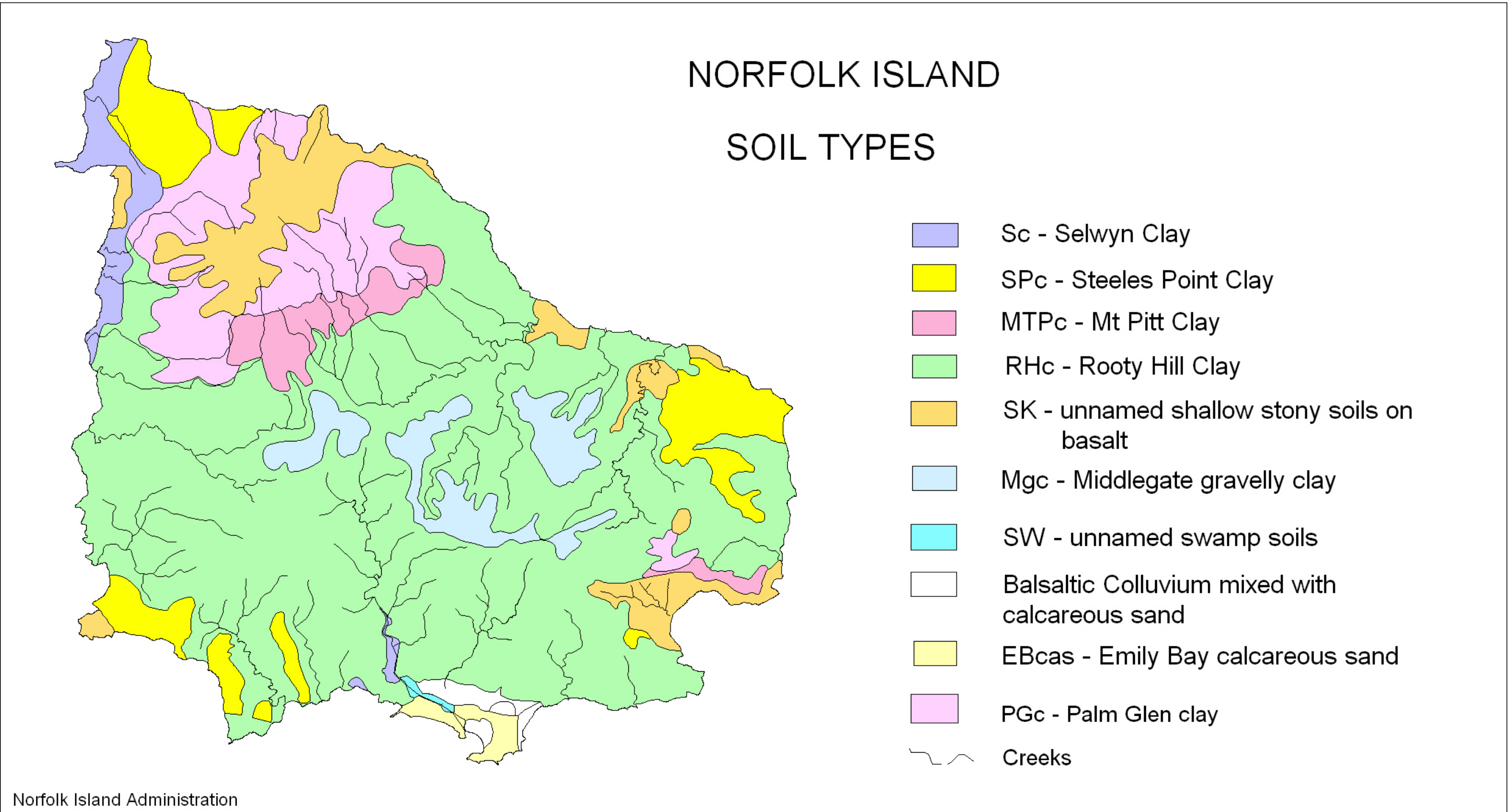
1. Public building
2. Public wharf & carpark
3. Hospital
4. Public building, Park & Outdoor Sport & Recreation Facilties
5. Residences
6. Public building
7. Carpark
8. Public building & Depot
9. Educational establishment / Indoor and Outdoor sport & recreation facilties
10. Public buildings & Education establishment
11. Public buildings & Education establishment
12. Government House & Domain
13. Cemetery
14. Endangered species habitat
15. Industry - Noxious, Hazardous or Offensive (Tanalising works), Public Works - Major, and Depot
16. Child care centre

- Rural
- Rural Residential
- Residential
- Mixed Use
- Business
- Light Industry
- Industrial
- Open Space
- Conservation
- Special Use
- Airport
- Roads
- Cadastral Boundaries
- Mean High Water Mark

Last Variation Approved On: 10th April 2018
Last Variation Gazetted On: 13th April 2018
Last Variation Approved By: Eric Hutchinson
Administrator

0 1 2
kilometers

Appendix C: Norfolk Island Soil Map


NORFOLK ISLAND
SOIL TYPES
Sc - Selwyn Clay
SPc - Steeles Point Clay
MTPc - Mt Pitt Clay
RHc - Rooty Hill Clay
SK - unnamed shallow stony soils on basalt
Mgc - Middlegate gravelly clay
SW - unnamed swamp soils
Balsaltic Colluvium mixed with calcareous sand
EBcas - Emily Bay calcareous sand
PGc - Palm Glen clay
Creeks
Norfolk Island Administration

Appendix D: Historical Aerial Photographs

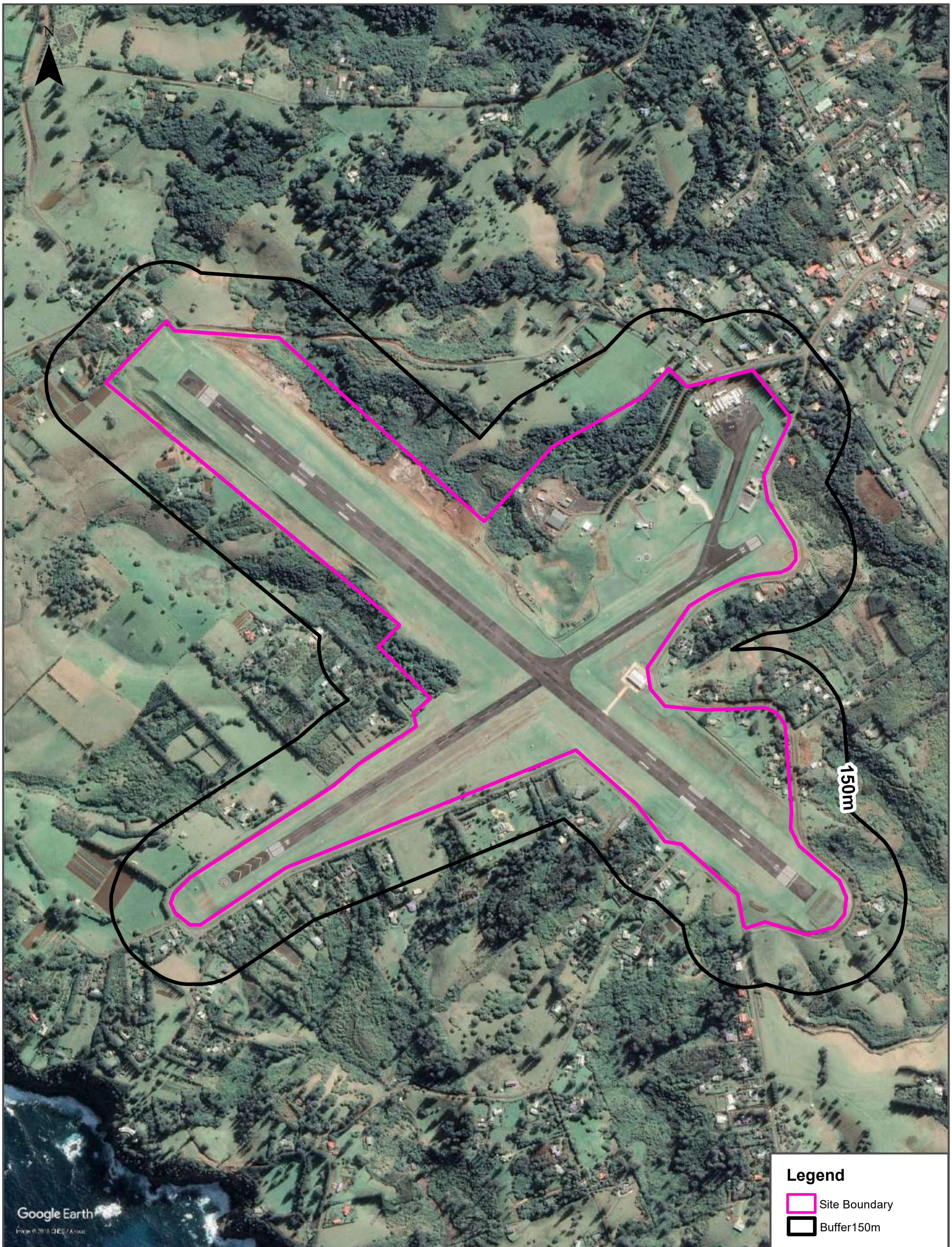
Date: 23 Jan 2019

Reference: LS0010437 EA

Address: Norfolk Island International Airport, Norfolk Island 2899

Aerial Imagery 2019

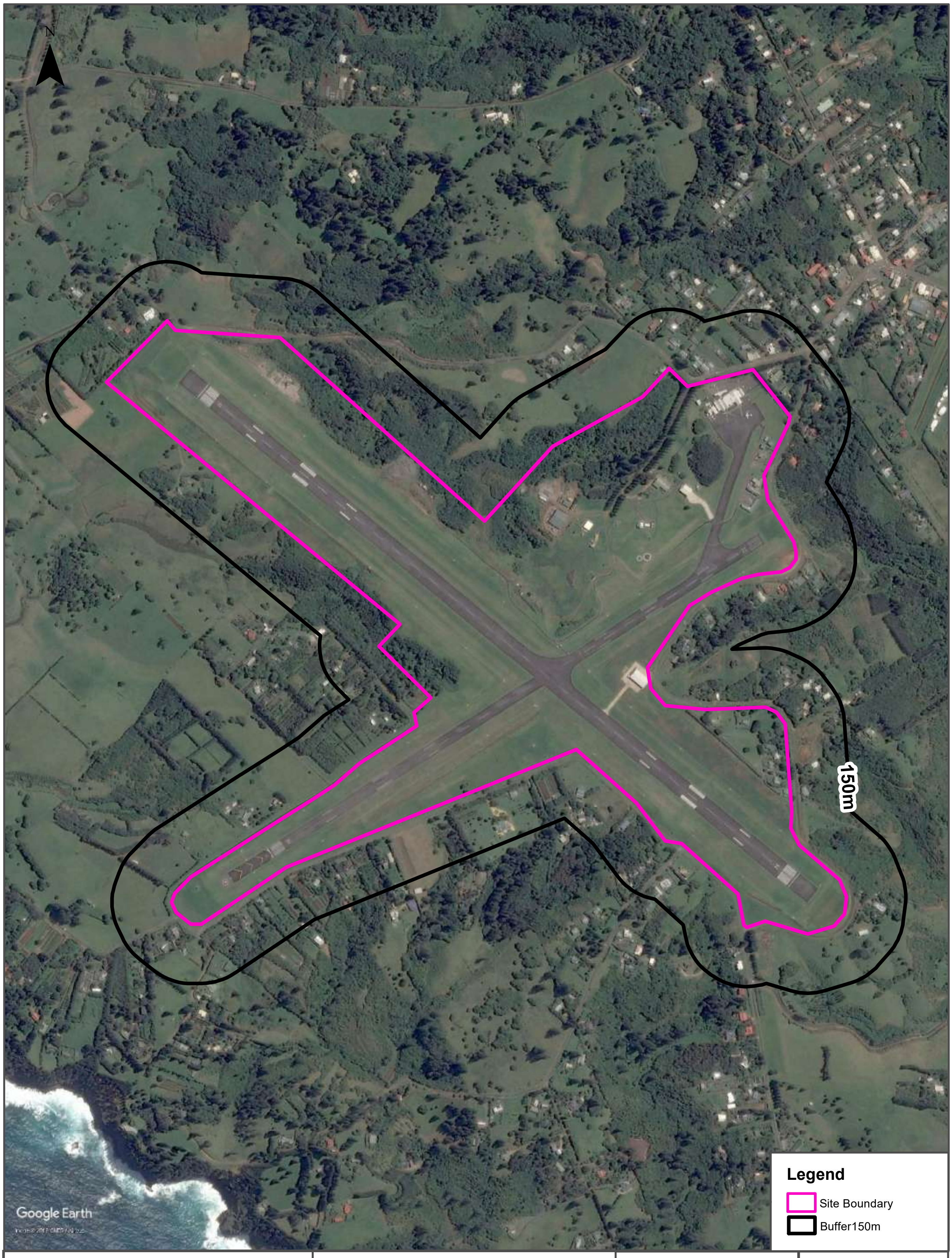
Norfolk Island International Airport, Norfolk Island 2899



Scale: 0 150 300 450 600 Meters	Data Source Aerial Imagery: © 2019 Google Inc, used with permission. Google and the Google logo are registered trademarks of Google Inc.	Coordinate System: GDA 1994 MGA Zone 56	Date: 17 January 2020

Aerial Imagery 2016

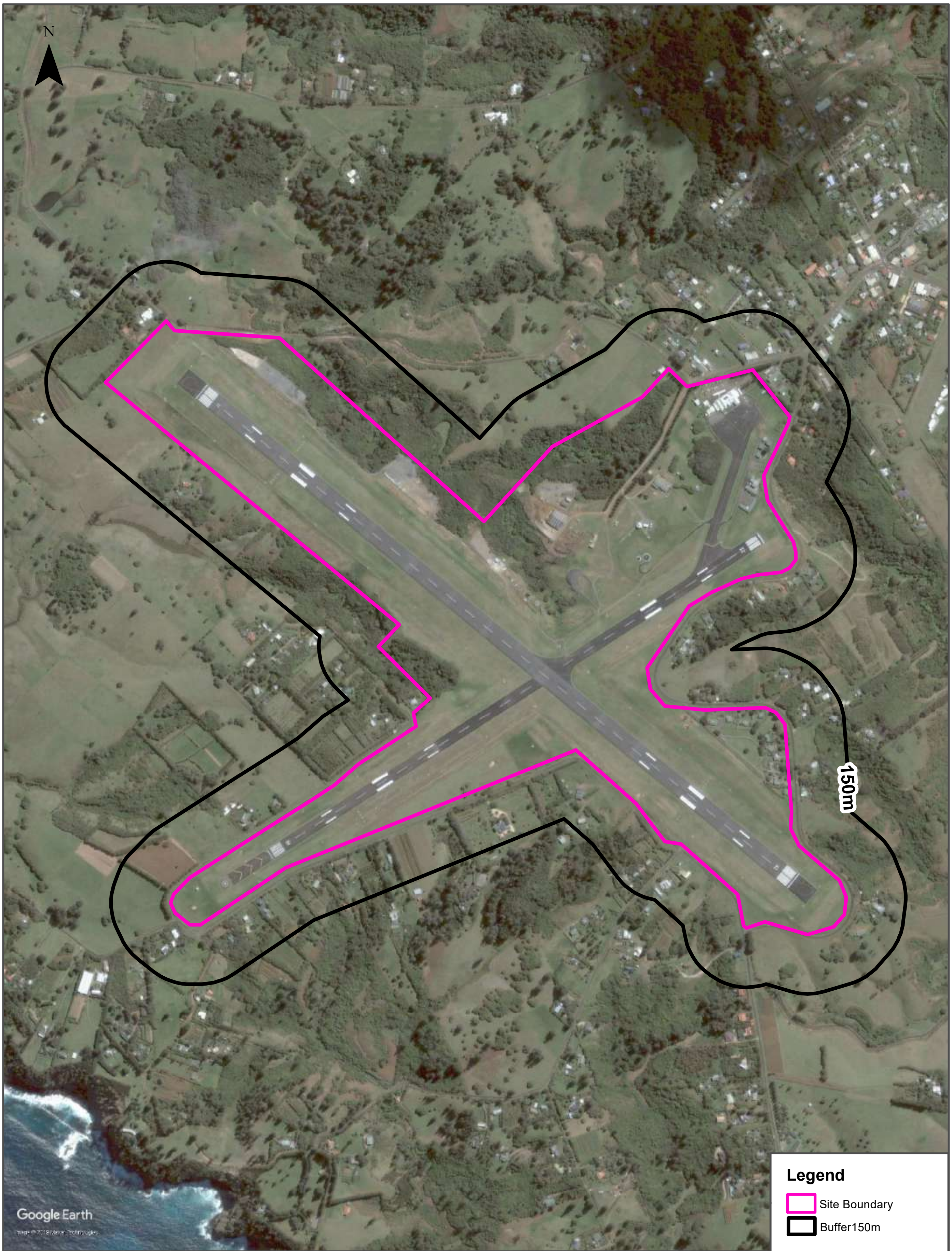
Norfolk Island International Airport, Norfolk Island 2899



Scale: 0 150 300 450 600 Meters	Data Source Aerial Imagery: © 2019 Google Inc, used with permission. Google and the Google logo are registered trademarks of Google Inc.	Coordinate System: GDA 1994 MGA Zone 56	Date: 17 January 2020

Aerial Imagery 2006

Norfolk Island International Airport, Norfolk Island 2899



Scale: 0 150 300 450 600 Meters	Data Source Aerial Imagery: © 2019 Google Inc, used with permission. Google and the Google logo are registered trademarks of Google Inc.	Coordinate System: GDA 1994 MGA Zone 56	Date: 17 January 2020

Aerial Imagery 1997

Norfolk Island International Airport, Norfolk Island 2899

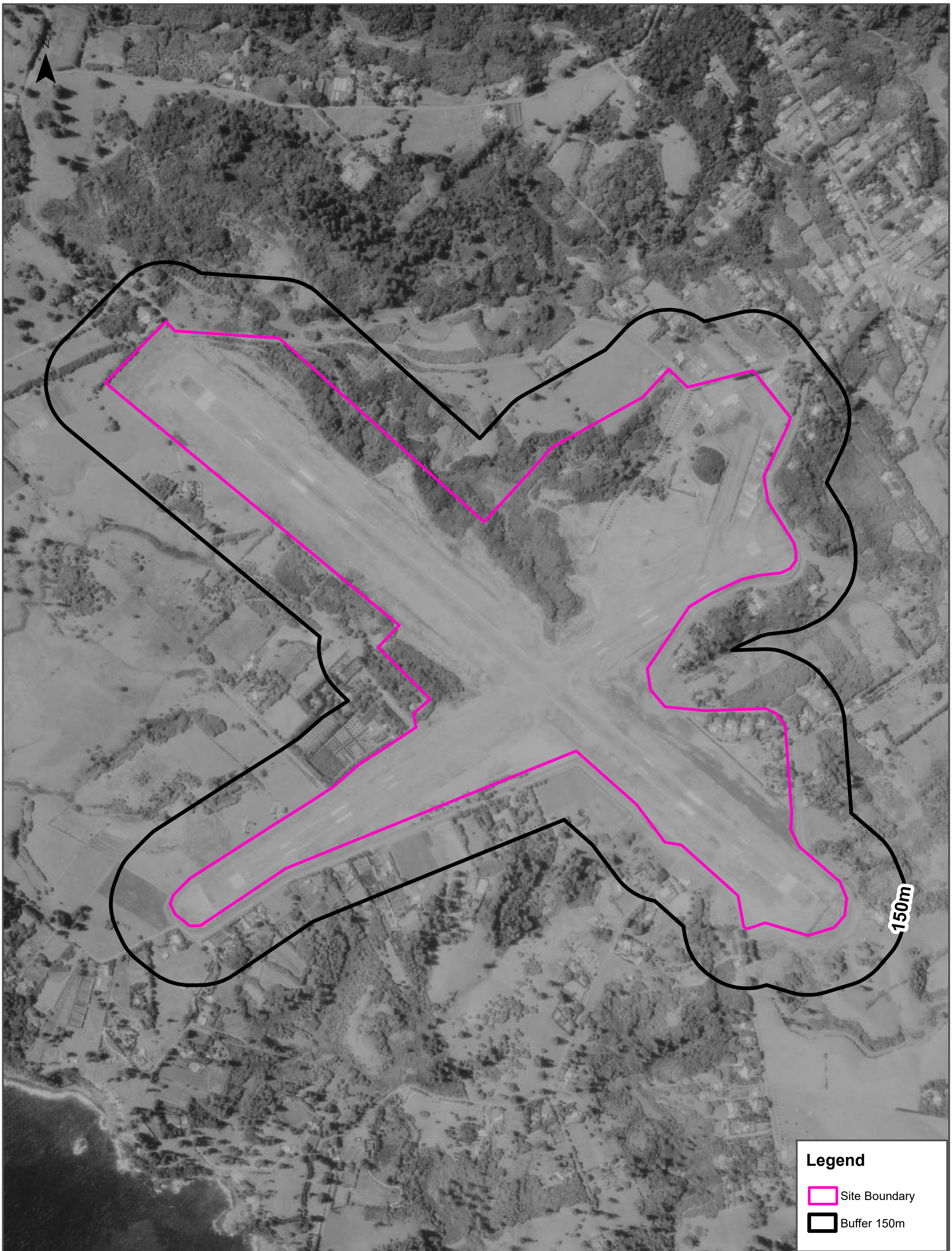
Legend

- Site Boundary
- Buffer 150m

Scale: 0 150 300 450 600 Meters	Data Source Aerial Imagery: Photomapping Services (2020)	Coordinate System: GDA 1994 MGA Zone 56	Date: 17 January 2020

Aerial Imagery 1987

Norfolk Island International Airport, Norfolk Island 2899



Scale: 0 150 300 450 600 Meters	Data Source Aerial Imagery: © 2020 Geoscience Australia	Coordinate System: GDA 1994 MGA Zone 56	Date: 23 January 2020

Aerial Imagery 1978

Norfolk Island International Airport, Norfolk Island 2899

Scale: 0 150 300 450 600 Meters	Data Source Aerial Imagery: © 2020 Geoscience Australia	Coordinate System: GDA 1994 MGA Zone 56	Date: 23 January 2020

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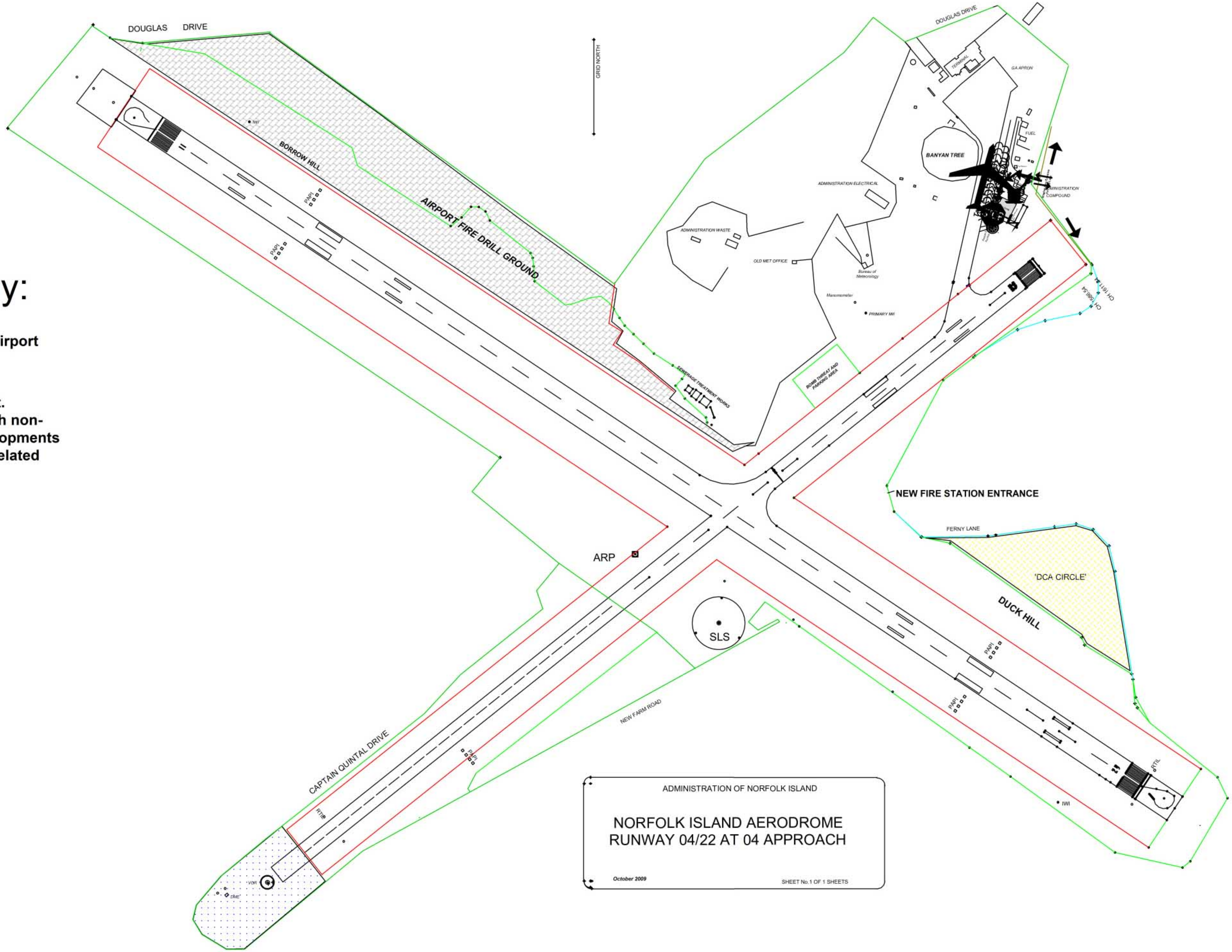
Appendix E: Council Provided Maps

Key:

Aviation Precinct.
Areas preserved for Airport developments in the first instance.

Development Precinct.
Areas suitable for both non-Aviation/Airport developments and Aviation/Airport related developments

DCA Circle Precinct



NORFOLK ISLAND
AERODROME
Leagues Club
Terminal Building
Tanks
Aerials
Aerials
Radar Dish
DRIVE
LITTLE GREEN LANE
LANE
ROAD
FERNY
FERNY
Rem.
150c
150e
150g
150d
150h
68k
174
35b
35e
35f
35g
35h
35j1
35k1
35n1
35n2
35n3
35n4
35n6
35o
58q
58d
58g1
58g2
58g3
58x
167
36z
36m1
36m2
36m3
35c5
36d
59o
59b
59c
59d
59e
59f
59n
59g
59j
59i
59h
71e
71l
71m1
71m4
71m3
71n
71o
71f
71b
71b6
71b5
71a1
71a
69n
58b
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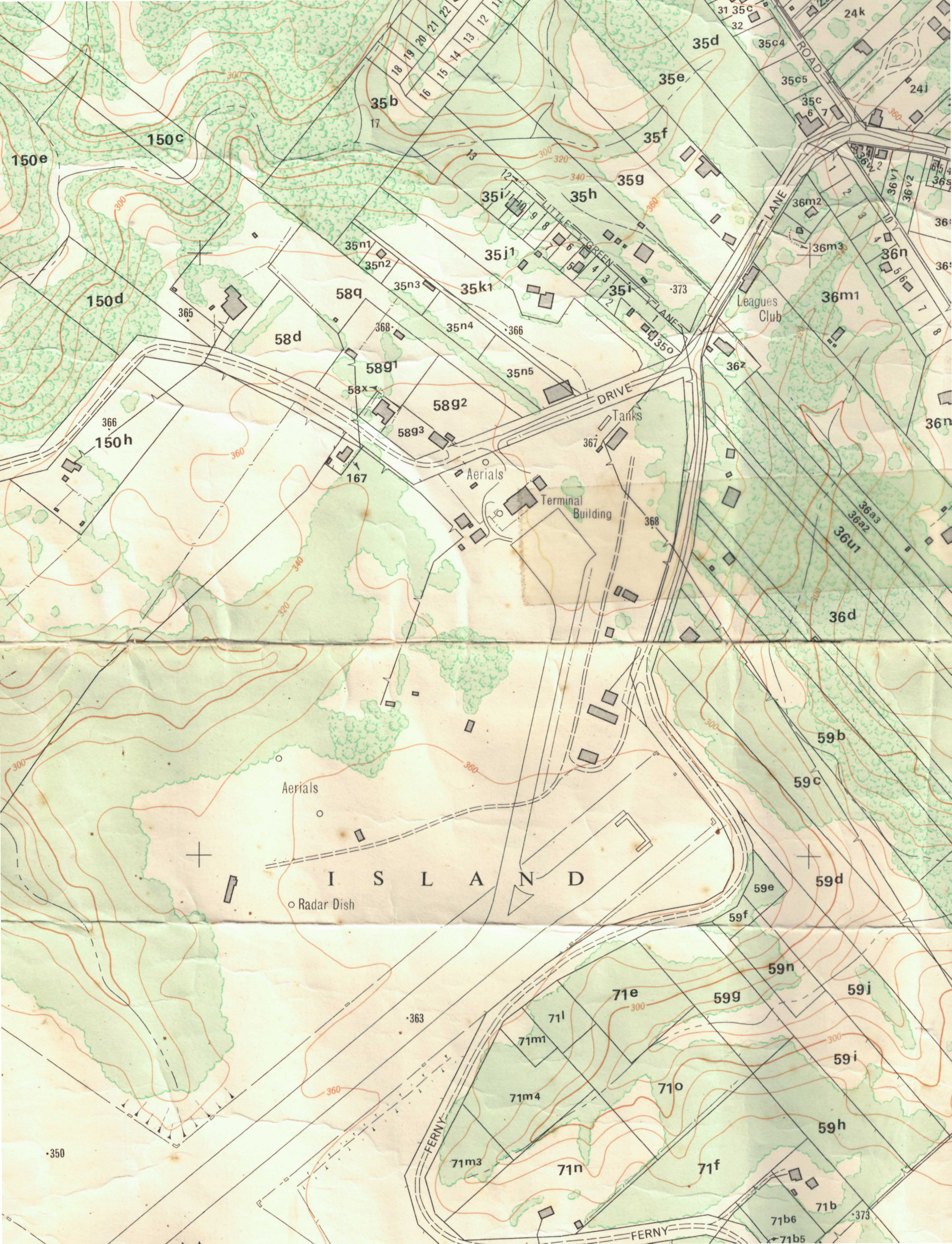

ISLAND
Aerials
Aerials
Radar Dish
Terminal Building
Tanks
Leagues Club
LITTLE GREEN LANE
DRIVE
LANE
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35n2
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35n4
35n5
35o
35c
35c4
35c5
58q
58d
58g1
58g2
58g3
58x
36m1
36m2
36m3
36n
36z
36a3
36a2
36u1
36d
36w
36v1
36v2
24k
24j
59b
59c
59d
59e
59f
59n
59g
59j
59i
59h
71e
71l
71m1
71m4
71m3
71o
71n
71f
71b
71b6
71b5
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340
360


DRIVE
112·3
112·1
112·2
112·4
Sub Station
Conc.
CH
109·8
Pump
108·2
110·3
Markers
Marker
Car
Park
2216
110·1
110
109·6
Grid
Mast
111·3
M/H
Sign?
107·5
AERODROME
102·5
100·7
105
Dense
Scrub
109·1
109·2
106·8
106·3
Signs?
FERNY
Timber


DOUGLAS
DRIVE
LANE
FERNY
AERODROME
150g
150d (rem)
150c1
150h
58z
58v2 (rem)
58y
58g5
58x1
58g6
58g8
58g9
58g10
167
174a
174 (rem)
35b17 (rem)
35i
35f2
35g
35h
35k2
35j1
35n3
35n4
35n5
35k1 (rem)
35o
35f1
35d1
35c11
35c12
35c7
35e1
36n1
36n2
36n3
36m2
36m3
36m5
36m4
36a4
36m5 (rem)
36z
36d4
36u1
36d5
59a1
59b
59c
59d
59e
59f
59j1
59n
59g
59j2
59h1
59i
59h2
71e2
71l
71e1
71m1
71m4
71o
71m3
71n
71f1
71f2
71f3
71f4
71f5
71b10
71b16
71b15
71b11
71b12
71a2
107
108
110
95
105

Appendix F: Interview Records

Site Interviews

The following tables summarise interviews conducted while on island in January 2020.

Date	Interview Attendees / Description
13 January 2020	**CSIRO Field Investigation Team**
	Discussion of areas of interest at airport: • Old fire station ▪ Outside where the airport buildings are now / where freight is. • Old drill area was out the back of waste management ▪ Drill area moved in the mid to late 90s ▪ Also used for a burning dump ▪ Fuel truck/ equipment storage in wooden shed --> old fire station ▪ Foam shed (10x10m wooden shed) north of these buildings, filled from outside with potential for spills. • These buildings were built before planning was required, no plans available • Airport workshop ▪ Maintenance depot for fire trucks ▪ Wash bay with no containment • Current fire station ▪ Drainage culvert under runway towards mission creek catchment i.e. heads west *Discussion of airport bore* • Used for public toilets in island • Septic tanks leaking raised as a potential issue *Discussion of hospital* • Hospital tanks have overflowed in the past ▪ These tanks have been filled by airport bore in the past • Sample bore near hospital (used for laundry only) • Broken Bridge Creek is downstream from the hospital, suggested sample location *Other recommended sampling locations* • Watermill valley • School bore, near principal’s office Hospital bore
	Chief Fire Officer (NIRC) + Current and Former Fire Fighters

Date	Interview Attendees / Description
13 & 21 January 2020	*Timeline of AFFF usage on Norfolk Island* • 1950s to 1980s: Protein foam • 1992: Civil aviation handover to administration of Norfolk Island • 1992 to 1997: No records • 1980s to 2004: Light water used • 2004: Change from light water to Ansulite • 2015: No PFAS foam (no foam) *Discussion of current and former drills, flushing of trucks* • Current drill ground ▪ Currently occupied by Boral ▪ Soils pushed into creek to level ▪ Direct access to mission creek ▪ PCB contamination from transformers ▪ 2-3 exercises a week • Flush outs ▪ After every training exercise (2-3 times per week) ▪ Foam was not always used but most ▪ Clean water used ▪ All around current and former fire stations ▪ No enviro protections • Annual drill ▪ AEP* once a year ▪ Large scale use of foams ▪ West of the chapel • Trucks filled using airport bore ▪ Most (if not all) fires put out using water from airport bore *Historical use of AFFF on Norfolk Island* • AFFF used at perfumery (also known as national duty free fire) • Common oval on quality row used to make snow • Possible around old fire buildings • 220, 000 produced L of AFFF *AEP = aerodrome emergency plan
Date	**Environmental Representative – Norfolk Council**
13 January 2020	*Suggested sample locations. Council to accompany Senversa for sampling on 14 January* • Pound paddock • Rosy Hessie • Headstone bore • Kingfisher • School bore • Hospital bore • Town Creek • Water carter bores *Mission Creek Catchment* • Airport bore to be retested • ~50 head of cattle in this catchment
15 January 2020	**Island Plumber**

Date	Interview Attendees / Description

15 January 2020	*Hospital bore and tanks*
	• Hospital Bore
	  ▪ 8m deep
	  ▪ Feeds into laundry and morgue
	  ▪ Tank is 1.5 years old
	  ▪ Used to use it, horse died nearby, water blamed, stopped using it and started using airport bore more frequently instead of hospital bore
	
	• Tank 1 - distribution
	  ▪ All rainwater tanks pumped to tank 1 for distribution to the building via filtration
	  ▪ Filtration tap sampled as well as tank
	  ▪ Two joined tanks
	  ▪ Previously filled with airport bore
	  ▪ Last filled with airport bore water 2 years ago
	
	• Tank 2 - concrete UST
	  ▪ Contained airport bore water
	  ▪ Potentially overflowed into creek
	  ▪ Has been cleared
	  ▪ Not lined
	  ▪ Potential for concrete leaching PFAS
	  ▪ ~1m of water
	  ▪ >30 years old
	
	• 3 rainwater tanks
	  ▪ No top ups with bore water, all rain water
	  ▪ All feed into distribution tank
	
	Fire Station
	• Interviewed plumber did not install or do the plumbing for the current fire station. Plumbers understanding is as follows:
	• 3 x 10,000 L tanks (1 tank leads to building / 2 tanks for fires)
	• Believed to be entirely airport bore water pumped from concrete storage tank
	• No filtration
	• Pumped under runway

Appendix G: Water Use Survey

Senversa Pty Ltd
Level 6, 15 William Street, Melbourne, VIC 3000
ABN 89 132 231 380 www.senversa.com.au

Water Use Questionnaire – Norfolk Island

The purpose of this questionnaire is to obtain information from you about your sources and use of water. Information collected through these questionnaires will help us to determine what additional sampling needs to be conducted to better understand potential exposures to PFAS on Norfolk Island.

If you have any questions about completing this questionnaire, or the current PFAS investigations, please contact the Department's on-Island team on **23315** or NIPFAS@infrastructure.gov.au

Name	
Phone number	
Email	
Postal address	
Property address	

Elevated levels of per- and poly-fluoroalkyl substances (PFAS) have been detected in water samples from three sites on public land within the headwaters of the Mission Creek catchment directly below the aviation fire services training drill ground, adjacent to Norfolk Island International Airport. Please see PFAS – Norfolk Island Fact Sheet for further background information.
Further, detailed environmental investigation and assessment is now required to identify the nature and extent of PFAS in the local environment related to the historical use of firefighting foams at Norfolk Island International Airport for training activities, and any potential exposure risks to people or the environment.

The Department of Infrastructure, Transport, Cities and Regional Development (the Department) has engaged Senversa to conduct the environmental investigation for Norfolk Island. The purpose of this investigation, which will take a number of months to complete, is to understand how groundwater may have been affected by legacy fire-fighting foams containing PFAS. The information collected will assist Senversa's understanding of the groundwater impacts and contribute to developing appropriate management strategies in relation to any potential human health and ecological risks.

Information obtained by Senversa in the course of this investigation program, including results of sampling taken from residential properties, and through the completion of surveys will be used to identify whether PFOS and/or PFOA are present in the environment and, if so, to understand the extent of any presence and levels of these chemicals and how people might be exposed. The information will also be used during engagement with local and state authorities, as well as communities, to determine what action, if any, needs to occur as a result.

The collection of your information is voluntary. If you choose not to provide any information, Senversa and the Department will not be able to take into account your specific circumstances when conducting the investigation, engaging with relevant authorities and the community, and taking further action.

The information you provide may be shared with the Department's technical advisors, relevant state and local government agencies and organisations, and business entities directly involved in any action linked to the investigation, to the extent that is necessary for the purposes of the environmental investigation, and the determination and implementation of any further action. The Department Privacy Policy is available at https://www.infrastructure.gov.au/department/about/privacy-policy.aspx The Department Privacy Policy contains information on how you may apply for access to your personal information and how you may apply to have your personal information amended. The Department Privacy Policy also contains information on how to make a privacy complaint about the way the Department has handled your personal information.

1. **What type of property are you responding about (tick all that apply)?**
   - ☐ Private residential
   - ☐ Growing Produce / Raising Livestock
   - ☐ Other (please specify)

2. **If property is used for food production (fruit, vegetables or livestock (meat, milk cheese etc.), please provide details of types of activities below (e.g. dairy farming, irrigation of food crops, etc)?**

3. **If property is residential, how many people usually live at this property?**

   ____

4. **How long have you lived at this property?**

   ____

5. **Do you have water tanks on your property?**
   - ☐ Yes
   - ☐ No

   If there are no water tanks, please go to Question 10.

6. **How many water tanks are on your property**

   ____

7. **What are they made of (e.g. concrete, iron, poly, fiberglass)?**

   ____

8. **Are your water tanks above or below ground?**

   ____

9. What water do your water tanks currently contain (tick all that apply)?

- ☐ Rainwater collected on property
- ☐ Bore water
- ☐ Filling or topping up of tanks by water carriers
- ☐ Other (please specify)

10. What water have your tanks contained in the past (tick all that apply)?

- ☐ Rainwater collected on property
- ☐ Bore water
- ☐ Filling or topping up of tanks by water carriers
- ☐ Other (please specify)

11. Is there any surface water (e.g. creek or drain) on your property?

- ☐ Yes
- ☐ No

12. If yes, please describe what waters are present and outline any uses of the water you are aware of?

____

13. Do you have water bores on your property?

- ☐ Yes
- ☐ No

If there are no bores, please go to Question 15.

14. How many bores do you have on your property?

Active bores ____

Inactive bores ____

15. Is water from the bore plumbed directly to the house and used for household purposes?

- ☐ The bore is currently plumed directly to the house to supply household water
- ☐ The bore was plumbed to the house in the past (but isn't now)
- ☐ Not plumbed to the house, but bore water is used to fill the tanks I use for household water
- ☐ Bore water isn't used for domestic/household purposes

16. How do you use water at your property (tick all that apply)?

	Tank water	Bore water	Other
Drinking water supply			
Indoor domestic uses (shower, bathing, laundry, cleaning, etc.)			
Outdoor domestic uses (gardens, etc.)			
Stock watering (e.g. drinking water for cattle)			
Irrigation of fruit and vegetables			
Irrigation of pasture			
Other:			
Other:			

17. Have you historically used water for any other purposes, not identified above, on your property? If yes, please provide details below.

18. If you grow fruit or vegetables, please indicate what types, and who consumes it (e.g. just the household, sold or given to other community members)

19. If you keep livestock or poultry, please indicate what types of animals you have (or had previously), and what produce (e.g. eggs, cheese, meat) is consumed, and who consumes it:

20. Please provide any additional comments about your water usage.

Thank you for completing this questionnaire.

If you have any questions about completing this questionnaire, or the current PFAS investigations, please contact the Department's on-Island team on **23315** or NIPFAS@infrastructure.gov.au

For more information on PFAS generally, visit PFAS.gov.au

Additional notes (Senversa use)

21. **Please detail any additional comments/queries from the respondents provided while giving the water use survey**

22. **Please detail responses provided, or required follow up actions**

Appendix H: Site Inspection Record

Appendix H - Site Inspection Observations

Feature of Interest (as per NEPM Schedule guidance)	Site Observations
Current uses of the site and surrounding land.	The site includes the International Airport and associated terminal buildings, maintenance depot, the fire station, the waste management centre, regional council office and drill area (currently used by Boral as part of the runway upgrade works).
Areas of discoloured, odorous or stained soil, bare soil patches and disturbed or distressed vegetation.	No discoloured, odorous or stained soil was observed. Vegetation appeared to be in good condition across the site. Areas of visibly greener grass were noted in low lying areas down gradient of the former fire station, underground drainage may have discharged or leaked in these areas.
The presence of any stockpiled material, imported soil or fill material such as slag, ashes, potential asbestos containing materials, scrap and industrial or chemical waste, as well as any signs of settlement, subsidence and disturbed ground.	Soil in the waste management area (former drill ground) appeared to have been pushed to the boundary to make way for infrastructure and rubbish. No other fill was observed during surface soil sampling across the site.
Presence of surface water bodies (pits, ponds, lagoons etc.)	No surface water bodies were present on site at the time of inspection.
Quality of surface water (e.g. sheens, significant odours).	Not applicable based on absence of surface water on site during inspection.
The direction of the flow of water run-off from the site and adjacent properties.	All surface water from the former fire station and flushing out area drained to the west to a low-lying area and drainage point at the site boundary. Water at the current fire station drains to low lying drainage channels both to the north east and west. A drain to the west of the buildings drains under the runway towards Mission Creek. Water from the maintenance sheds is collected in a network of drains which flows into a sump at the rear of the workshop. A drainage channel under the runway was observed at the western fence line of the area. Surface water at the waste management centre is assumed to drain to the south and west to low lying areas and ultimately into Mission Creek.
Presence and type of groundwater bores on the site and the condition of headworks.	One bore observed within site boundary (A_BORE1). It is believed to not currently be in use. Headworks were in a poor condition. One bore was observed off-site, adjacent to the northern site boundary (PWS_AIRPORT_BORE). Water is pumped onsite to a collection tank near the council offices from which it is used across the site and off-site via a publicly accessible fill point. The bore is also pumped to the fire station tanks where it is used within the fire station buildings and for firefighting purposes via hydrants.
The depth of any standing water, the direction and rate of flow of rivers, streams or canals, together with their flood levels and any tidal fluctuations	Standing water levels were not measured. No information on water levels was available from the CSIRO study at the time of this PSI.
Condition and construction of buildings, concrete and bitumen floors and roads etc.	The terminal buildings are generally well maintained with a concrete hardstand or bitumen. Older buildings, which made up the former fire station contain concrete hardstand, areas surrounding these buildings were unpaved (either bitumen or grass cover).

Feature of Interest (as per NEPM Schedule guidance)	Site Observations
	The maintenance sheds were generally well maintained. Observed buildings (those open at the time of inspection) had concrete hardstand floors. Concrete hardstand surrounding these buildings was in a good condition. Current fire station was well maintained with a concrete hardstand. The waste management centre had some areas of concrete hardstand and some areas of compacted gravel. The buildings were not inspected, but generally consisted of relatively current (last 20 years) steel or aluminium sheds.
Means of heating (fuel type) and cooling buildings on the site.	Not able to be confirmed. Heating is not required very often on Norfolk Island due to its sub-tropical climate.
Presence and condition of chemical containers, holding tanks, bunds, underground storage tanks and associate infrastructure and any other underground structures that may be associated with sub-surface contamination.	Aqueous film-forming foam (AFFF) was stored in IBCs at the fire station in a loft area and appeared to be in good condition, with no evidence of leaks as observed from the top / sides of the IBCs (IBCs were not lifted). The primary focus of the site inspection was for the use of AFFF, some additional chemical storage was observed and is discussed below. An underground fuel storage tank was observed to the west of the runway, adjacent to the terminal buildings. Infrastructure appeared to be in a fair condition. The waste management centre had storage of IBCs with waste oils with no or limited evidence of bunding or other environmental controls.
Condition of materials storage and handling facilities and any solid or liquid waste disposal areas.	A small flammable goods storage shed was located at the rear of the waste management facility and appeared to be in poor condition.
Any evidence of on-site spillage of dangerous goods and/or offsite migration.	There was evidence of historical spills to have occurred around the flammable goods storage shed at the waste management facility. No evidence of spills around the terminal buildings, maintenance sheds or current fire station.
Any differences between the present conditions and the information obtained from the site history.	None observed.

Appendix I: Site Photographs

Photo 1. Potential PFAS Source Area 1: Former Fire Station and Foam Shed – current council facility, tank filled by airport bore in background.

Photo 2. Potential PFAS Source Area 1: Former Fire Station and Foam Shed

Photo 3. Potential PFAS Source Area 1: Former Fire Station and Foam Shed – underground fuel storage area.

Photo 4. Potential PFAS Source Area 1: Former Fire Station and Foam Shed – concrete hardstand inside former firefighting building

Photo 5. Potential PFAS Source Area 2: Former Flushing Out Area – south west of the former fire station

Photo 6. Potential PFAS Source Area 2: Former Flushing Out Area – hose rinse pit.

Photo 7. Potential PFAS Source Area 2: Former Flushing Out Area – drainage line out of hose rinse pit

Photo 8. Potential PFAS Source Area 2: Former Drill Ground (Current Waste Management Centre)

Photo 9. Potential PFAS Source Area 3: Former Drill Ground (Current Waste Management Centre) – flammable liquid storage.

Photo 10. Potential PFAS Source Area 4: Current Drill Ground, occupied by Boral.

Photo 11. Potential PFAS Source Area 5: Maintenance Depot

Photo 12. Potential PFAS Source Area 5: Maintenance Depot – fire truck washdown area at rear of maintenance building

Photo 13. Potential PFAS Source Area 6: Current Fire Station

Photo 14. Potential PFAS Source Area 6: Current Fire Station – current hose wash infrastructure.

Photo 15. Potential PFAS Source Area 6: Current Fire Station – tank infrastructure and hydrant.

Photo 16. Potential PFAS Source Area 6: Current Fire Station – storage of Ansulite (AFFF)

Photo 17. Potential PFAS Source Area 8: St Barnabas Chapel Paddock, looking north towards Mission Creek.

Photo 18. Potential PFAS Source Area 9: Works Depot / Former Fire Truck Storage – tanks filled with airport bore water.

Photo 19. Potential PFAS Source Area 9: Works Depot / Former Fire Truck Storage – drain in front of former fire truck storage.

Photo 20. Potential PFAS Source Area 10: Ball Bay Refuelling Area

Photo 21. Potential PFAS Source Area 11: Stormwater Drains from airport along New Farm Road, looking north west.

Photo 22. Sample location PWS_POUND_BORE, sampled on 14 January 2020.

Photo 23. Sample location PWS_HESSIES_RESERVOIR, sampled on 14 January 2020.

Photo 24. Truck fill point at sample location PWS_DUCK_DAM, sampled on 14 January 2020.

Photo 25. Sample location PWS_HEAD_DAM, sampled on 14 January 2020.

Photo 26. Sample location PWS_KINGFISH_BORE, sampled on 14 January 2020.

Photo 27. Sample location A_BORE1 on airport land, sampled on 14 January 2020.

Photo 28 Sample location PWS_AIRPORT_BORE, concrete tank filled from airport bore. Sampled on 14 January 2020.

Photo 29. Mission Pool, sample locations MC_SD06 – MC_SD10, looking west towards Anson Bay Road.

Photo 30. Sample location PWS_HOSP_TANK1, main hospital tank sampled on 15 January 2020.

Photo 31. Sample location PWS_SCH_BORE, school bore, looking east towards oval. Sampled on 16 January 2020.

Photo 32. Sample location AD_SD02, drainage off of airport along New Farm Road, looking west. Sampled 20 January 2020.

Photo 33. Sample location A_SD01, drainage culvert under runway, looking east towards maintenance sheds. Sampled 22 January 2020.

Photo 34. Sample location A_SS25, adjacent to runway south of terminal buildings, looking north east. Sampled 22 January 2020.

Photo 35. Sample location A_SS45, south west of fire station, looking north east. Sampled 22 January 2020.

Appendix J: Fieldwork Methodology

Appendix J: Fieldwork Methodology

The following describes the methodology undertaken during the fieldworks program for on-site and off-site sampling during the targeted PSI investigation.

On-Site Sampling

Activity	Item	Description
Bore sampling	Dates	14 January 2020
	Sample IDs	A_BORE1 and PWS_AIRPORT_BORE
	Method	A total of two on-site bores were sampled during the investigation using two sampling techniques. • A_BORE1 was sampled using a disposable bailer. The disposable bailer was lowered into the well until it was fully submerged in water. Sample bottles were filled directly from the bailer. • PWS_AIRPORT_BORE was sampled from a concrete holding tank in the north eastern portion of the site as there was no direct access to the bore. Samples were collected from an opening on the top of the same directly into laboratory supplied sample bottles. All sample bottles were placed in individual zip locked backs and stored in a chilled esky.
Targeted Shallow Soil Sampling	Dates	22 and 23 January 2020
	Sample IDs	A_SS01 to A_SS63
	Method	Sample spatial locations were located on-site by using a Global Positioning System on a mobile smart phone. A total of 63 targeted shallow soil locations on-site were sampled during the targeted sampling field program. Locations were targeted based on outcomes of the site history review (**Table 1**). Targeted soil samples were collected directly below the ground surface cover (grass/ gravel) at depths <0.1 m. Soil samples were collected from directly under the grass/gravel surface cover using either a hand trowel or gloved hand. Soil was then placed into laboratory supplied jars, put in individual zip lock bags and placed on ice in a chilled esky.
Drain Sediment Sampling	Dates	20 and 22 January 2020
	Sample IDs	A_SD01 to A_SD10 and AD_SD01 to AD_SD10
	Method	Sample spatial locations were located on-site by using a Global Positioning System on a mobile smart phone. A total of 20 targeted drain sediment samples were collected from both on-site drains and off-site drains surrounding the site. Sediment samples were collected using either a hand trowel or gloved hand. Sediment was then placed into laboratory supplied jars, put in individual zip lock bags and placed on ice in a chilled esky.

Off-Site Sampling

Activity	Item	Description
Private Property and Public Water Tanks and Taps	Dates	14 – 24 January 2020
	Sample IDs	Public Water Supply – CHAP_TAP1, CHAP_TAP2, DEPOT_TANK1, DEPOT_TANK2, DEPOT_TAP, FRE_TAP1, FRE_TAP2, PWS_HOSP_TANK1 to PWS_HOSP_TANK5, PWS_HOSP_TAP, PWS_SCH_TANK, PWS_SCH_TAP. Private Properties - ID002_TANK, ID004_TANK, ID005_TANK
	Method	• Water tank samples were collected by turning on the outlet to flush it of water for approximately 30 seconds (1 to 1.5 litres of water) by using a smooth flowing water stream. Sample bottles for were filled directly using the smooth flowing water stream. • Where a tap was not present, a disposable bailer was lowered into the tank. Sample bottles were filled directly from the bailer. Samples collected were put into individual zip lock bags and placed on ice in a chilled esky.
Private Property, Public Bores & Water Carters	Dates	14 – 24 January 2020
	Sample IDs	Public Water Supply – PWS_POUND_BORE, PWS_KINGFISH_BORE B, PWS_HOSP_BORE, PWS_SCH_BORE Private Properties - ID001_BORE, ID003_BORE, ID003_WELL, ID006_BORE1, ID006_BORE2, ID009_WELL, ID010_BORE, ID013_BORE, ID014_BORE, ID015_BORE Water Carters - WC01, WC02, WC_03_BORE (Sample ID005_Tank was also known to have been recently filled by a fourth water carter).
	Method	• Bore samples were collected by turning on the outlet to flush it of water for approximately 30 seconds (1 to 1.5 litres of water) by using a smooth flowing water stream. Sample bottles for were filled directly using the smooth flowing water stream. • Where a tap was not present, a disposable bailer was lowered into the bore. Sample bottles were filled directly from the bailer. Samples collected were put into individual zip lock bags and placed on ice in a chilled esky.
Private Property and Public Surface Water Sampling	Dates	14 – 24 January 2020
	Sample IDs	Public Water Supply – BUMORAS_SW01, COCKPIT_SW01, PWS_HEAD_DAM, PWS_HESSIES_RESV, PWS_DUCK_DAM, PWS_WWII_DAM. Private Properties - ID003_SW01, ID007_SPRING, ID012_SW02, ID013_SW01. Creeks - TC_SW01, TC_SW02, BBC_SW01.
	Method	• Sample spatial locations were located by using a Global Positioning System on a mobile smart phone. • Surface water was collected by placing a laboratory supplied bottle approximately 5cm below the water surface. Samples collected were put into individual zip lock bags and placed on ice in a chilled esky.
Private Property Soil Sampling	Dates	20 – 21 January 2020
	Sample IDs	BALL_SS01, BALL_SS02, CHAP_SS01 – CHAP_SS05, ID008_SS01 – ID008_SS03
	Method	Soil samples were collected from 10 locations off-site. • Sample spatial locations were located by using a Global Positioning System on a mobile smart phone. • Targeted soil samples were collected directly below the ground surface cover (grass/ gravel) at depths <0.1 m. • Soil samples were collected from directly under the grass/gravel surface cover using either a hand trowel or gloved hand. Soil was then placed into laboratory supplied jars, put in individual zip lock bags and placed on ice in a chilled esky.

Activity	Item	Description
Private Property Sediment Sampling	Dates	20 – 21 January 2020
	Sample IDs	MC_SD01 – MC_SD10, ID010_SD01, ID011_SD01, ID011_SD02, ID012_SD01, ID012_SD02
	Method	Sediment samples were collected from 15 locations off-site. • Sample spatial locations were located by using a Global Positioning System on a mobile smart phone. • Where grass, reeds or vegetation growth covered the sediment, this material was moved aside using hand tools, with the sediment sample collected from directly underneath the vegetation layer (i.e. at 0-0.1 m bgl from the sediment layer). • The sediment was collected using a hand trowel or gloved hand. Sediment was then placed into laboratory supplied containers using disposable nitrile gloves.

General Investigation and Sampling Requirements

The following table details general investigation and sampling techniques associated with the site works.

Activity	Description and Further Information
Field Parameter Measurement	Field water quality parameters were measured using a water quality meter in conjunction with sampling for all surface water and bore water sampling. The parameters include pH, electrical conductivity, dissolved oxygen, oxidation reduction potential (redox) and temperature. Field observations were also noted of for both sediment and surface water including characteristics such as colour, particle size, odour, discoloration, presence of unusual materials such as waste, etc.
Photographs	A photograph of each sample location was taken for records and was included in the georeferenced database application where records of sampling were also collected.
Location Survey	A georeferenced database application was used on a portable device to establish all investigation sampling locations. The accuracy of such a method was within +/- 3-5 m of the proposed location coordinates, unless cloud cover or poor coverage reduced satellite accuracy.
Sample Handling and Preservation	• Samples were placed into laboratory-prepared and supplied jars and bottles. • Sample containers were filled to the top with no head space. • Each individual sample container collected was placed into a separate individual LDPE zip-lock bag. • Samples were collected and stored on ice blocks prior to and during transit to the laboratory to minimise sample degradation. • All samples collected were recorded on field logs sheets or in the sampling database and within the georeferenced database application. • Chain of Custody (COC) forms were completed for transport. • Samples were couriered from Norfolk Island to the laboratories in Sydney. Due to customs, samples took up to 10 days to reach the laboratory. • Quality control samples were collected during the sampling program, Quality assurance is detailed in **Appendix L**.
Waste Disposal	• No spoil was generated for surface water, surface soil and sediment sampling.

Activity	Description and Further Information
Avoidance of Cross Contamination	Sampling procedures used to prevent cross contamination considered the guidance provided in Appendix 1 of the Interim Guideline of the Assessment and Management of PFAS (WA DER, 2016) during site works and involve: • Samples were placed into laboratory-supplied jars / bottles appropriate for PFAS sampling (i.e. without Teflon liners). Sampling bottles for other contaminants were standard laboratory supplied containers. • All sample containers were stored in individual LDPE zip-lock bags. • Decontamination of re-usable sampling equipment was completed between sampling locations, using a Decon 90 and potable water wash, and a double rinse with potable water. • Use of dedicated disposable latex free gloves that were replaced between each sample collection and location. • Quality control samples were collected for each sample media to assess cross contamination as per the SAQP. • Quality control samples to assess cross contamination were collected during the sampling program as per **Appendix L** of the report. Decontamination procedures were performed in line with WA guidance, where Decon 90 solution was used. Results of field blank analysis are included in **Appendix K**.

Appendix K: Laboratory Analytical Results

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES2002822**	Page	: 1 of 6
Client	: **SENVERSA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: LUCINDA TRICKEY	Contact	: Brenda Hong
Address	: Level 5, Grafton Bond Building 201 Kent Street SYDNEY NSW 2000	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 03 9606 0070	Telephone	: +61 2 8784 8555
Project	: S17776 PSI	Date Samples Received	: 29-Jan-2020 16:45
Order number	: ----	Date Analysis Commenced	: 29-Jan-2020
C-O-C number	: ----	Issue Date	: 04-Feb-2020 10:31
Sampler	: LUCINDA TRICKEY		
Site	: ----		
Quote number	: SY/665/19		
No. of samples received	: 1		
No. of samples analysed	: 1		

NATA

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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Alex Rossi	Organic Chemist	Sydney Organics, Smithfield, NSW
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW
Wisam Marassa	Inorganics Coordinator	Sydney Inorganics, Smithfield, NSW

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 - Per- and Polyfluoroalkyl Substances (PFAS): Samples received in 20ml or 125ml bottles have been tested in accordance with the QSM5.3 compliant, NATA accredited method. 60mL or 250mL bottles have been tested to the legacy QSM 5.1 aligned, NATA accredited method.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.

Analytical Results

Sub-Matrix: WATER
(Matrix: WATER)

Compound	CAS Number	LOR	Unit	ID007_SPRING	----	----	----	----
Client sampling date / time				18-Jan-2020 00:00	----	----	----	----
				ES2002822-001	--------	--------	--------	--------
				Result	----	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**40**	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	**40**	----	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**14**	----	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**160**	----	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**6**	----	----	----	----
Magnesium	7439-95-4	1	mg/L	**13**	----	----	----	----
Sodium	7440-23-5	1	mg/L	**91**	----	----	----	----
Potassium	7440-09-7	1	mg/L	**2**	----	----	----	----
EN055: Ionic Balance								
ø Total Anions	----	0.01	meq/L	**5.60**	----	----	----	----
ø Total Cations	----	0.01	meq/L	**5.38**	----	----	----	----
ø Ionic Balance	----	0.01	%	**2.05**	----	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	----	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	----	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	----	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	----	----	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	----	----	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	----	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	----	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	----	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	----	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	----	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	ID007_SPRING	----	----	----	----
			Client sampling date / time	18-Jan-2020 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	ES2002822-001	--------	--------	--------	--------
				Result	----	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids - Continued								
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	----	----	----	----
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	----	----	----	----
EP231C: 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	----	----	----	----
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	----	----	----	----
EP231D: (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	----	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	ID007_SPRING	----	----	----	----
			Client sampling date / time	18-Jan-2020 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	ES2002822-001	--------	--------	--------	--------
				Result	----	----	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids - Continued								
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	----	----	----	----
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	<0.01	----	----	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	<0.01	----	----	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L	<0.01	----	----	----	----
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	**101**	----	----	----	----
13C8-PFOA	----	0.02	%	**107**	----	----	----	----

Surrogate Control Limits

Sub-Matrix: **WATER**

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

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **ES2002822**	Page	: 1 of 5
Client	: **SENVERSA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: LUCINDA TRICKEY	Telephone	: +61 2 8784 8555
Project	: S17776 PSI	Date Samples Received	: 29-Jan-2020
Site	: ----	Issue Date	: 04-Feb-2020
Sampler	: LUCINDA TRICKEY	No. of samples received	: 1
Order number	: ----	No. of samples analysed	: 1

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

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

Summary of Outliers

Outliers : Quality Control Samples

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

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **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

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

Outliers : Analysis Holding Time Compliance

Matrix: **WATER**

Method / Container / Client Sample ID(s)	Extraction / Preparation: Date extracted	Due for extraction	Days overdue	Analysis: Date analysed	Due for analysis	Days overdue
ED093F: Dissolved Major Cations						
Clear Plastic Bottle - Natural						
ID007_SPRING	----	----	----	31-Jan-2020	25-Jan-2020	**6**

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type / Method	Count: QC	Count: Regular	Rate (%): Actual	Rate (%): Expected	Quality Control Specification
Laboratory Duplicates (DUP)					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	1	20	5.00	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	0	20	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

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

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

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

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

Matrix: **WATER**

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation: Date extracted	Due for extraction	Evaluation	Analysis: Date analysed	Due for analysis	Evaluation
ED037P: Alkalinity by PC Titrator							
Clear Plastic Bottle - Natural (ED037-P)							
ID007_SPRING	**18-Jan-2020**	**----**	----	----	**29-Jan-2020**	01-Feb-2020	✓
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA							
Clear Plastic Bottle - Natural (ED041G)							
ID007_SPRING	**18-Jan-2020**	**----**	----	----	**30-Jan-2020**	15-Feb-2020	✓
ED045G: Chloride by Discrete Analyser							
Clear Plastic Bottle - Natural (ED045G)							
ID007_SPRING	**18-Jan-2020**	**----**	----	----	**30-Jan-2020**	15-Feb-2020	✓
ED093F: Dissolved Major Cations							
Clear Plastic Bottle - Natural (ED093F)							
ID007_SPRING	**18-Jan-2020**	**----**	----	----	**31-Jan-2020**	25-Jan-2020	×
EP231A: Perfluoroalkyl Sulfonic Acids							
HDPE (no PTFE) (EP231X)							
ID007_SPRING	**18-Jan-2020**	**30-Jan-2020**	16-Jul-2020	✓	**31-Jan-2020**	16-Jul-2020	✓

Matrix: **WATER**

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

Method Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP231B: Perfluoroalkyl Carboxylic Acids							
HDPE (no PTFE) (EP231X) ID007_SPRING	**18-Jan-2020**	**30-Jan-2020**	16-Jul-2020	✓	**31-Jan-2020**	16-Jul-2020	✓
EP231C: Perfluoroalkyl Sulfonamides							
HDPE (no PTFE) (EP231X) ID007_SPRING	**18-Jan-2020**	**30-Jan-2020**	16-Jul-2020	✓	**31-Jan-2020**	16-Jul-2020	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE (no PTFE) (EP231X) ID007_SPRING	**18-Jan-2020**	**30-Jan-2020**	16-Jul-2020	✓	**31-Jan-2020**	16-Jul-2020	✓
EP231P: PFAS Sums							
HDPE (no PTFE) (EP231X) ID007_SPRING	**18-Jan-2020**	**30-Jan-2020**	16-Jul-2020	✓	**31-Jan-2020**	16-Jul-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)							
Alkalinity by PC Titrator	ED037-P	1	5	**20.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	11	**18.18**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	9	**22.22**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	20	**5.00**	**10.00**	✗	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	2	5	**40.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	11	**18.18**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	9	**11.11**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Chloride by Discrete Analyser	ED045G	1	11	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	9	**11.11**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Chloride by Discrete Analyser	ED045G	1	11	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	0	20	**0.00**	**5.00**	✗	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

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

Analytical Methods	*Method*	*Matrix*	*Method Descriptions*
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM (2013) Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM (2013) Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G.The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride.in the presence of ferric ions the librated thiocyanate forms highly-coloured ferric thiocyanate which is measured at 480 nm APHA 21st edition seal method 2 017-1-L april 2003
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM (2013) Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM (2013) Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM (2013) Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	* EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM (2013) Schedule B(3)
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	WATER	In-house: Analysis of fresh and saline waters by Solid Phase Extraction (SPE) followed by LC-Electrospray-MS-MS, Negative Mode using MRM and internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.

Preparation Methods	*Method*	*Matrix*	*Method Descriptions*
Solid Phase Extraction (SPE) for PFAS in water	ORG72	WATER	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.

QUALITY CONTROL REPORT

Work Order	: **ES2002822**	Page	: 1 of 5
Client	: **SENVERSA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: LUCINDA TRICKEY	Contact	: Brenda Hong
Address	: Level 5, Grafton Bond Building 201 Kent Street SYDNEY NSW 2000	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 03 9606 0070	Telephone	: +61 2 8784 8555
Project	: S17776 PSI	Date Samples Received	: 29-Jan-2020
Order number	: ----	Date Analysis Commenced	: 29-Jan-2020
C-O-C number	: ----	Issue Date	: 04-Feb-2020
Sampler	: LUCINDA TRICKEY		
Site	: ----		
Quote number	: SY/665/19		
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*
Alex Rossi	Organic Chemist	Sydney Organics, Smithfield, NSW
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW
Wisam Marassa	Inorganics Coordinator	Sydney Inorganics, Smithfield, NSW

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 (%)*
ED037P: Alkalinity by PC Titrator (QC Lot: 2832186)									
ES2002751-002	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	9	8	0.00	No Limit
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	9	8	0.00	No Limit
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 2833986)									
ES2002447-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	2	3	0.00	No Limit
ES2002348-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	18	18	0.00	0% - 50%
ED045G: Chloride by Discrete Analyser (QC Lot: 2833987)									
ES2002348-001	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	21	21	0.00	0% - 20%
ES2002945-001	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	6	6	0.00	No Limit
ED093F: Dissolved Major Cations (QC Lot: 2834390)									
ES2002111-001	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	40	40	0.00	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	26	25	0.00	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	62	61	0.00	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	9	8	0.00	No Limit
ES2002822-001	ID007_SPRING	ED093F: Calcium	7440-70-2	1	mg/L	6	5	0.00	No Limit
		ED093F: Magnesium	7439-95-4	1	mg/L	13	12	0.00	0% - 50%
		ED093F: Sodium	7440-23-5	1	mg/L	91	88	3.21	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	2	2	0.00	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 2833089)									
ES2002813-001	Anonymous	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	1.93	1.78	8.24	0% - 20%
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	0.16	0.15	7.31	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	0.17	0.14	19.2	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	1.20	1.10	8.85	0% - 20%

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: 2833089) - continued									
ES2002813-001	Anonymous	EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	0.08	0.07	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 2833089)									
ES2002813-001	Anonymous	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	0.05	0.04	0.00	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	0.04	0.04	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	0.15	0.15	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
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 2833089)									
ES2002813-001	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
		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
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 2833089)									
ES2002813-001	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
EP231P: PFAS Sums (QC Lot: 2833089)									
ES2002813-001	Anonymous	EP231X: Sum of PFAS	----	0.01	µg/L	3.80	3.49	8.50	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
ED037P: Alkalinity by PC Titrator (QCLot: 2832186)								
ED037-P: Total Alkalinity as CaCO3	----	----	mg/L	----	200 mg/L	94.0	81.0	111
				----	50 mg/L	112	70.0	130
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 2833986)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	110	82.0	122
				<1	500 mg/L	93.7	82.0	122
ED045G: Chloride by Discrete Analyser (QCLot: 2833987)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	106	80.9	127
				<1	1000 mg/L	102	80.9	127
ED093F: Dissolved Major Cations (QCLot: 2834390)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	104	80.0	114
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	107	90.0	116
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	98.7	82.0	120
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	94.6	85.0	113
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 2833089)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	102	72.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	108	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	108	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	115	69.0	134
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	112	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	112	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 2833089)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	108	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	125	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	116	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	119	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	98.8	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	117	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	113	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	108	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	122	72.0	134
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	106	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	89.5	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 2833089)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	116	67.0	137

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report Result	Laboratory Control Spike (LCS) Report Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%) Low	Recovery Limits (%) High
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 2833089) - continued								
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	128	70.0	130
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	121	70.0	130
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	113	70.0	130
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	113	70.0	130
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	113	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	103	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 2833089)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	119	63.0	143
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.25 µg/L	118	67.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.25 µg/L	120	67.0	138
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.25 µg/L	116	70.0	130

Matrix Spike (MS) Report

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

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report Spike Concentration	SpikeRecovery(%) MS	Recovery Limits (%) Low	Recovery Limits (%) High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 2833986)							
ES2002348-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	10 mg/L	104	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 2833987)							
ES2002348-001	Anonymous	ED045G: Chloride	16887-00-6	250 mg/L	118	70.0	130

ALS Environmental

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **ES2002824**

Client	: **SENVERSA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: LUCINDA TRICKEY	Contact	: Brenda Hong
Address	: Level 5, Grafton Bond Building 201 Kent Street SYDNEY NSW 2000	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: lucinda.trickey@senversa.com.au	E-mail	: Brenda.Hong@ALSGlobal.com
Telephone	: +61 03 9606 0070	Telephone	: +61 2 8784 8555
Facsimile	: +61 03 9606 0074	Facsimile	: +61-2-8784 8500
Project	: S17776 PSI	Page	: 1 of 2
Order number	: ----	Quote number	: ES2019SENVER0020 (SY/665/19)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	: LUCINDA TRICKEY		

Dates

Date Samples Received	: 29-Jan-2020 16:45	Issue Date	: 29-Jan-2020
Client Requested Due Date	: 03-Feb-2020	Scheduled Reporting Date	: **03-Feb-2020**

Delivery Details

Mode of Delivery	: Undefined	Security Seal	: Intact.
No. of coolers/boxes	: ----	Temperature	: 17.9'C - Ice Bricks present
Receipt Detail	:	No. of samples received / analysed	: 3 / 3

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 refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**
- Please direct any queries you have regarding this work order to the above ALS laboratory contact.
- Analytical work for this work order will be conducted at ALS Sydney.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months ± 1 week) from receipt of samples.
- 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)
ES2002824-001	20-Jan-2020 00:00	ID008_SS01	✓	✓
ES2002824-002	20-Jan-2020 00:00	ID008_SS02	✓	✓
ES2002824-003	20-Jan-2020 00:00	ID008_SS03	✓	✓

Proactive Holding Time Report

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

Requested Deliverables

CHRISTOPHER SANDIFORD

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

LUCINDA TRICKEY

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

SUPPLIER ACCOUNTS

- A4 - AU Tax Invoice (INV)	Email	supplieraccounts@senversa.com.au

senversa

Chain of Custody Documentation

Senversa Pty Ltd
www.senversa.com.au
ABN 89 132 231 380

Laboratory: ALS NSW
Address: 277-289 Woodpark Road, Smithfield
Contact: Brenda Hong
Phone: 02 8784 8515

Job Number:	S17776	Purchase Order:	
Project Name:	PSI	Quote No:	SY-665-19 V2
Sampled By:	LT/CW	Turn Around Time:	Standard
Project Manager:	Lucinda Trickey	Page:	1 of 1
Email Report To:	lucinda.trickey@senversa.com.au	Phone/Mobile:	+61 424 172 065

Analysis Required

Lab ID	Sample ID	Matrix *	Date	Time	Type / Code	Total Bottles	EP231X - PFAS - Full Suite (28 Analytes)	Comments:
	ID008_SS01	S	20-1-20			1 JAR	X	
	ID008_SS02	S	20-1-20			1	X	
	ID008_SS03	S	20-1-20			1	X	
Total							0	

Environmental Division
Sydney
Work Order Reference
ES2002824

Telephone : + 61-2-8784 8555

Sampler: I attest that proper field sampling procedures in accordance with Senversa standard procedures and/or project specifications were used during the collection of these samples:	Sampler Name:	Lucinda Trickey	Signature:	Date: 20-1-20

Relinquished By:			Method of Shipment (if applicable):	Received by:	
Name/Signature:	Lucinda Trickey	Date: 24/01	Carrier / Reference #:	Name/Signature: loren	Date: 29/1/20
Of:	Senversa	Time: 9:00	Date/Time:	Of: ALS	Time: 16:45
Name/Signature:		Date:	Carrier / Reference #:	Name/Signature:	Date:
Of:		Time:	Date/Time:	Of:	Time:
Name/Signature:		Date:	Carrier / Reference #:	Name/Signature:	Date:
Of:		Time:	Date/Time:	Of:	Time:

Water Container Codes: P = Unpreserved Plastic; N = Nitric Acid (HNO_3) Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide (NaOH)/Cadmium (Cd) Preserved; S = Sodium Hydroxide Preserved Plastic; STH = Sodium thiosulfate preserved plastic;
V = VOA Vial Hydochloric Acid (HCl) Preserved; VS = VOA Vial Sulphuric Preserved; VSA = Sulphuric Preserved Amber Glass; H = HCl Preserved Plastic; HS = HCl Preserved Speciation Bottle; SP = Sulphuric Preserved Plastic;
F = Formaldehyde Preserved Glass; Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; UA = Unpreserved Amber Glass; L=Lugol's iodine preserved white plastic bottle; SW= sulfuric acid preserved wide mouth glass jar

Completed by: ________
Checked by: ________

CERTIFICATE OF ANALYSIS

Work Order	: **ES2002824**	Page	: 1 of 5
Client	: **SENVERSA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: LUCINDA TRICKEY	Contact	: Brenda Hong
Address	: Level 5, Grafton Bond Building 201 Kent Street SYDNEY NSW 2000	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 03 9606 0070	Telephone	: +61 2 8784 8555
Project	: S17776 PSI	Date Samples Received	: 29-Jan-2020 16:45
Order number	: ----	Date Analysis Commenced	: 30-Jan-2020
C-O-C number	: ----	Issue Date	: 03-Feb-2020 16:39
Sampler	: LUCINDA TRICKEY		
Site	: ----		
Quote number	: SY/665/19		
No. of samples received	: 3		
No. of samples analysed	: 3		

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

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. 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 Inorganics, Smithfield, NSW
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW

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.

- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	ID008_SS01	ID008_SS02	ID008_SS03	----	----
			Client sampling date / time	20-Jan-2020 00:00	20-Jan-2020 00:00	20-Jan-2020 00:00	----	----
Compound	CAS Number	LOR	Unit	ES2002824-001	ES2002824-002	ES2002824-003	--------	--------
				Result	Result	Result	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	8.6	11.0	4.8	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	**0.0015**	<0.0002	**0.0003**	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	<0.001	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	**0.0002**	<0.0002	<0.0002	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	----	----
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	ID008_SS01	ID008_SS02	ID008_SS03	----	----
			Client sampling date / time	20-Jan-2020 00:00	20-Jan-2020 00:00	20-Jan-2020 00:00	----	----
Compound	CAS Number	LOR	Unit	ES2002824-001	ES2002824-002	ES2002824-003	--------	--------
				Result	Result	Result	----	----
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	----	----
EP231P: PFAS Sums								
Sum of PFAS	----	0.0002	mg/kg	**0.0017**	<0.0002	**0.0003**	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	**0.0015**	<0.0002	**0.0003**	----	----
Sum of PFAS (WA DER List)	----	0.0002	mg/kg	**0.0017**	<0.0002	**0.0003**	----	----
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.0002	%	**106**	**116**	**116**	----	----
13C8-PFOA	----	0.0002	%	**115**	**120**	**112**	----	----

Surrogate Control Limits

Sub-Matrix: **SOIL**

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

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **ES2002824**	Page	: 1 of 4
Client	: **SENVERSA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: LUCINDA TRICKEY	Telephone	: +61 2 8784 8555
Project	: S17776 PSI	Date Samples Received	: 29-Jan-2020
Site	: ----	Issue Date	: 03-Feb-2020
Sampler	: LUCINDA TRICKEY	No. of samples received	: 3
Order number	: ----	No. of samples analysed	: 3

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

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

Summary of Outliers

Outliers : Quality Control Samples

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

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

Outliers : Analysis Holding Time Compliance

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

Outliers : Frequency of Quality Control Samples

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

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.
This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.
Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.
Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

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

Method		*Sample Date*	*Extraction / Preparation*			*Analysis*		
Container / Client Sample ID(s)			*Date extracted*	*Due for extraction*	*Evaluation*	*Date analysed*	*Due for analysis*	*Evaluation*
EA055: Moisture Content (Dried @ 105-110°C)								
HDPE Soil Jar (EA055) ID008_SS01, ID008_SS03	ID008_SS02,	**20-Jan-2020**	**----**	----	----	**30-Jan-2020**	03-Feb-2020	✓
EP231A: Perfluoroalkyl Sulfonic Acids								
HDPE Soil Jar (EP231X) ID008_SS01, ID008_SS03	ID008_SS02,	**20-Jan-2020**	**31-Jan-2020**	18-Jul-2020	✓	**31-Jan-2020**	11-Mar-2020	✓
EP231B: Perfluoroalkyl Carboxylic Acids								
HDPE Soil Jar (EP231X) ID008_SS01, ID008_SS03	ID008_SS02,	**20-Jan-2020**	**31-Jan-2020**	18-Jul-2020	✓	**31-Jan-2020**	11-Mar-2020	✓
EP231C: Perfluoroalkyl Sulfonamides								
HDPE Soil Jar (EP231X) ID008_SS01, ID008_SS03	ID008_SS02,	**20-Jan-2020**	**31-Jan-2020**	18-Jul-2020	✓	**31-Jan-2020**	11-Mar-2020	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
HDPE Soil Jar (EP231X) ID008_SS01, ID008_SS03	ID008_SS02,	**20-Jan-2020**	**31-Jan-2020**	18-Jul-2020	✓	**31-Jan-2020**	11-Mar-2020	✓
EP231P: PFAS Sums								
HDPE Soil Jar (EP231X) ID008_SS01, ID008_SS03	ID008_SS02,	**20-Jan-2020**	**31-Jan-2020**	18-Jul-2020	✓	**31-Jan-2020**	11-Mar-2020	✓

Quality Control Parameter Frequency Compliance

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

Matrix: **SOIL**

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

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Moisture Content	EA055	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	18	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

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

Analytical Methods	*Method*	*Matrix*	*Method Descriptions*
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: Analysis of soils by solvent extraction followed by LC-Electrospray-MS-MS, Negative Mode using MRM using internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to a portion of soil which is then extracted with MTBE and an ion pairing reagent. A portion of extract is exchanged into the analytical solvent mixture, combined with an equal volume reagent water and filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.

Preparation Methods	*Method*	*Matrix*	*Method Descriptions*
Sample Extraction for PFAS in solid matrices	ORG73	SOIL	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to a portion of soil which is then extracted with MTBE and an ion pairing reagent. A portion of extract is exchanged into the analytical solvent mixture, combined with an equal volume reagent water and filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **ES2002824**	Page	: 1 of 7
Client	: **SENVERSA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: LUCINDA TRICKEY	Contact	: Brenda Hong
Address	: Level 5, Grafton Bond Building 201 Kent Street SYDNEY NSW 2000	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 03 9606 0070	Telephone	: +61 2 8784 8555
Project	: S17776 PSI	Date Samples Received	: 29-Jan-2020
Order number	: ----	Date Analysis Commenced	: 30-Jan-2020
C-O-C number	: ----	Issue Date	: 03-Feb-2020
Sampler	: LUCINDA TRICKEY		
Site	: ----		
Quote number	: SY/665/19		
No. of samples received	: 3		
No. of samples analysed	: 3		

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*
Franco Lentini	LCMS Coordinator	Sydney Inorganics, Smithfield, NSW
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW

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: 2834264)									
ES2002810-014	Anonymous	EA055: Moisture Content	----	0.1	%	13.6	13.8	1.85	0% - 20%
ES2002812-010	Anonymous	EA055: Moisture Content	----	0.1	%	13.0	12.1	7.14	0% - 20%
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 2833566)									
ES2002812-001	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	0.0004	0.0004	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
ES2002824-001	ID008_SS01	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	0.0015	0.0020	23.7	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: 2833566)									
ES2002812-001	Anonymous	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 2833566) - continued									
ES2002812-001	Anonymous	EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.00	No Limit
ES2002824-001	ID008_SS01	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	0.0002	0.0002	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.00	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 2833566)									
ES2002812-001	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
ES2002824-001	ID008_SS01	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report					
				LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 2833566)									
ES2002812-001	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
ES2002824-001	ID008_SS01	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit

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: 2833566)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	0.00125 mg/kg	78.4	70.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	86.4	70.0	130
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	107	70.0	130
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	84.4	70.0	130
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	79.2	70.0	130
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	127	70.0	130
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 2833566)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	0.00625 mg/kg	118	70.0	130
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	103	70.0	130
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	82.0	70.0	130
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	87.6	70.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	83.2	70.0	130
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	79.2	70.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	0.00125 mg/kg	81.6	70.0	130
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	121	70.0	130
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	111	70.0	130
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	78.4	70.0	130
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	109	70.0	130
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 2833566)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	111	70.0	130
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	0.00312 mg/kg	89.4	70.0	130
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	122	70.0	130
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	84.8	70.0	130
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	70.4	70.0	130
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	112	70.0	130
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	109	70.0	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 2833566)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	76.4	70.0	130
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	0.00125 mg/kg	76.4	70.0	130
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	74.8	70.0	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: 2833566) - continued								
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	0.00125 mg/kg	85.2	70.0	130

Matrix Spike (MS) Report

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

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report Spike Concentration	SpikeRecovery(%) MS	Recovery Limits (%) Low	Recovery Limits (%) High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 2833566)							
ES2002812-001	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.00125 mg/kg	89.6	50.0	130
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.00125 mg/kg	106	50.0	130
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.00125 mg/kg	119	50.0	130
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.00125 mg/kg	96.8	50.0	130
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.00125 mg/kg	83.2	50.0	130
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.00125 mg/kg	97.2	50.0	130
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 2833566)							
ES2002812-001	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.00625 mg/kg	120	30.0	130
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.00125 mg/kg	121	50.0	130
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.00125 mg/kg	103	50.0	130
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.00125 mg/kg	93.2	50.0	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.00125 mg/kg	95.6	50.0	130
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.00125 mg/kg	93.6	50.0	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.00125 mg/kg	92.0	50.0	130
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.00125 mg/kg	118	50.0	130
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.00125 mg/kg	106	50.0	130
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.00125 mg/kg	71.6	30.0	130
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.00312 mg/kg	97.8	30.0	130
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 2833566)							
ES2002812-001	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.00125 mg/kg	116	50.0	130
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.00312 mg/kg	89.4	30.0	130
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.00312 mg/kg	111	30.0	130
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.00312 mg/kg	87.3	30.0	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.00312 mg/kg	78.7	30.0	130
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.00125 mg/kg	126	30.0	130

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report Spike Concentration	SpikeRecovery(%) MS	Recovery Limits (%) Low	High
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 2833566) - continued							
ES2002812-001	Anonymous	EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.00125 mg/kg	130	30.0	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 2833566)							
ES2002812-001	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.00125 mg/kg	102	50.0	130
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.00125 mg/kg	86.8	50.0	130
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.00125 mg/kg	89.2	50.0	130
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.00125 mg/kg	111	50.0	130

ALS Environmental

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **ES2002826**

Client	: **SENVERSA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: LUCINDA TRICKEY	Contact	: Brenda Hong
Address	: Level 5, Grafton Bond Building 201 Kent Street SYDNEY NSW 2000	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: lucinda.trickey@senversa.com.au	E-mail	: Brenda.Hong@ALSGlobal.com
Telephone	: +61 03 9606 0070	Telephone	: +61 2 8784 8555
Facsimile	: +61 03 9606 0074	Facsimile	: +61-2-8784 8500
Project	: S17776 PSI	Page	: 1 of 2
Order number	: ----	Quote number	: ES2019SENVER0020 (SY/665/19)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	: LUCINDA TRICKEY		

Dates

Date Samples Received	: 29-Jan-2020 16:45	Issue Date	: 29-Jan-2020
Client Requested Due Date	: 03-Feb-2020	Scheduled Reporting Date	: **03-Feb-2020**

Delivery Details

Mode of Delivery	: Undefined	Security Seal	: Intact.
No. of coolers/boxes	: ----	Temperature	: 27.9'c - Ice Bricks present
Receipt Detail	:	No. of samples received / analysed	: 1 / 1

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**
- **Unable to add major cations and anions as no green bottle was received.**
- Please direct any queries you have regarding this work order to the above ALS laboratory contact.
- Analytical work for this work order will be conducted at ALS Sydney.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months ± 1 week) from receipt of samples.
- 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 PFAS - Full Suite (28 analytes)
ES2002826-001	20-Jan-2020 00:00	ID009_Well	✓

Proactive Holding Time Report

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

Requested Deliverables

CHRISTOPHER SANDIFORD

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

LUCINDA TRICKEY

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

SUPPLIER ACCOUNTS

- A4 - AU Tax Invoice (INV)	Email	supplieraccounts@senversa.com.au

senversa

Senversa Pty Ltd
www.senversa.com.au
ABN 89 132 231 380

Chain of Custody Documentation

Laboratory: ALS NSW
Address: 277-289 Woodpark Road, Smithfield
Contact: Brenda Hong
Phone: 02 8784 8515

Job Number:	S17776	Purchase Order:	
Project Name:	PSI	Quote No:	SY-665-19 V2
Sampled By:	LT/CW	Turn Around Time:	Standard
Project Manager:	Lucinda Trickey	Page:	1 of 1
Email Report To:	lucinda.trickey@senversa.com.au	Phone/Mobile:	+61 424 172 065

Sample Information					Container Information		Analysis Required		Comments:
Lab ID	Sample ID	Matrix *	Date	Time	Type / Code	Total Bottles	EP231X - PFAS - Full Suite (28 Analytes)	Major anions + cations	
	ID009-Well	W	20-1-20			3	X	X	
Total							0		

Environmental Division
Sydney
Work Order Reference
ES2002826
Telephone : +61-2-8784 8555

Sampler: I attest that proper field sampling procedures in accordance with Senversa standard procedures and/or project specifications were used during the collection of these samples:

Sampler Name: Lucinda Trickey Signature: [signature] Date: 20-1-20

Relinquished By:			Method of Shipment (if applicable):	Received by:	
Name/Signature: Lucinda Trickey	Date: 24/01		Carrier / Reference #:	Name/Signature: Lwin	Date: 24/1/20
Of: Senversa	Time: 9:00		Date/Time:	Of: ALS	Time: 16:45
Name/Signature:	Date:		Carrier / Reference #:	Name/Signature:	Date:
Of:	Time:		Date/Time:	Of:	Time:
Name/Signature:	Date:		Carrier / Reference #:	Name/Signature:	Date:
Of:	Time:		Date/Time:	Of:	Time:

Water Container Codes: P = Unpreserved Plastic; N = Nitric Acid (HNO_3) Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide (NaOH)/Cadmium (Cd) Preserved; S = Sodium Hydroxide Preserved Plastic; STH = Sodium thiosulfate preserved plastic; V = VOA Vial Hydochloric Acid (HCl) Preserved; VS = VOA Vial Sulphuric Preserved; VSA = Sulphuric Preserved Amber Glass; H = HCl Preserved Plastic; HS = HCl Preserved Speciation Bottle; SP = Sulphuric Preserved Plastic; F = Formaldehyde Preserved Glass; Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; UA = Unpreserved Amber Glass; L=Lugol's Iodine preserved white plastic bottle; SW= sulfuric acid preserved wide mouth glass jar

Completed by: ________
Checked by: ________

CERTIFICATE OF ANALYSIS

Work Order	: **ES2002826**	Page	: 1 of 5
Client	: **SENVERSA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: LUCINDA TRICKEY	Contact	: Brenda Hong
Address	: Level 5, Grafton Bond Building 201 Kent Street SYDNEY NSW 2000	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 03 9606 0070	Telephone	: +61 2 8784 8555
Project	: S17776 PSI	Date Samples Received	: 29-Jan-2020 16:45
Order number	: ----	Date Analysis Commenced	: 30-Jan-2020
C-O-C number	: ----	Issue Date	: 02-Feb-2020 12:56
Sampler	: LUCINDA TRICKEY		
Site	: ----		
Quote number	: SY/665/19		
No. of samples received	: 1		
No. of samples analysed	: 1		

NATA

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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Alex Rossi	Organic Chemist	Sydney Organics, Smithfield, NSW

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 - Per- and Polyfluoroalkyl Substances (PFAS): Samples received in 20ml or 125ml bottles have been tested in accordance with the QSM5.3 compliant, NATA accredited method. 60mL or 250mL bottles have been tested to the legacy QSM 5.1 aligned, NATA accredited method.
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.

Analytical Results

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

Compound	CAS Number	LOR	Unit	ID009_Well	----	----	----	----
			Client sampling date / time	20-Jan-2020 00:00	----	----	----	----
				ES2002826-001	--------	--------	--------	--------
				Result	----	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	----	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	----	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	----	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	----	----	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	----	----	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	----	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	----	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	----	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	----	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	----	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	----	----	----	----
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	----	----	----	----
EP231C: 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	ID009_Well	----	----	----	----
			Client sampling date / time	20-Jan-2020 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	ES2002826-001	--------	--------	--------	--------
				Result	----	----	----	----
EP231C: 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	----	----	----	----
EP231D: (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	----	----	----	----
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	<0.01	----	----	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	<0.01	----	----	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L	<0.01	----	----	----	----
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	**98.5**	----	----	----	----
13C8-PFOA	----	0.02	%	**106**	----	----	----	----

Surrogate Control Limits

Sub-Matrix: **WATER**

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

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **ES2002826**	Page	: 1 of 4
Client	: **SENVERSA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: LUCINDA TRICKEY	Telephone	: +61 2 8784 8555
Project	: S17776 PSI	Date Samples Received	: 29-Jan-2020
Site	: ----	Issue Date	: 02-Feb-2020
Sampler	: LUCINDA TRICKEY	No. of samples received	: 1
Order number	: ----	No. of samples analysed	: 1

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

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

Summary of Outliers

Outliers : Quality Control Samples

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

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

Outliers : Analysis Holding Time Compliance

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

Outliers : Frequency of Quality Control Samples

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

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
EP231A: Perfluoroalkyl Sulfonic Acids	ES2002831--002	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	ES2002831--002	Anonymous	**Perfluorooctane sulfonic acid (PFOS)**	1763-23-1	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**

Analysis Holding Time Compliance

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

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

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

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

Matrix: **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) ID009_Well	**20-Jan-2020**	**30-Jan-2020**	18-Jul-2020	✓	**31-Jan-2020**	18-Jul-2020	✓
EP231B: Perfluoroalkyl Carboxylic Acids							
HDPE (no PTFE) (EP231X) ID009_Well	**20-Jan-2020**	**30-Jan-2020**	18-Jul-2020	✓	**31-Jan-2020**	18-Jul-2020	✓
EP231C: Perfluoroalkyl Sulfonamides							
HDPE (no PTFE) (EP231X) ID009_Well	**20-Jan-2020**	**30-Jan-2020**	18-Jul-2020	✓	**31-Jan-2020**	18-Jul-2020	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE (no PTFE) (EP231X) ID009_Well	**20-Jan-2020**	**30-Jan-2020**	18-Jul-2020	✓	**31-Jan-2020**	18-Jul-2020	✓
EP231P: PFAS Sums							
HDPE (no PTFE) (EP231X) ID009_Well	**20-Jan-2020**	**30-Jan-2020**	18-Jul-2020	✓	**31-Jan-2020**	18-Jul-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)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	5	**20.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	5	**20.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	5	**20.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	5	**20.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

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

Analytical Methods	*Method*	*Matrix*	*Method Descriptions*
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	WATER	In-house: Analysis of fresh and saline waters by Solid Phase Extraction (SPE) followed by LC-Electrospray-MS-MS, Negative Mode using MRM and internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.

Preparation Methods	*Method*	*Matrix*	*Method Descriptions*
Solid Phase Extraction (SPE) for PFAS in water	ORG72	WATER	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **ES2002826**	Page	: 1 of 6
Client	: **SENVERSA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: LUCINDA TRICKEY	Contact	: Brenda Hong
Address	: Level 5, Grafton Bond Building 201 Kent Street SYDNEY NSW 2000	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 03 9606 0070	Telephone	: +61 2 8784 8555
Project	: S17776 PSI	Date Samples Received	: 29-Jan-2020
Order number	: ----	Date Analysis Commenced	: 30-Jan-2020
C-O-C number	: ----	Issue Date	: 02-Feb-2020
Sampler	: LUCINDA TRICKEY		
Site	: ----		
Quote number	: SY/665/19		
No. of samples received	: 1		
No. of samples analysed	: 1		

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*
Alex Rossi	Organic Chemist	Sydney Organics, Smithfield, NSW

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 (%)
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 2833090)									
ES2002831-001	Anonymous	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	0.00	No Limit
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 2833090)									
ES2002831-001	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	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.00	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 2833090)									
ES2002831-001	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 sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 2833090) - continued									
ES2002831-001	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
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 2833090)									
ES2002831-001	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
EP231P: PFAS Sums (QC Lot: 2833090)									
ES2002831-001	Anonymous	EP231X: Sum of PFAS	----	0.01	µg/L	<0.01	<0.01	0.00	No Limit

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

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

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 2833090)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	103	72.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	107	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	104	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	113	69.0	134
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	105	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	108	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 2833090)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	108	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	120	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	117	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	122	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	101	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	119	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	117	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	110	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	118	72.0	134
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	106	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	90.7	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 2833090)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	115	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	126	70.0	130
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	115	70.0	130
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	126	70.0	130
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	117	70.0	130
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	119	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	103	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 2833090)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	111	63.0	143
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.25 µg/L	120	67.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.25 µg/L	122	67.0	138

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
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 2833090) - continued								
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.25 µg/L	127	70.0	130

Matrix Spike (MS) Report

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

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
				Concentration	MS	Low	High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 2833090)							
ES2002831-002	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.25 µg/L	105	50.0	130
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.25 µg/L	103	50.0	130
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.25 µg/L	# Not Determined	50.0	130
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.25 µg/L	120	50.0	130
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.25 µg/L	# Not Determined	50.0	130
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.25 µg/L	121	50.0	130
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 2833090)							
ES2002831-002	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	1.25 µg/L	113	50.0	130
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.25 µg/L	123	50.0	130
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.25 µg/L	123	50.0	130
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.25 µg/L	121	50.0	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.25 µg/L	98.0	50.0	130
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.25 µg/L	120	50.0	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.25 µg/L	113	50.0	130
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.25 µg/L	113	50.0	130
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.25 µg/L	114	50.0	130
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.25 µg/L	106	50.0	130
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.625 µg/L	88.0	50.0	150
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 2833090)							
ES2002831-002	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.25 µg/L	121	50.0	130
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.625 µg/L	123	50.0	150
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.625 µg/L	103	50.0	150
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.625 µg/L	130	50.0	150
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.625 µg/L	135	50.0	150

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%) MS	Recovery Limits (%) Low	High
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 2833090) - continued							
ES2002831-002	Anonymous	EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.25 µg/L	104	50.0	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.25 µg/L	98.4	50.0	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 2833090)							
ES2002831-002	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.25 µg/L	113	50.0	130
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.25 µg/L	124	50.0	130
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.25 µg/L	128	50.0	130
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.25 µg/L	125	50.0	130

ALS Environmental

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **ES2002827**

Client	: **SENVERSA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: LUCINDA TRICKEY	Contact	: Brenda Hong
Address	: Level 5, Grafton Bond Building 201 Kent Street SYDNEY NSW 2000	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: lucinda.trickey@senversa.com.au	E-mail	: Brenda.Hong@ALSGlobal.com
Telephone	: +61 03 9606 0070	Telephone	: +61 2 8784 8555
Facsimile	: +61 03 9606 0074	Facsimile	: +61-2-8784 8500
Project	: S17776 PSI	Page	: 1 of 3
Order number	: ----	Quote number	: ES2019SENVER0020 (SY/665/19)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	: LUCINDA TRICKEY		

Dates

Date Samples Received	: 29-Jan-2020 16:45	Issue Date	: 29-Jan-2020
Client Requested Due Date	: 03-Feb-2020	Scheduled Reporting Date	: **03-Feb-2020**

Delivery Details

Mode of Delivery	: Undefined	Security Seal	: Intact.
No. of coolers/boxes	: ----	Temperature	: 27.9'C - Ice Bricks present
Receipt Detail	:	No. of samples received / analysed	: 2 / 2

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 refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**
- Please direct any queries you have regarding this work order to the above ALS laboratory contact.
- Analytical work for this work order will be conducted at ALS Sydney.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months ± 1 week) from receipt of samples.
- 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)
ES2002827-002	20-Jan-2020 00:00	ID010_SD01	✓	✓

Matrix: **WATER**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	WATER - EP231X PFAS - Full Suite (28 analytes)	WATER - NT-01 & 02 Ca, Mg, Na, K, Cl, SO4, Alkalinity
ES2002827-001	20-Jan-2020 00:00	ID010_BORE	✓	✓

Proactive Holding Time Report

The following table summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory.

Matrix: **WATER**

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

Method Client Sample ID(s)	Container	Due for extraction	Due for analysis	Samples Received		Instructions Received	
				Date	Evaluation	Date	Evaluation
ED093F: Major Cations - Dissolved							
ID010_BORE	Clear Plastic Bottle - Natural	----	27-Jan-2020	29-Jan-2020	×	----	----

Requested Deliverables

CHRISTOPHER SANDIFORD		
- *AU Certificate of Analysis - NATA (COA)	Email	christopher.sandiford@senversa.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	christopher.sandiford@senversa.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	christopher.sandiford@senversa.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	christopher.sandiford@senversa.com.au
- Chain of Custody (CoC) (COC)	Email	christopher.sandiford@senversa.com.au
- EDI Format - ENMRG (ENMRG)	Email	christopher.sandiford@senversa.com.au
- EDI Format - ESDAT (ESDAT)	Email	christopher.sandiford@senversa.com.au
LUCINDA TRICKEY		
- *AU Certificate of Analysis - NATA (COA)	Email	lucinda.trickey@senversa.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	lucinda.trickey@senversa.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	lucinda.trickey@senversa.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	lucinda.trickey@senversa.com.au
- A4 - AU Tax Invoice (INV)	Email	lucinda.trickey@senversa.com.au
- Chain of Custody (CoC) (COC)	Email	lucinda.trickey@senversa.com.au
- EDI Format - ENMRG (ENMRG)	Email	lucinda.trickey@senversa.com.au
- EDI Format - ESDAT (ESDAT)	Email	lucinda.trickey@senversa.com.au
SUPPLIER ACCOUNTS		
- A4 - AU Tax Invoice (INV)	Email	supplieraccounts@senversa.com.au

senversa

Chain of Custody Documentation

Senversa Pty Ltd
www.senversa.com.au
ABN 89 132 231 380

Laboratory: ALS NSW
Address: 277-289 Woodpark Road, Smithfield
Contact: Brenda Hong
Phone: 02 8784 8515

Job Number:	S17776	**Purchase Order:**	
Project Name:	PSI	**Quote No:**	SY-665-19 V2
Sampled By:	LT/CW	**Turn Around Time:**	Standard
Project Manager:	Lucinda Trickey	**Page:**	1 of 1
Email Report To:	lucinda.trickey@senversa.com.au	**Phone/Mobile:**	+61 424 172 065

Analysis Required

Sample Information					Container Information		Analysis Required		
Lab ID	**Sample ID**	**Matrix ***	**Date**	**Time**	**Type / Code**	**Total Bottles**	EP231X - PFAS - Full Suite (28 Analytes)	Major anions + cations	Comments:
	ID010-BORE	W	20-1-20			3	X	X	
	ID010-SD01	S	20-1-20			1	X		
Total							0		

Environmental Division
Sydney
Work Order Reference
ES2002827

Telephone : + 61-2-8784 8555

Sampler: I attest that proper field sampling procedures in accordance with Senversa standard procedures and/or project specifications were used during the collection of these samples:	**Sampler Name:**	Lucinda Trickey	**Signature:**		**Date:** 20-1-20

Relinquished By:			**Method of Shipment (if applicable):**	**Received by:**	
Name/Signature:	Lucinda Trickey	Date: 21/01	Carrier / Reference #:	Name/Signature: Lolan	Date: 21/1/20
Of:	Senversa	Time: 9:00	Date/Time:	Of: ALS	Time: 16:45
Name/Signature:		Date:	Carrier / Reference #:	Name/Signature:	Date:
Of:		Time:	Date/Time:	Of:	Time:
Name/Signature:		Date:	Carrier / Reference #:	Name/Signature:	Date:
Of:		Time:	Date/Time:	Of:	Time:

Water Container Codes: P = Unpreserved Plastic; N = Nitric Acid (HNO_3) Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide (NaOH)/Cadmium (Cd) Preserved; S = Sodium Hydroxide Preserved Plastic; STH = Sodium thiosulfate preserved plastic; V = VOA Vial Hydochloric Acid (HCl) Preserved; VS = VOA Vial Sulphuric Preserved; VSA = Sulphuric Preserved Amber Glass; H = HCl Preserved Plastic; HS = HCl Preserved Speciation Bottle; SP = Sulphuric Preserved Plastic; F = Formaldehyde Preserved Glass; Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; UA = Unpreserved Amber Glass; L=Lugol's Iodine preserved white plastic bottle; SW= sulfuric acid preserved wide mouth glass jar

Completed by: ________
Checked by: ________

CERTIFICATE OF ANALYSIS

Work Order	: **ES2002827**	Page	: 1 of 8
Client	: **SENVERSA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: LUCINDA TRICKEY	Contact	: Brenda Hong
Address	: Level 5, Grafton Bond Building 201 Kent Street SYDNEY NSW 2000	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 03 9606 0070	Telephone	: +61 2 8784 8555
Project	: S17776 PSI	Date Samples Received	: 29-Jan-2020 16:45
Order number	: ----	Date Analysis Commenced	: 29-Jan-2020
C-O-C number	: ----	Issue Date	: 03-Feb-2020 19:18
Sampler	: LUCINDA TRICKEY		
Site	: ----		
Quote number	: SY/665/19		
No. of samples received	: 2		
No. of samples analysed	: 2		

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*
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics, Smithfield, NSW
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW

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 - Per- and Polyfluoroalkyl Substances (PFAS): Samples received in 20ml or 125ml bottles have been tested in accordance with the QSM5.3 compliant, NATA accredited method. 60mL or 250mL bottles have been tested to the legacy QSM 5.1 aligned, NATA accredited method.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	ID010_SD01	----	----	----	----
			Client sampling date / time	20-Jan-2020 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	ES2002827-002	--------	--------	--------	--------
				Result	----	----	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	25.5	----	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	----	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	----	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	----	----	----	----
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	----	----	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	----	----	----	----

Analytical Results

Sub-Matrix: SOIL
(Matrix: SOIL)

Compound	CAS Number	LOR	Unit	ID010_SD01	----	----	----	----
Client sampling date / time				20-Jan-2020 00:00	----	----	----	----
				ES2002827-002	--------	--------	--------	--------
				Result	----	----	----	----
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	----	----	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	----	----	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	----	----	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	----	----	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	----	----	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	----	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	----	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	----	----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	----	----	----	----
EP231P: PFAS Sums								
Sum of PFAS	----	0.0002	mg/kg	<0.0002	----	----	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	<0.0002	----	----	----	----
Sum of PFAS (WA DER List)	----	0.0002	mg/kg	<0.0002	----	----	----	----
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.0002	%	**100**	----	----	----	----
13C8-PFOA	----	0.0002	%	**114**	----	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	ID010_BORE	----	----	----	----
			Client sampling date / time	20-Jan-2020 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	ES2002827-001	--------	--------	--------	--------
				Result	----	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**35**	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	**35**	----	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**35**	----	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**124**	----	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**8**	----	----	----	----
Magnesium	7439-95-4	1	mg/L	**12**	----	----	----	----
Sodium	7440-23-5	1	mg/L	**83**	----	----	----	----
Potassium	7440-09-7	1	mg/L	**2**	----	----	----	----
EN055: Ionic Balance								
ø Total Anions	----	0.01	meq/L	**4.92**	----	----	----	----
ø Total Cations	----	0.01	meq/L	**5.05**	----	----	----	----
ø Ionic Balance	----	0.01	%	**1.23**	----	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	----	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	----	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	----	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	----	----	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	----	----	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	----	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	----	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	----	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	----	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	----	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	ID010_BORE	----	----	----	----
			Client sampling date / time	20-Jan-2020 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	ES2002827-001	--------	--------	--------	--------
				Result	----	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids - Continued								
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	----	----	----	----
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	----	----	----	----
EP231C: 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	----	----	----	----
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	----	----	----	----
EP231D: (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	----	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	ID010_BORE	----	----	----	----
			Client sampling date / time	20-Jan-2020 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	ES2002827-001	--------	--------	--------	--------
				Result	----	----	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids - Continued								
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	----	----	----	----
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	<0.01	----	----	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	<0.01	----	----	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L	<0.01	----	----	----	----
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	**110**	----	----	----	----
13C8-PFOA	----	0.02	%	**111**	----	----	----	----

Surrogate Control Limits

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

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

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **ES2002827**	Page	: 1 of 6
Client	: **SENVERSA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: LUCINDA TRICKEY	Telephone	: +61 2 8784 8555
Project	: S17776 PSI	Date Samples Received	: 29-Jan-2020
Site	: ----	Issue Date	: 03-Feb-2020
Sampler	: LUCINDA TRICKEY	No. of samples received	: 2
Order number	: ----	No. of samples analysed	: 2

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

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

Summary of Outliers

Outliers : Quality Control Samples

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

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

Outliers : Analysis Holding Time Compliance

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

Outliers : Frequency of Quality Control Samples

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

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
EP231A: Perfluoroalkyl Sulfonic Acids	ES2002831--002	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	ES2002831--002	Anonymous	**Perfluorooctane sulfonic acid (PFOS)**	1763-23-1	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**

Outliers : Analysis Holding Time Compliance

Matrix: **WATER**

Method	*Extraction / Preparation*			*Analysis*		
Container / Client Sample ID(s)	*Date extracted*	*Due for extraction*	***Days overdue***	*Date analysed*	*Due for analysis*	***Days overdue***
ED093F: Dissolved Major Cations						
Clear Plastic Bottle - Natural						
ID010_BORE	----	----	----	31-Jan-2020	27-Jan-2020	**4**

Analysis Holding Time Compliance

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

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

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

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

Matrix: **SOIL**

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

Method	***Sample Date***	*Extraction / Preparation*			*Analysis*		
Container */ Client Sample ID(s)*		***Date extracted***	*Due for extraction*	*Evaluation*	***Date analysed***	*Due for analysis*	*Evaluation*
EA055: Moisture Content (Dried @ 105-110°C)							
HDPE Soil Jar (EA055)							
ID010_SD01	**20-Jan-2020**	**----**	----	----	**30-Jan-2020**	03-Feb-2020	✓
EP231A: Perfluoroalkyl Sulfonic Acids							
HDPE Soil Jar (EP231X)							
ID010_SD01	**20-Jan-2020**	**31-Jan-2020**	18-Jul-2020	✓	**31-Jan-2020**	11-Mar-2020	✓
EP231B: Perfluoroalkyl Carboxylic Acids							
HDPE Soil Jar (EP231X)							
ID010_SD01	**20-Jan-2020**	**31-Jan-2020**	18-Jul-2020	✓	**31-Jan-2020**	11-Mar-2020	✓
EP231C: Perfluoroalkyl Sulfonamides							
HDPE Soil Jar (EP231X)							
ID010_SD01	**20-Jan-2020**	**31-Jan-2020**	18-Jul-2020	✓	**31-Jan-2020**	11-Mar-2020	✓

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) ID010_SD01	**20-Jan-2020**	**31-Jan-2020**	18-Jul-2020	✓	**31-Jan-2020**	11-Mar-2020	✓
EP231P: PFAS Sums							
HDPE Soil Jar (EP231X) ID010_SD01	**20-Jan-2020**	**31-Jan-2020**	18-Jul-2020	✓	**31-Jan-2020**	11-Mar-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
ED037P: Alkalinity by PC Titrator							
Clear Plastic Bottle - Natural (ED037-P) ID010_BORE	**20-Jan-2020**	----	----	----	**29-Jan-2020**	03-Feb-2020	✓
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA							
Clear Plastic Bottle - Natural (ED041G) ID010_BORE	**20-Jan-2020**	----	----	----	**30-Jan-2020**	17-Feb-2020	✓
ED045G: Chloride by Discrete Analyser							
Clear Plastic Bottle - Natural (ED045G) ID010_BORE	**20-Jan-2020**	----	----	----	**30-Jan-2020**	17-Feb-2020	✓
ED093F: Dissolved Major Cations							
Clear Plastic Bottle - Natural (ED093F) ID010_BORE	**20-Jan-2020**	----	----	----	**31-Jan-2020**	27-Jan-2020	×
EP231A: Perfluoroalkyl Sulfonic Acids							
HDPE (no PTFE) (EP231X) ID010_BORE	**20-Jan-2020**	**30-Jan-2020**	18-Jul-2020	✓	**31-Jan-2020**	18-Jul-2020	✓
EP231B: Perfluoroalkyl Carboxylic Acids							
HDPE (no PTFE) (EP231X) ID010_BORE	**20-Jan-2020**	**30-Jan-2020**	18-Jul-2020	✓	**31-Jan-2020**	18-Jul-2020	✓
EP231C: Perfluoroalkyl Sulfonamides							
HDPE (no PTFE) (EP231X) ID010_BORE	**20-Jan-2020**	**30-Jan-2020**	18-Jul-2020	✓	**31-Jan-2020**	18-Jul-2020	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE (no PTFE) (EP231X) ID010_BORE	**20-Jan-2020**	**30-Jan-2020**	18-Jul-2020	✓	**31-Jan-2020**	18-Jul-2020	✓
EP231P: PFAS Sums							
HDPE (no PTFE) (EP231X) ID010_BORE	**20-Jan-2020**	**30-Jan-2020**	18-Jul-2020	✓	**31-Jan-2020**	18-Jul-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 / Analytical Methods	Method	Count QC	Count Regular	Rate (%) Actual	Rate (%) Expected	Evaluation	Quality Control Specification
Laboratory Duplicates (DUP)							
Moisture Content	EA055	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	18	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Matrix: **WATER**

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

Quality Control Sample Type / Analytical Methods	Method	Count QC	Count Regular	Rate (%) Actual	Rate (%) Expected	Evaluation	Quality Control Specification
Laboratory Duplicates (DUP)							
Alkalinity by PC Titrator	ED037-P	1	5	**20.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	11	**18.18**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	9	**22.22**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	5	**20.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	2	5	**40.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	11	**18.18**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	9	**11.11**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	5	**20.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Chloride by Discrete Analyser	ED045G	1	11	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	9	**11.11**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	5	**20.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Chloride by Discrete Analyser	ED045G	1	11	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	5	**20.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

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

Analytical Methods	*Method*	*Matrix*	*Method Descriptions*
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: Analysis of soils by solvent extraction followed by LC-Electrospray-MS-MS, Negative Mode using MRM using internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to a portion of soil which is then extracted with MTBE and an ion pairing reagent. A portion of extract is exchanged into the analytical solvent mixture, combined with an equal volume reagent water and filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM (2013) Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM (2013) Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G.The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride.in the presence of ferric ions the librated thiocynate forms highly-coloured ferric thiocynate which is measured at 480 nm APHA 21st edition seal method 2 017-1-L april 2003
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM (2013) Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM (2013) Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM (2013) Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	* EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM (2013) Schedule B(3)
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	WATER	In-house: Analysis of fresh and saline waters by Solid Phase Extraction (SPE) followed by LC-Electrospray-MS-MS, Negative Mode using MRM and internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.

Preparation Methods	*Method*	*Matrix*	*Method Descriptions*

Preparation Methods	Method	Matrix	Method Descriptions
Sample Extraction for PFAS in solid matrices	ORG73	SOIL	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to a portion of soil which is then extracted with MTBE and an ion pairing reagent. A portion of extract is exchanged into the analytical solvent mixture, combined with an equal volume reagent water and filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.
Solid Phase Extraction (SPE) for PFAS in water	ORG72	WATER	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **ES2002827**	Page	: 1 of 11
Client	: **SENVERSA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: LUCINDA TRICKEY	Contact	: Brenda Hong
Address	: Level 5, Grafton Bond Building 201 Kent Street SYDNEY NSW 2000	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 03 9606 0070	Telephone	: +61 2 8784 8555
Project	: S17776 PSI	Date Samples Received	: 29-Jan-2020
Order number	: ----	Date Analysis Commenced	: 29-Jan-2020
C-O-C number	: ----	Issue Date	: 03-Feb-2020
Sampler	: LUCINDA TRICKEY		
Site	: ----		
Quote number	: SY/665/19		
No. of samples received	: 2		
No. of samples analysed	: 2		

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*
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics, Smithfield, NSW
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW

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: 2834264)									
ES2002810-014	Anonymous	EA055: Moisture Content	----	0.1	%	13.6	13.8	1.85	0% - 20%
ES2002812-010	Anonymous	EA055: Moisture Content	----	0.1	%	13.0	12.1	7.14	0% - 20%
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 2833566)									
ES2002812-001	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	0.0004	0.0004	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
ES2002824-001	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	0.0015	0.0020	23.7	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: 2833566)									
ES2002812-001	Anonymous	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 2833566) - continued									
ES2002812-001	Anonymous	EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.00	No Limit
ES2002824-001	Anonymous	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	0.0002	0.0002	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		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: 2833566)									
ES2002812-001	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
ES2002824-001	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 2833566)									
ES2002812-001	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
ES2002824-001	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	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
ED037P: Alkalinity by PC Titrator (QC Lot: 2832186)									
ES2002751-002	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	9	8	0.00	No Limit
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	9	8	0.00	No Limit
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 2833986)									
ES2002447-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	2	3	0.00	No Limit
ES2002348-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	18	18	0.00	0% - 50%
ED045G: Chloride by Discrete Analyser (QC Lot: 2833987)									
ES2002348-001	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	21	21	0.00	0% - 20%
ES2002945-001	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	6	6	0.00	No Limit
ED093F: Dissolved Major Cations (QC Lot: 2834390)									
ES2002111-001	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	40	40	0.00	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	26	25	0.00	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	62	61	0.00	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	9	8	0.00	No Limit
ES2002822-001	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	6	5	0.00	No Limit
		ED093F: Magnesium	7439-95-4	1	mg/L	13	12	0.00	0% - 50%
		ED093F: Sodium	7440-23-5	1	mg/L	91	88	3.21	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	2	2	0.00	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 2833090)									
ES2002831-001	Anonymous	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	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: 2833090) - continued									
ES2002831-001	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 2833090)									
ES2002831-001	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	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.00	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 2833090)									
ES2002831-001	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
		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
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 2833090)									
ES2002831-001	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

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: 2833090)									
ES2002831-001	Anonymous	EP231X: Sum of PFAS	----	0.01	µg/L	<0.01	<0.01	0.00	No Limit

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

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

Sub-Matrix: **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: 2833566)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	0.00125 mg/kg	78.4	70.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	86.4	70.0	130
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	107	70.0	130
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	84.4	70.0	130
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	79.2	70.0	130
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	127	70.0	130
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 2833566)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	0.00625 mg/kg	118	70.0	130
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	103	70.0	130
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	82.0	70.0	130
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	87.6	70.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	83.2	70.0	130
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	79.2	70.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	0.00125 mg/kg	81.6	70.0	130
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	121	70.0	130
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	111	70.0	130
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	78.4	70.0	130
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	109	70.0	130
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 2833566)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	111	70.0	130
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	0.00312 mg/kg	89.4	70.0	130
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	122	70.0	130
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	84.8	70.0	130
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	70.4	70.0	130
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	112	70.0	130
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	109	70.0	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 2833566)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	76.4	70.0	130
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	0.00125 mg/kg	76.4	70.0	130
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	74.8	70.0	130

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
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 2833566) - continued								
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	0.00125 mg/kg	85.2	70.0	130

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
ED037P: Alkalinity by PC Titrator (QCLot: 2832186)								
ED037-P: Total Alkalinity as CaCO3	----	----	mg/L	----	200 mg/L	94.0	81.0	111
				----	50 mg/L	112	70.0	130
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 2833986)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	110	82.0	122
				<1	500 mg/L	93.7	82.0	122
ED045G: Chloride by Discrete Analyser (QCLot: 2833987)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	106	80.9	127
				<1	1000 mg/L	102	80.9	127
ED093F: Dissolved Major Cations (QCLot: 2834390)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	104	80.0	114
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	107	90.0	116
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	98.7	82.0	120
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	94.6	85.0	113
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 2833090)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	103	72.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	107	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	104	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	113	69.0	134
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	105	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	108	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 2833090)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	108	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	120	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	117	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	122	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	101	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	119	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	117	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	110	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	118	72.0	134
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	106	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	90.7	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 2833090)								

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 2833090) - continued								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	115	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	126	70.0	130
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	115	70.0	130
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	126	70.0	130
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	117	70.0	130
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	119	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	103	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 2833090)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	111	63.0	143
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.25 µg/L	120	67.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.25 µg/L	122	67.0	138
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.25 µg/L	127	70.0	130

Matrix Spike (MS) Report

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

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
				Concentration	MS	Low	High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 2833566)							
ES2002812-001	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.00125 mg/kg	89.6	50.0	130
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.00125 mg/kg	106	50.0	130
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.00125 mg/kg	119	50.0	130
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.00125 mg/kg	96.8	50.0	130
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.00125 mg/kg	83.2	50.0	130
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.00125 mg/kg	97.2	50.0	130
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 2833566)							
ES2002812-001	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.00625 mg/kg	120	30.0	130
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.00125 mg/kg	121	50.0	130
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.00125 mg/kg	103	50.0	130
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.00125 mg/kg	93.2	50.0	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.00125 mg/kg	95.6	50.0	130
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.00125 mg/kg	93.6	50.0	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.00125 mg/kg	92.0	50.0	130

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report Spike Concentration	SpikeRecovery(%) MS	Recovery Limits (%) Low	High
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 2833566) - continued							
ES2002812-001	Anonymous	EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.00125 mg/kg	118	50.0	130
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.00125 mg/kg	106	50.0	130
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.00125 mg/kg	71.6	30.0	130
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.00312 mg/kg	97.8	30.0	130
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 2833566)							
ES2002812-001	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.00125 mg/kg	116	50.0	130
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.00312 mg/kg	89.4	30.0	130
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.00312 mg/kg	111	30.0	130
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.00312 mg/kg	87.3	30.0	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.00312 mg/kg	78.7	30.0	130
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.00125 mg/kg	126	30.0	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.00125 mg/kg	130	30.0	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 2833566)							
ES2002812-001	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.00125 mg/kg	102	50.0	130
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.00125 mg/kg	86.8	50.0	130
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.00125 mg/kg	89.2	50.0	130
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.00125 mg/kg	111	50.0	130

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report Spike Concentration	SpikeRecovery(%) MS	Recovery Limits (%) Low	High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 2833986)							
ES2002348-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	10 mg/L	104	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 2833987)							
ES2002348-001	Anonymous	ED045G: Chloride	16887-00-6	250 mg/L	118	70.0	130
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 2833090)							
ES2002831-002	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.25 µg/L	105	50.0	130
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.25 µg/L	103	50.0	130
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.25 µg/L	# Not Determined	50.0	130
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.25 µg/L	120	50.0	130
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.25 µg/L	# Not Determined	50.0	130

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report Spike Concentration	SpikeRecovery(%) MS	Recovery Limits (%) Low	High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 2833090) - continued							
ES2002831-002	Anonymous	EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.25 µg/L	121	50.0	130
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 2833090)							
ES2002831-002	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	1.25 µg/L	113	50.0	130
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.25 µg/L	123	50.0	130
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.25 µg/L	123	50.0	130
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.25 µg/L	121	50.0	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.25 µg/L	98.0	50.0	130
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.25 µg/L	120	50.0	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.25 µg/L	113	50.0	130
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.25 µg/L	113	50.0	130
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.25 µg/L	114	50.0	130
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.25 µg/L	106	50.0	130
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.625 µg/L	88.0	50.0	150
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 2833090)							
ES2002831-002	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.25 µg/L	121	50.0	130
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.625 µg/L	123	50.0	150
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.625 µg/L	103	50.0	150
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.625 µg/L	130	50.0	150
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.625 µg/L	135	50.0	150
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.25 µg/L	104	50.0	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.25 µg/L	98.4	50.0	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 2833090)							
ES2002831-002	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.25 µg/L	113	50.0	130
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.25 µg/L	124	50.0	130
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.25 µg/L	128	50.0	130
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.25 µg/L	125	50.0	130

ALS Environmental

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order	:	**ES2002829**			
Client	:	**SENVERSA PTY LTD**	Laboratory	:	Environmental Division Sydney
Contact	:	LUCINDA TRICKEY	Contact	:	Brenda Hong
Address	:	Level 5, Grafton Bond Building 201 Kent Street SYDNEY NSW 2000	Address	:	277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	:	lucinda.trickey@senversa.com.au	E-mail	:	Brenda.Hong@ALSGlobal.com
Telephone	:	+61 03 9606 0070	Telephone	:	+61 2 8784 8555
Facsimile	:	+61 03 9606 0074	Facsimile	:	+61-2-8784 8500
Project	:	S17776 PSI	Page	:	1 of 2
Order number	:	----	Quote number	:	ES2019SENVER0020 (SY/665/19)
C-O-C number	:	----	QC Level	:	NEPM 2013 B3 & ALS QC Standard
Site	:	----			
Sampler	:	LUCINDA TRICKEY			

Dates

Date Samples Received	:	29-Jan-2020 16:45	Issue Date	:	29-Jan-2020
Client Requested Due Date	:	03-Feb-2020	Scheduled Reporting Date	:	**03-Feb-2020**

Delivery Details

Mode of Delivery	:	Undefined	Security Seal	:	Intact.
No. of coolers/boxes	:	----	Temperature	:	17.9'C - Ice Bricks present
Receipt Detail	:		No. of samples received / analysed	:	2 / 2

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 refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**
- Please direct any queries you have regarding this work order to the above ALS laboratory contact.
- Analytical work for this work order will be conducted at ALS Sydney.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months ± 1 week) from receipt of samples.
- 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)
ES2002829-001	21-Jan-2020 00:00	ID011_SD01	✓	✓
ES2002829-002	21-Jan-2020 00:00	ID011_SD02	✓	✓

Proactive Holding Time Report

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

Requested Deliverables

CHRISTOPHER SANDIFORD

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

LUCINDA TRICKEY

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

SUPPLIER ACCOUNTS

- A4 - AU Tax Invoice (INV)	Email	supplieraccounts@senversa.com.au

senversa

Senversa Pty Ltd
www.senversa.com.au
ABN 89 132 231 380

Chain of Custody Documentation

Laboratory: ALS NSW
Address: 277-289 Woodpark Road, Smithfield
Contact: Brenda Hong
Phone: 02 8784 8515

Job Number:	S17776	Purchase Order:	
Project Name:	PSI	Quote No:	SY-665-19 V2
Sampled By:	LT/CW	Turn Around Time:	Standard
Project Manager:	Lucinda Trickey	Page:	1 of 1
Email Report To:	lucinda.trickey@senversa.com.au	Phone/Mobile:	+61 424 172 065

Analysis Required

Lab ID	Sample ID	Matrix *	Date	Time	Type / Code	Total Bottles	EP231X - PFAS - Full Suite (28 Analytes)	Comments:
	ID011-SD01	Soil	21-1-20			1 JAR	X	
	ID011-SD02	Soil	21-1-20			1 JAR	X	
Total							0	

Environmental Division
Sydney
Work Order Reference
ES2002829

Telephone : + 61-2-8784 8555

Sampler: I attest that proper field sampling procedures in accordance with Senversa standard procedures and/or project specifications were used during the collection of these samples:

Sampler Name: Lucinda Trickey Signature: [signature] Date: 21-1-20

Relinquished By:

Name/Signature:	Lucinda Trickey	Date: 24/01		
Of:	Senversa	Time: 9:00		
Name/Signature:		Date:		
Of:		Time:		
Name/Signature:		Date:		
Of:		Time:		

Method of Shipment (if applicable):

Carrier / Reference #:
Date/Time:
Carrier / Reference #:
Date/Time:
Carrier / Reference #:
Date/Time:

Received by:

Name/Signature:	Vn/ro	Date:	24/1/20
Of:	PLJ	Time:	16:45
Name/Signature:		Date:	
Of:		Time:	
Name/Signature:		Date:	
Of:		Time:	

Water Container Codes: P = Unpreserved Plastic; N = Nitric Acid (HNO_3) Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide (NaOH)/Cadmium (Cd) Preserved; S = Sodium Hydroxide Preserved Plastic; STH = Sodium thiosulfate preserved plastic; V = VOA Vial Hydochloric Acid (HCl) Preserved; VS = VOA Vial Sulphuric Preserved; VSA = Sulphuric Preserved Amber Glass; H = HCl Preserved Plastic; HS = HCl Preserved Speciation Bottle; SP = Sulphuric Preserved Plastic; F = Formaldehyde Preserved Glass; Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; UA = Unpreserved Amber Glass; L=Lugol's Iodine preserved white plastic bottle; SW= sulfuric acid preserved wide mouth glass jar

Completed by: ________
Checked by: ________

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES2002829**	Page	: 1 of 5
Client	: **SENVERSA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: LUCINDA TRICKEY	Contact	: Brenda Hong
Address	: Level 5, Grafton Bond Building 201 Kent Street SYDNEY NSW 2000	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 03 9606 0070	Telephone	: +61 2 8784 8555
Project	: S17776 PSI	Date Samples Received	: 29-Jan-2020 16:45
Order number	: ----	Date Analysis Commenced	: 30-Jan-2020
C-O-C number	: ----	Issue Date	: 03-Feb-2020 15:43
Sampler	: LUCINDA TRICKEY		
Site	: ----		
Quote number	: SY/665/19		
No. of samples received	: 2		
No. of samples analysed	: 2		

NATA

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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Franco Lentini	LCMS Coordinator	Sydney Inorganics, Smithfield, NSW
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW

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.

- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	ID011_SD01	ID011_SD02	----	----	----
			Client sampling date / time	21-Jan-2020 00:00	21-Jan-2020 00:00	----	----	----
Compound	CAS Number	LOR	Unit	ES2002829-001	ES2002829-002	--------	--------	--------
				Result	Result	----	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	**15.5**	**4.0**	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	**0.0003**	**0.0005**	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	----	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	**0.0008**	**0.0051**	----	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	----	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	----	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	----	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	----	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	----	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	----	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	----	----	----
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	----	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	ID011_SD01	ID011_SD02	----	----	----
			Client sampling date / time	21-Jan-2020 00:00	21-Jan-2020 00:00	----	----	----
Compound	CAS Number	LOR	Unit	ES2002829-001	ES2002829-002	--------	--------	--------
				Result	Result	----	----	----
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	----	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	----	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	----	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	----	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<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	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	----	----	----
EP231P: PFAS Sums								
Sum of PFAS	----	0.0002	mg/kg	**0.0011**	**0.0056**	----	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	**0.0011**	**0.0056**	----	----	----
Sum of PFAS (WA DER List)	----	0.0002	mg/kg	**0.0011**	**0.0056**	----	----	----
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.0002	%	**111**	**96.0**	----	----	----
13C8-PFOA	----	0.0002	%	**118**	**108**	----	----	----

Surrogate Control Limits

Sub-Matrix: **SOIL**

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

Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **ES2002829**	Page	: 1 of 4
Client	: **SENVERSA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: LUCINDA TRICKEY	Telephone	: +61 2 8784 8555
Project	: S17776 PSI	Date Samples Received	: 29-Jan-2020
Site	: ----	Issue Date	: 03-Feb-2020
Sampler	: LUCINDA TRICKEY	No. of samples received	: 2
Order number	: ----	No. of samples analysed	: 2

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

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

Summary of Outliers

Outliers : Quality Control Samples

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

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

Outliers : Analysis Holding Time Compliance

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

Outliers : Frequency of Quality Control Samples

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

Analysis Holding Time Compliance

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

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

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

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

Matrix: **SOIL**

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

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA055: Moisture Content (Dried @ 105-110°C)								
HDPE Soil Jar (EA055)								
ID011_SD01,	ID011_SD02	**21-Jan-2020**	**----**	----	----	**30-Jan-2020**	04-Feb-2020	✓
EP231A: Perfluoroalkyl Sulfonic Acids								
HDPE Soil Jar (EP231X)								
ID011_SD01,	ID011_SD02	**21-Jan-2020**	**31-Jan-2020**	19-Jul-2020	✓	**31-Jan-2020**	11-Mar-2020	✓
EP231B: Perfluoroalkyl Carboxylic Acids								
HDPE Soil Jar (EP231X)								
ID011_SD01,	ID011_SD02	**21-Jan-2020**	**31-Jan-2020**	19-Jul-2020	✓	**31-Jan-2020**	11-Mar-2020	✓
EP231C: Perfluoroalkyl Sulfonamides								
HDPE Soil Jar (EP231X)								
ID011_SD01,	ID011_SD02	**21-Jan-2020**	**31-Jan-2020**	19-Jul-2020	✓	**31-Jan-2020**	11-Mar-2020	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
HDPE Soil Jar (EP231X)								
ID011_SD01,	ID011_SD02	**21-Jan-2020**	**31-Jan-2020**	19-Jul-2020	✓	**31-Jan-2020**	11-Mar-2020	✓
EP231P: PFAS Sums								
HDPE Soil Jar (EP231X)								
ID011_SD01,	ID011_SD02	**21-Jan-2020**	**31-Jan-2020**	19-Jul-2020	✓	**31-Jan-2020**	11-Mar-2020	✓

Quality Control Parameter Frequency Compliance

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

Matrix: **SOIL**

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

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Moisture Content	EA055	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	18	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

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

Analytical Methods	*Method*	*Matrix*	*Method Descriptions*
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: Analysis of soils by solvent extraction followed by LC-Electrospray-MS-MS, Negative Mode using MRM using internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to a portion of soil which is then extracted with MTBE and an ion pairing reagent. A portion of extract is exchanged into the analytical solvent mixture, combined with an equal volume reagent water and filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.

Preparation Methods	*Method*	*Matrix*	*Method Descriptions*
Sample Extraction for PFAS in solid matrices	ORG73	SOIL	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to a portion of soil which is then extracted with MTBE and an ion pairing reagent. A portion of extract is exchanged into the analytical solvent mixture, combined with an equal volume reagent water and filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **ES2002829**	Page	: 1 of 7
Client	: **SENVERSA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: LUCINDA TRICKEY	Contact	: Brenda Hong
Address	: Level 5, Grafton Bond Building 201 Kent Street SYDNEY NSW 2000	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 03 9606 0070	Telephone	: +61 2 8784 8555
Project	: S17776 PSI	Date Samples Received	: 29-Jan-2020
Order number	: ----	Date Analysis Commenced	: 30-Jan-2020
C-O-C number	: ----	Issue Date	: 03-Feb-2020
Sampler	: LUCINDA TRICKEY		
Site	: ----		
Quote number	: SY/665/19		
No. of samples received	: 2		
No. of samples analysed	: 2		

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*
Franco Lentini	LCMS Coordinator	Sydney Inorganics, Smithfield, NSW
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW

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: 2834264)									
ES2002810-014	Anonymous	EA055: Moisture Content	----	0.1	%	13.6	13.8	1.85	0% - 20%
ES2002812-010	Anonymous	EA055: Moisture Content	----	0.1	%	13.0	12.1	7.14	0% - 20%
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 2833566)									
ES2002812-001	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	0.0004	0.0004	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
ES2002824-001	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	0.0015	0.0020	23.7	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: 2833566)									
ES2002812-001	Anonymous	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 2833566) - continued									
ES2002812-001	Anonymous	EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.00	No Limit
ES2002824-001	Anonymous	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	0.0002	0.0002	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		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: 2833566)									
ES2002812-001	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
ES2002824-001	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report					
				LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 2833566)									
ES2002812-001	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
ES2002824-001	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

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: 2833566)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	0.00125 mg/kg	78.4	70.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	86.4	70.0	130
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	107	70.0	130
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	84.4	70.0	130
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	79.2	70.0	130
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	127	70.0	130
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 2833566)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	0.00625 mg/kg	118	70.0	130
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	103	70.0	130
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	82.0	70.0	130
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	87.6	70.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	83.2	70.0	130
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	79.2	70.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	0.00125 mg/kg	81.6	70.0	130
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	121	70.0	130
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	111	70.0	130
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	78.4	70.0	130
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	109	70.0	130
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 2833566)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	111	70.0	130
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	0.00312 mg/kg	89.4	70.0	130
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	122	70.0	130
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	84.8	70.0	130
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	70.4	70.0	130
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	112	70.0	130
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	109	70.0	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 2833566)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	76.4	70.0	130
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	0.00125 mg/kg	76.4	70.0	130
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	74.8	70.0	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
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 2833566) - continued								
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	0.00125 mg/kg	85.2	70.0	130

Matrix Spike (MS) Report

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

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
				Concentration	MS	Low	High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 2833566)							
ES2002812-001	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.00125 mg/kg	89.6	50.0	130
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.00125 mg/kg	106	50.0	130
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.00125 mg/kg	119	50.0	130
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.00125 mg/kg	96.8	50.0	130
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.00125 mg/kg	83.2	50.0	130
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.00125 mg/kg	97.2	50.0	130
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 2833566)							
ES2002812-001	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.00625 mg/kg	120	30.0	130
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.00125 mg/kg	121	50.0	130
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.00125 mg/kg	103	50.0	130
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.00125 mg/kg	93.2	50.0	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.00125 mg/kg	95.6	50.0	130
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.00125 mg/kg	93.6	50.0	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.00125 mg/kg	92.0	50.0	130
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.00125 mg/kg	118	50.0	130
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.00125 mg/kg	106	50.0	130
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.00125 mg/kg	71.6	30.0	130
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.00312 mg/kg	97.8	30.0	130
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 2833566)							
ES2002812-001	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.00125 mg/kg	116	50.0	130
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.00312 mg/kg	89.4	30.0	130
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.00312 mg/kg	111	30.0	130
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.00312 mg/kg	87.3	30.0	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.00312 mg/kg	78.7	30.0	130
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.00125 mg/kg	126	30.0	130

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report Spike Concentration	SpikeRecovery(%) MS	Recovery Limits (%) Low	High
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 2833566) - continued							
ES2002812-001	Anonymous	EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.00125 mg/kg	130	30.0	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 2833566)							
ES2002812-001	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.00125 mg/kg	102	50.0	130
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.00125 mg/kg	86.8	50.0	130
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.00125 mg/kg	89.2	50.0	130
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.00125 mg/kg	111	50.0	130

Environmental

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **ES2002830**

Client	: **SENVERSA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: LUCINDA TRICKEY	Contact	: Brenda Hong
Address	: Level 5, Grafton Bond Building 201 Kent Street SYDNEY NSW 2000	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: lucinda.trickey@senversa.com.au	E-mail	: Brenda.Hong@ALSGlobal.com
Telephone	: +61 03 9606 0070	Telephone	: +61 2 8784 8555
Facsimile	: +61 03 9606 0074	Facsimile	: +61-2-8784 8500
Project	: S17776 PSI	Page	: 1 of 3
Order number	: ----	Quote number	: ES2019SENVER0020 (SY/665/19)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	: LUCINDA TRICKEY		

Dates

Date Samples Received	: 29-Jan-2020 16:45	Issue Date	: 29-Jan-2020
Client Requested Due Date	: 03-Feb-2020	Scheduled Reporting Date	: **03-Feb-2020**

Delivery Details

Mode of Delivery	: Undefined	Security Seal	: Intact.
No. of coolers/boxes	: ----	Temperature	: 27.9'C - Ice Bricks present
Receipt Detail	:	No. of samples received / analysed	: 3 / 3

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 refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**
- Please direct any queries you have regarding this work order to the above ALS laboratory contact.
- Analytical work for this work order will be conducted at ALS Sydney.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months ± 1 week) from receipt of samples.
- 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)
ES2002830-001	21-Jan-2020 00:00	ID012_SD01	✓	✓
ES2002830-002	21-Jan-2020 00:00	ID012_SD02	✓	✓

Matrix: **WATER**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	WATER - EP231X PFAS - Full Suite (28 analytes)
ES2002830-003	21-Jan-2020 00:00	ID012_SW02	✓

Proactive Holding Time Report

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

Requested Deliverables

CHRISTOPHER SANDIFORD		
- *AU Certificate of Analysis - NATA (COA)	Email	christopher.sandiford@senversa.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	christopher.sandiford@senversa.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	christopher.sandiford@senversa.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	christopher.sandiford@senversa.com.au
- Chain of Custody (CoC) (COC)	Email	christopher.sandiford@senversa.com.au
- EDI Format - ENMRG (ENMRG)	Email	christopher.sandiford@senversa.com.au
- EDI Format - ESDAT (ESDAT)	Email	christopher.sandiford@senversa.com.au
LUCINDA TRICKEY		
- *AU Certificate of Analysis - NATA (COA)	Email	lucinda.trickey@senversa.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	lucinda.trickey@senversa.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	lucinda.trickey@senversa.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	lucinda.trickey@senversa.com.au
- A4 - AU Tax Invoice (INV)	Email	lucinda.trickey@senversa.com.au
- Chain of Custody (CoC) (COC)	Email	lucinda.trickey@senversa.com.au
- EDI Format - ENMRG (ENMRG)	Email	lucinda.trickey@senversa.com.au
- EDI Format - ESDAT (ESDAT)	Email	lucinda.trickey@senversa.com.au
SUPPLIER ACCOUNTS		
- A4 - AU Tax Invoice (INV)	Email	supplieraccounts@senversa.com.au

Chain of Custody Documentation

Senversa Pty Ltd
www.senversa.com.au
ABN 89 132 231 380

Laboratory: ALS NSW
Address: 277-289 Woodpark Road, Smithfield
Contact: Brenda Hong
Phone: 02 8784 8515

Job Number:	S17776	Purchase Order:	
Project Name:	PSI	Quote No:	SY-665-19 V2
Sampled By:	LT/CW	Turn Around Time:	Standard
Project Manager:	Lucinda Trickey	Page:	1 of 1
Email Report To:	lucinda.trickey@senversa.com.au	Phone/Mobile:	+61 424 172 065

Analysis Required: EP231X - PFAS - Full Suite (28 Analytes)

Comments:

Lab ID	Sample ID	Matrix *	Date	Time	Type / Code	Total Bottles	EP231X - PFAS - Full Suite (28 Analytes)
	ID012_SD01	S	21-1-20			1	X
	ID012_SD02	S	21-1-20			1	X
	ID012_SW02	W	21-1-20			2	X
Total							0

Environmental Division
Sydney
Work Order Reference
ES2002830
Telephone : + 61-2-8784 8555

Sampler: I attest that proper field sampling procedures in accordance with Senversa standard procedures and/or project specifications were used during the collection of these samples:

Sampler Name: Lucinda Trickey Signature: [signature] Date: 21-1-20

Relinquished By:			Method of Shipment (if applicable):	Received by:	
Name/Signature: Lucinda Trickey	Date: 24/01		Carrier / Reference #:	Name/Signature: Valen	Date: 24/1/20
Of: Senversa	Time: 9:00		Date/Time:	Of: ALS	Time: 16:45
Name/Signature:	Date:		Carrier / Reference #:	Name/Signature:	Date:
Of:	Time:		Date/Time:	Of:	Time:
Name/Signature:	Date:		Carrier / Reference #:	Name/Signature:	Date:
Of:	Time:		Date/Time:	Of:	Time:

Water Container Codes: P = Unpreserved Plastic; N = Nitric Acid (HNO_3) Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide (NaOH)/Cadmium (Cd) Preserved; S = Sodium Hydroxide Preserved Plastic; STH = Sodium thiosulfate preserved plastic; V = VOA Vial Hydochloric Acid (HCl) Preserved; VS = VOA Vial Sulphuric Preserved; VSA = Sulphuric Preserved Amber Glass; H = HCl Preserved Plastic; HS = HCl Preserved Speciation Bottle; SP = Sulphuric Preserved Plastic; F = Formaldehyde Preserved Glass; Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; UA = Unpreserved Amber Glass; L=Lugol's iodine preserved white plastic bottle; SW= sulfuric acid preserved wide mouth glass jar

S17776_COC_PS

Completed by: ________
Checked by: ________

CERTIFICATE OF ANALYSIS

Work Order	: **ES2002830**	Page	: 1 of 7
Client	: **SENVERSA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: LUCINDA TRICKEY	Contact	: Brenda Hong
Address	: Level 5, Grafton Bond Building 201 Kent Street SYDNEY NSW 2000	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 03 9606 0070	Telephone	: +61 2 8784 8555
Project	: S17776 PSI	Date Samples Received	: 29-Jan-2020 16:45
Order number	: ----	Date Analysis Commenced	: 30-Jan-2020
C-O-C number	: ----	Issue Date	: 03-Feb-2020 16:40
Sampler	: LUCINDA TRICKEY		
Site	: ----		
Quote number	: SY/665/19		
No. of samples received	: 3		
No. of samples analysed	: 3		

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

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. 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 Inorganics, Smithfield, NSW
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW

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 - Per- and Polyfluoroalkyl Substances (PFAS): Samples received in 20ml or 125ml bottles have been tested in accordance with the QSM5.3 compliant, NATA accredited method. 60mL or 250mL bottles have been tested to the legacy QSM 5.1 aligned, NATA accredited method.
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	ID012_SD01	ID012_SD02	----	----	----
			Client sampling date / time	21-Jan-2020 00:00	21-Jan-2020 00:00	----	----	----
Compound	CAS Number	LOR	Unit	ES2002830-001	ES2002830-002	--------	--------	--------
				Result	Result	----	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	**84.1**	**81.8**	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	**0.0041**	**0.0020**	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	----	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	**0.0167**	**0.0090**	----	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	**0.001**	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	----	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	----	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	----	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	----	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	----	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	----	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0006	<0.0006	----	----	----
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	----	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0006	<0.0006	----	----	----

Analytical Results

Sub-Matrix: SOIL
(Matrix: SOIL)

Compound	CAS Number	LOR	Unit	ID012_SD01	ID012_SD02	----	----	----
Client sampling date / time				21-Jan-2020 00:00	21-Jan-2020 00:00	----	----	----
				ES2002830-001	ES2002830-002	--------	--------	--------
				Result	Result	----	----	----
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0006	<0.0006	----	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0006	<0.0006	----	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0006	<0.0006	----	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	----	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<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	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	----	----	----
EP231P: PFAS Sums								
Sum of PFAS	----	0.0002	mg/kg	**0.0208**	**0.0120**	----	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	**0.0208**	**0.0110**	----	----	----
Sum of PFAS (WA DER List)	----	0.0002	mg/kg	**0.0208**	**0.0120**	----	----	----
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.0002	%	**94.5**	**104**	----	----	----
13C8-PFOA	----	0.0002	%	**116**	**115**	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)

Compound	CAS Number	LOR	Unit	ID012_SW02	----	----	----	----
Client sampling date / time				21-Jan-2020 00:00	----	----	----	----
				ES2002830-003	--------	--------	--------	--------
				Result	----	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	----	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	----	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	**0.08**	----	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	----	----	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	**0.10**	----	----	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	----	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	----	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	----	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	----	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	----	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	----	----	----	----
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	----	----	----	----
EP231C: 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	ID012_SW02	----	----	----	----
			Client sampling date / time	21-Jan-2020 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	ES2002830-003	--------	--------	--------	--------
				Result	----	----	----	----
EP231C: 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	----	----	----	----
EP231D: (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	----	----	----	----
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	**0.18**	----	----	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	**0.18**	----	----	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L	**0.18**	----	----	----	----
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	**104**	----	----	----	----
13C8-PFOA	----	0.02	%	**109**	----	----	----	----

Surrogate Control Limits

Sub-Matrix: **SOIL**

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

Sub-Matrix: **WATER**

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

Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: ES2002830	Page	: 1 of 5
Client	: SENVERSA PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: LUCINDA TRICKEY	Telephone	: +61 2 8784 8555
Project	: S17776 PSI	Date Samples Received	: 29-Jan-2020
Site	: ----	Issue Date	: 03-Feb-2020
Sampler	: LUCINDA TRICKEY	No. of samples received	: 3
Order number	: ----	No. of samples analysed	: 3

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

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

Summary of Outliers

Outliers : Quality Control Samples

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

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

Outliers : Analysis Holding Time Compliance

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

Outliers : Frequency of Quality Control Samples

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

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
EP231A: Perfluoroalkyl Sulfonic Acids	ES2002831--002	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	ES2002831--002	Anonymous	**Perfluorooctane sulfonic acid (PFOS)**	1763-23-1	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**

Analysis Holding Time Compliance

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

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

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

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

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

Method		*Sample Date*	*Extraction / Preparation*			*Analysis*		
Container / Client Sample ID(s)			***Date extracted***	*Due for extraction*	*Evaluation*	***Date analysed***	*Due for analysis*	*Evaluation*
EA055: Moisture Content (Dried @ 105-110°C)								
HDPE Soil Jar (EA055)								
ID012_SD01,	ID012_SD02	**21-Jan-2020**	**----**	----	----	**30-Jan-2020**	04-Feb-2020	✓
EP231A: Perfluoroalkyl Sulfonic Acids								
HDPE Soil Jar (EP231X)								
ID012_SD01,	ID012_SD02	**21-Jan-2020**	**31-Jan-2020**	19-Jul-2020	✓	**31-Jan-2020**	11-Mar-2020	✓
EP231B: Perfluoroalkyl Carboxylic Acids								
HDPE Soil Jar (EP231X)								
ID012_SD01,	ID012_SD02	**21-Jan-2020**	**31-Jan-2020**	19-Jul-2020	✓	**31-Jan-2020**	11-Mar-2020	✓
EP231C: Perfluoroalkyl Sulfonamides								
HDPE Soil Jar (EP231X)								
ID012_SD01,	ID012_SD02	**21-Jan-2020**	**31-Jan-2020**	19-Jul-2020	✓	**31-Jan-2020**	11-Mar-2020	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
HDPE Soil Jar (EP231X)								
ID012_SD01,	ID012_SD02	**21-Jan-2020**	**31-Jan-2020**	19-Jul-2020	✓	**31-Jan-2020**	11-Mar-2020	✓
EP231P: PFAS Sums								
HDPE Soil Jar (EP231X)								
ID012_SD01,	ID012_SD02	**21-Jan-2020**	**31-Jan-2020**	19-Jul-2020	✓	**31-Jan-2020**	11-Mar-2020	✓

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

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) ID012_SW02	**21-Jan-2020**	**30-Jan-2020**	19-Jul-2020	✓	**31-Jan-2020**	19-Jul-2020	✓
EP231B: Perfluoroalkyl Carboxylic Acids							
HDPE (no PTFE) (EP231X) ID012_SW02	**21-Jan-2020**	**30-Jan-2020**	19-Jul-2020	✓	**31-Jan-2020**	19-Jul-2020	✓
EP231C: Perfluoroalkyl Sulfonamides							
HDPE (no PTFE) (EP231X) ID012_SW02	**21-Jan-2020**	**30-Jan-2020**	19-Jul-2020	✓	**31-Jan-2020**	19-Jul-2020	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE (no PTFE) (EP231X) ID012_SW02	**21-Jan-2020**	**30-Jan-2020**	19-Jul-2020	✓	**31-Jan-2020**	19-Jul-2020	✓
EP231P: PFAS Sums							
HDPE (no PTFE) (EP231X) ID012_SW02	**21-Jan-2020**	**30-Jan-2020**	19-Jul-2020	✓	**31-Jan-2020**	19-Jul-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	18	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

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	1	5	**20.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	5	**20.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	5	**20.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	5	**20.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

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: Analysis of soils by solvent extraction followed by LC-Electrospray-MS-MS, Negative Mode using MRM using internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to a portion of soil which is then extracted with MTBE and an ion pairing reagent. A portion of extract is exchanged into the analytical solvent mixture, combined with an equal volume reagent water and filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	WATER	In-house: Analysis of fresh and saline waters by Solid Phase Extraction (SPE) followed by LC-Electrospray-MS-MS, Negative Mode using MRM and internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.

Preparation Methods	*Method*	*Matrix*	*Method Descriptions*
Sample Extraction for PFAS in solid matrices	ORG73	SOIL	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to a portion of soil which is then extracted with MTBE and an ion pairing reagent. A portion of extract is exchanged into the analytical solvent mixture, combined with an equal volume reagent water and filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.
Solid Phase Extraction (SPE) for PFAS in water	ORG72	WATER	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **ES2002830**	Page	: 1 of 10
Client	: **SENVERSA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: LUCINDA TRICKEY	Contact	: Brenda Hong
Address	: Level 5, Grafton Bond Building 201 Kent Street SYDNEY NSW 2000	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 03 9606 0070	Telephone	: +61 2 8784 8555
Project	: S17776 PSI	Date Samples Received	: 29-Jan-2020
Order number	: ----	Date Analysis Commenced	: 30-Jan-2020
C-O-C number	: ----	Issue Date	: 03-Feb-2020
Sampler	: LUCINDA TRICKEY		
Site	: ----		
Quote number	: SY/665/19		
No. of samples received	: 3		
No. of samples analysed	: 3		

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*
Franco Lentini	LCMS Coordinator	Sydney Inorganics, Smithfield, NSW
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW

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: 2834265)									
ES2002886-001	Anonymous	EA055: Moisture Content	----	0.1	%	1.0	1.4	28.0	0% - 50%
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 2833566)									
ES2002812-001	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	0.0004	0.0004	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
ES2002824-001	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	0.0015	0.0020	23.7	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: 2833566)									
ES2002812-001	Anonymous	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report					
				LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 2833566) - continued									
ES2002812-001	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
ES2002824-001	Anonymous	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	0.0002	0.0002	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		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: 2833566)									
ES2002812-001	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
ES2002824-001	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: 2833566)									

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 2833566) - continued									
ES2002812-001	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
ES2002824-001	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	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 2833090)									
ES2002831-001	Anonymous	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	0.00	No Limit
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 2833090)									
ES2002831-001	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	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.00	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 2833090)									
ES2002831-001	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report					
				LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 2833090) - continued									
ES2002831-001	Anonymous	EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 2833090)									
ES2002831-001	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
EP231P: PFAS Sums (QC Lot: 2833090)									
ES2002831-001	Anonymous	EP231X: Sum of PFAS	----	0.01	µg/L	<0.01	<0.01	0.00	No Limit

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

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

Sub-Matrix: **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
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 2833566)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	0.00125 mg/kg	78.4	70.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	86.4	70.0	130
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	107	70.0	130
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	84.4	70.0	130
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	79.2	70.0	130
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	127	70.0	130
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 2833566)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	0.00625 mg/kg	118	70.0	130
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	103	70.0	130
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	82.0	70.0	130
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	87.6	70.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	83.2	70.0	130
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	79.2	70.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	0.00125 mg/kg	81.6	70.0	130
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	121	70.0	130
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	111	70.0	130
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	78.4	70.0	130
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	109	70.0	130
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 2833566)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	111	70.0	130
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	0.00312 mg/kg	89.4	70.0	130
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	122	70.0	130
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	84.8	70.0	130
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	70.4	70.0	130
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	112	70.0	130
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	109	70.0	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 2833566)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	76.4	70.0	130
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	0.00125 mg/kg	76.4	70.0	130
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	74.8	70.0	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: 2833566) - continued								
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	0.00125 mg/kg	85.2	70.0	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: 2833090)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	103	72.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	107	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	104	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	113	69.0	134
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	105	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	108	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 2833090)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	108	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	120	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	117	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	122	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	101	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	119	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	117	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	110	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	118	72.0	134
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	106	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	90.7	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 2833090)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	115	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	126	70.0	130
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	115	70.0	130
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	126	70.0	130
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	117	70.0	130
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	119	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	103	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 2833090)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	111	63.0	143
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.25 µg/L	120	67.0	140

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
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 2833090) - continued								
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.25 µg/L	122	67.0	138
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.25 µg/L	127	70.0	130

Matrix Spike (MS) Report

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

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
				Concentration	MS	Low	High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 2833566)							
ES2002812-001	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.00125 mg/kg	89.6	50.0	130
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.00125 mg/kg	106	50.0	130
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.00125 mg/kg	119	50.0	130
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.00125 mg/kg	96.8	50.0	130
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.00125 mg/kg	83.2	50.0	130
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.00125 mg/kg	97.2	50.0	130
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 2833566)							
ES2002812-001	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.00625 mg/kg	120	30.0	130
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.00125 mg/kg	121	50.0	130
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.00125 mg/kg	103	50.0	130
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.00125 mg/kg	93.2	50.0	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.00125 mg/kg	95.6	50.0	130
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.00125 mg/kg	93.6	50.0	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.00125 mg/kg	92.0	50.0	130
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.00125 mg/kg	118	50.0	130
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.00125 mg/kg	106	50.0	130
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.00125 mg/kg	71.6	30.0	130
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.00312 mg/kg	97.8	30.0	130
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 2833566)							
ES2002812-001	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.00125 mg/kg	116	50.0	130
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.00312 mg/kg	89.4	30.0	130
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.00312 mg/kg	111	30.0	130
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.00312 mg/kg	87.3	30.0	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.00312 mg/kg	78.7	30.0	130

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Spike Concentration	SpikeRecovery(%) MS	Recovery Limits (%) Low	Recovery Limits (%) High
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 2833566) - continued							
ES2002812-001	Anonymous	EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.00125 mg/kg	126	30.0	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.00125 mg/kg	130	30.0	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 2833566)							
ES2002812-001	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.00125 mg/kg	102	50.0	130
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.00125 mg/kg	86.8	50.0	130
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.00125 mg/kg	89.2	50.0	130
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.00125 mg/kg	111	50.0	130

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Spike Concentration	SpikeRecovery(%) MS	Recovery Limits (%) Low	Recovery Limits (%) High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 2833090)							
ES2002831-002	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.25 µg/L	105	50.0	130
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.25 µg/L	103	50.0	130
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.25 µg/L	# Not Determined	50.0	130
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.25 µg/L	120	50.0	130
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.25 µg/L	# Not Determined	50.0	130
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.25 µg/L	121	50.0	130
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 2833090)							
ES2002831-002	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	1.25 µg/L	113	50.0	130
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.25 µg/L	123	50.0	130
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.25 µg/L	123	50.0	130
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.25 µg/L	121	50.0	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.25 µg/L	98.0	50.0	130
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.25 µg/L	120	50.0	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.25 µg/L	113	50.0	130
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.25 µg/L	113	50.0	130
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.25 µg/L	114	50.0	130
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.25 µg/L	106	50.0	130
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.625 µg/L	88.0	50.0	150
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 2833090)							
ES2002831-002	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.25 µg/L	121	50.0	130
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.625 µg/L	123	50.0	150
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.625 µg/L	103	50.0	150

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report Spike Concentration	SpikeRecovery(%) MS	Recovery Limits (%) Low	High
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 2833090) - continued							
ES2002831-002	Anonymous	EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.625 µg/L	130	50.0	150
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.625 µg/L	135	50.0	150
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.25 µg/L	104	50.0	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.25 µg/L	98.4	50.0	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 2833090)							
ES2002831-002	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.25 µg/L	113	50.0	130
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.25 µg/L	124	50.0	130
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.25 µg/L	128	50.0	130
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.25 µg/L	125	50.0	130

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **ES2002831**

Client	: **SENVERSA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: LUCINDA TRICKEY	Contact	: Brenda Hong
Address	: Level 5, Grafton Bond Building 201 Kent Street SYDNEY NSW 2000	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: lucinda.trickey@senversa.com.au	E-mail	: Brenda.Hong@ALSGlobal.com
Telephone	: +61 03 9606 0070	Telephone	: +61 2 8784 8555
Facsimile	: +61 03 9606 0074	Facsimile	: +61-2-8784 8500
Project	: S17776 PSI	Page	: 1 of 2
Order number	: ----	Quote number	: ES2019SENVER0020 (SY/665/19)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	: LUCINDA TRICKEY		

Dates

Date Samples Received	: 29-Jan-2020 16:45	Issue Date	: 29-Jan-2020
Client Requested Due Date	: 03-Feb-2020	Scheduled Reporting Date	: **03-Feb-2020**

Delivery Details

Mode of Delivery	: Undefined	Security Seal	: Intact.
No. of coolers/boxes	: ----	Temperature	: 27.9'C - Ice Bricks present
Receipt Detail	:	No. of samples received / analysed	: 2 / 2

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 refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**
- Please direct any queries you have regarding this work order to the above ALS laboratory contact.
- Analytical work for this work order will be conducted at ALS Sydney.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months ± 1 week) from receipt of samples.
- 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 PFAS - Full Suite (28 analytes)	WATER - NT-01 & 02 Ca, Mg, Na, K, Cl, SO4, Alkalinity
ES2002831-001	22-Jan-2020 00:00	ID013_BORE	✓	✓
ES2002831-002	22-Jan-2020 00:00	ID013_SW01	✓	

Proactive Holding Time Report

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

Requested Deliverables

CHRISTOPHER SANDIFORD		
- *AU Certificate of Analysis - NATA (COA)	Email	christopher.sandiford@senversa.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	christopher.sandiford@senversa.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	christopher.sandiford@senversa.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	christopher.sandiford@senversa.com.au
- Chain of Custody (CoC) (COC)	Email	christopher.sandiford@senversa.com.au
- EDI Format - ENMRG (ENMRG)	Email	christopher.sandiford@senversa.com.au
- EDI Format - ESDAT (ESDAT)	Email	christopher.sandiford@senversa.com.au
LUCINDA TRICKEY		
- *AU Certificate of Analysis - NATA (COA)	Email	lucinda.trickey@senversa.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	lucinda.trickey@senversa.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	lucinda.trickey@senversa.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	lucinda.trickey@senversa.com.au
- A4 - AU Tax Invoice (INV)	Email	lucinda.trickey@senversa.com.au
- Chain of Custody (CoC) (COC)	Email	lucinda.trickey@senversa.com.au
- EDI Format - ENMRG (ENMRG)	Email	lucinda.trickey@senversa.com.au
- EDI Format - ESDAT (ESDAT)	Email	lucinda.trickey@senversa.com.au
SUPPLIER ACCOUNTS		
- A4 - AU Tax Invoice (INV)	Email	supplieraccounts@senversa.com.au

senversa

Senversa Pty Ltd
www.senversa.com.au
ABN 89 132 231 380

Chain of Custody Documentation

Laboratory: ALS NSW
Address: 277-289 Woodpark Road, Smithfield
Contact: Brenda Hong
Phone: 02 8784 8515

Job Number:	S17776	Purchase Order:	
Project Name:	PSI	Quote No:	SY-665-19 V2
Sampled By:	LT/CW	Turn Around Time:	2 DAY TAT
Project Manager:	Lucinda Trickey	Page:	1 of 1
Email Report To:	lucinda.trickey@senversa.com.au	Phone/Mobile:	+61 424 172 065

Analysis Required

Lab ID	Sample ID	Matrix *	Date	Time	Type / Code	Total Bottles	EP231X - PFAS - Full Suite (28 Analytes)	Major anions + cations	Comments:
	ID013_BORE	W	22-1-20			~~3~~5	X	X	extra bottles for
	ID013_SW01	W	22-1-20			4	X		lab QC
Total							0		

Environmental Division
Sydney
Work Order Reference
ES2002831

Telephone : + 61-2-8784 8555

Sampler: I attest that proper field sampling procedures in accordance with Senversa standard procedures and/or project specifications were used during the collection of these samples:	Sampler Name:	Lucinda Trickey	Signature:	Date:	24/01/20

Relinquished By:				Method of Shipment (if applicable):	Received by:			
Name/Signature:	Lucinda Trickey	Date:	24/01	Carrier / Reference #:	Name/Signature:	Loren	Date:	24/1/20
Of:	Senversa	Time:	9.00	Date/Time:	Of:	ALS	Time:	16:45
Name/Signature:		Date:		Carrier / Reference #:	Name/Signature:		Date:	
Of:		Time:		Date/Time:	Of:		Time:	
Name/Signature:		Date:		Carrier / Reference #:	Name/Signature:		Date:	
Of:		Time:		Date/Time:	Of:		Time:	

Water Container Codes: P = Unpreserved Plastic; N = Nitric Acid (HNO_3) Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide (NaOH)/Cadmium (Cd) Preserved; S = Sodium Hydroxide Preserved Plastic; STH = Sodium thiosulfate preserved plastic;
V = VOA Vial Hydochloric Acid (HCl) Preserved; VS = VOA Vial Sulphuric Preserved; VSA = Sulphuric Preserved Amber Glass; H = HCl Preserved Plastic; HS = HCl Preserved Speciation Bottle; SP = Sulphuric Preserved Plastic;
F = Formaldehyde Preserved Glass; Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; UA = Unpreserved Amber Glass; L=Lugol's iodine preserved white plastic bottle; SW= sulfuric acid preserved wide mouth glass jar

Completed by: ________
Checked by: ________

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES2002831**	Page	: 1 of 6
Client	: **SENVERSA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: LUCINDA TRICKEY	Contact	: Brenda Hong
Address	: Level 5, Grafton Bond Building 201 Kent Street SYDNEY NSW 2000	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 03 9606 0070	Telephone	: +61 2 8784 8555
Project	: S17776 PSI	Date Samples Received	: 29-Jan-2020 16:45
Order number	: ----	Date Analysis Commenced	: 29-Jan-2020
C-O-C number	: ----	Issue Date	: 03-Feb-2020 09:14
Sampler	: LUCINDA TRICKEY		
Site	: ----		
Quote number	: SY/665/19		
No. of samples received	: 2		
No. of samples analysed	: 2		

ilac-MRA NATA

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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Alex Rossi	Organic Chemist	Sydney Organics, Smithfield, NSW
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW

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 - Per- and Polyfluoroalkyl Substances (PFAS): Samples received in 20ml or 125ml bottles have been tested in accordance with the QSM5.3 compliant, NATA accredited method. 60mL or 250mL bottles have been tested to the legacy QSM 5.1 aligned, NATA accredited method.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.

Analytical Results

Sub-Matrix: WATER
(Matrix: WATER)

Compound	CAS Number	LOR	Unit	ID013_BORE	ID013_SW01	----	----	----
			Client sampling date / time	22-Jan-2020 00:00	22-Jan-2020 00:00	----	----	----
				ES2002831-001	ES2002831-002	--------	--------	--------
				Result	Result	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**52**	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	**52**	----	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**20**	----	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**237**	----	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**16**	----	----	----	----
Magnesium	7439-95-4	1	mg/L	**22**	----	----	----	----
Sodium	7440-23-5	1	mg/L	**114**	----	----	----	----
Potassium	7440-09-7	1	mg/L	**4**	----	----	----	----
EN055: Ionic Balance								
ø Total Anions	----	0.01	meq/L	**8.14**	----	----	----	----
ø Total Cations	----	0.01	meq/L	**7.67**	----	----	----	----
ø Ionic Balance	----	0.01	%	**2.98**	----	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	**0.14**	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	**0.17**	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	**1.72**	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	**0.14**	----	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	**2.78**	----	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	**0.03**	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	**0.14**	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	**0.03**	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	ID013_BORE	ID013_SW01	----	----	----
			Client sampling date / time	22-Jan-2020 00:00	22-Jan-2020 00:00	----	----	----
Compound	CAS Number	LOR	Unit	ES2002831-001	ES2002831-002	--------	--------	--------
				Result	Result	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids - Continued								
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	**0.07**	----	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	----	----	----
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	----	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	----	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	----	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	----	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	----	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	----	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	----	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	ID013_BORE	ID013_SW01	----	----	----
			Client sampling date / time	22-Jan-2020 00:00	22-Jan-2020 00:00	----	----	----
Compound	CAS Number	LOR	Unit	ES2002831-001	ES2002831-002	--------	--------	--------
				Result	Result	----	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids - Continued								
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	----	----	----
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	<0.01	**5.22**	----	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	<0.01	**4.50**	----	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L	<0.01	**4.91**	----	----	----
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	**102**	**113**	----	----	----
13C8-PFOA	----	0.02	%	**110**	**106**	----	----	----

Surrogate Control Limits

Sub-Matrix: **WATER**

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

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **ES2002831**	Page	: 1 of 5
Client	: **SENVERSA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: LUCINDA TRICKEY	Telephone	: +61 2 8784 8555
Project	: S17776 PSI	Date Samples Received	: 29-Jan-2020
Site	: ----	Issue Date	: 03-Feb-2020
Sampler	: LUCINDA TRICKEY	No. of samples received	: 2
Order number	: ----	No. of samples analysed	: 2

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

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

Summary of Outliers

Outliers : Quality Control Samples

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

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

Outliers : Analysis Holding Time Compliance

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

Outliers : Frequency of Quality Control Samples

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

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
EP231A: Perfluoroalkyl Sulfonic Acids	ES2002831--002	ID013_SW01	**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	ES2002831--002	ID013_SW01	**Perfluorooctane sulfonic acid (PFOS)**	1763-23-1	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**

Outliers : Analysis Holding Time Compliance

Matrix: **WATER**

Method	*Extraction / Preparation*			*Analysis*		
Container / Client Sample ID(s)	*Date extracted*	*Due for extraction*	***Days overdue***	*Date analysed*	*Due for analysis*	***Days overdue***
ED093F: Dissolved Major Cations						
Clear Plastic Bottle - Natural						
ID013_BORE	----	----	----	31-Jan-2020	29-Jan-2020	**2**

Analysis Holding Time Compliance

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

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

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

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

Matrix: **WATER**

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

Method	***Sample Date***	*Extraction / Preparation*			*Analysis*		
Container */ Client Sample ID(s)*		***Date extracted***	*Due for extraction*	*Evaluation*	***Date analysed***	*Due for analysis*	*Evaluation*
ED037P: Alkalinity by PC Titrator							
Clear Plastic Bottle - Natural (ED037-P)							
ID013_BORE	**22-Jan-2020**	**----**	----	----	**29-Jan-2020**	05-Feb-2020	✓
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA							
Clear Plastic Bottle - Natural (ED041G)							
ID013_BORE	**22-Jan-2020**	**----**	----	----	**30-Jan-2020**	19-Feb-2020	✓
ED045G: Chloride by Discrete Analyser							
Clear Plastic Bottle - Natural (ED045G)							
ID013_BORE	**22-Jan-2020**	**----**	----	----	**30-Jan-2020**	19-Feb-2020	✓
ED093F: Dissolved Major Cations							
Clear Plastic Bottle - Natural (ED093F)							
ID013_BORE	**22-Jan-2020**	**----**	----	----	**31-Jan-2020**	29-Jan-2020	✘

Matrix: **WATER**

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

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP231A: Perfluoroalkyl Sulfonic Acids								
HDPE (no PTFE) (EP231X)								
ID013_BORE,	ID013_SW01	**22-Jan-2020**	**30-Jan-2020**	20-Jul-2020	✓	**31-Jan-2020**	20-Jul-2020	✓
EP231B: Perfluoroalkyl Carboxylic Acids								
HDPE (no PTFE) (EP231X)								
ID013_BORE,	ID013_SW01	**22-Jan-2020**	**30-Jan-2020**	20-Jul-2020	✓	**31-Jan-2020**	20-Jul-2020	✓
EP231C: Perfluoroalkyl Sulfonamides								
HDPE (no PTFE) (EP231X)								
ID013_BORE,	ID013_SW01	**22-Jan-2020**	**30-Jan-2020**	20-Jul-2020	✓	**31-Jan-2020**	20-Jul-2020	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
HDPE (no PTFE) (EP231X)								
ID013_BORE,	ID013_SW01	**22-Jan-2020**	**30-Jan-2020**	20-Jul-2020	✓	**31-Jan-2020**	20-Jul-2020	✓
EP231P: PFAS Sums								
HDPE (no PTFE) (EP231X)								
ID013_BORE,	ID013_SW01	**22-Jan-2020**	**30-Jan-2020**	20-Jul-2020	✓	**31-Jan-2020**	20-Jul-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)							
Alkalinity by PC Titrator	ED037-P	2	16	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	1	**100.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	9	**22.22**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	5	**20.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	1	**100.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	2	16	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	1	**200.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	9	**11.11**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	5	**20.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	1	**200.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Chloride by Discrete Analyser	ED045G	1	1	**100.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	9	**11.11**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	5	**20.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	1	**100.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Chloride by Discrete Analyser	ED045G	1	1	**100.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	5	**20.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	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*
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM (2013) Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM (2013) Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G.The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride.in the presence of ferric ions the libarated thiocynate forms highly-coloured ferric thiocynate which is measured at 480 nm APHA 21st edition seal method 2 017-1-L april 2003
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM (2013) Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM (2013) Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM (2013) Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	* EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM (2013) Schedule B(3)
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	WATER	In-house: Analysis of fresh and saline waters by Solid Phase Extraction (SPE) followed by LC-Electrospray-MS-MS, Negative Mode using MRM and internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.

Preparation Methods	*Method*	*Matrix*	*Method Descriptions*
Solid Phase Extraction (SPE) for PFAS in water	ORG72	WATER	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.

QUALITY CONTROL REPORT

Work Order	: **ES2002831**	Page	: 1 of 7
Client	: **SENVERSA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: LUCINDA TRICKEY	Contact	: Brenda Hong
Address	: Level 5, Grafton Bond Building 201 Kent Street SYDNEY NSW 2000	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 03 9606 0070	Telephone	: +61 2 8784 8555
Project	: S17776 PSI	Date Samples Received	: 29-Jan-2020
Order number	: ----	Date Analysis Commenced	: 29-Jan-2020
C-O-C number	: ----	Issue Date	: 03-Feb-2020
Sampler	: LUCINDA TRICKEY		
Site	: ----		
Quote number	: SY/665/19		
No. of samples received	: 2		
No. of samples analysed	: 2		

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

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

This Quality Control Report contains the following information:

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Alex Rossi	Organic Chemist	Sydney Organics, Smithfield, NSW
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW

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 (%)
ED037P: Alkalinity by PC Titrator (QC Lot: 2832176)									
ES2002603-001	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	696	697	0.00	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	696	697	0.00	0% - 20%
ES2002744-003	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	27	28	6.68	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	27	28	6.68	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 2833751)									
ES2002831-001	ID013_BORE	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	20	20	0.00	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 2833752)									
ES2002831-001	ID013_BORE	ED045G: Chloride	16887-00-6	1	mg/L	237	242	2.02	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 2834390)									
ES2002111-001	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	40	40	0.00	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	26	25	0.00	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	62	61	0.00	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	9	8	0.00	No Limit
ES2002822-001	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	6	6	0.00	No Limit
		ED093F: Magnesium	7439-95-4	1	mg/L	13	13	0.00	0% - 50%
		ED093F: Sodium	7440-23-5	1	mg/L	88	86	2.58	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	2	2	0.00	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 2833090)									
ES2002831-001	ID013_BORE	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	0.00	No Limit
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	0.00	No Limit

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 2833090) - continued									
ES2002831-001	ID013_BORE	EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 2833090)									
ES2002831-001	ID013_BORE	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	0.00	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.00	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 2833090)									
ES2002831-001	ID013_BORE	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 2833090)									
ES2002831-001	ID013_BORE	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP231P: PFAS Sums (QC Lot: 2833090)									

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 (%)
EP231P: PFAS Sums (QC Lot: 2833090) - continued									
ES2002831-001	ID013_BORE	EP231X: Sum of PFAS	----	0.01	µg/L	<0.01	<0.01	0.00	No Limit

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

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

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
ED037P: Alkalinity by PC Titrator (QCLot: 2832176)								
ED037-P: Total Alkalinity as CaCO3	----	----	mg/L	----	200 mg/L	99.6	81.0	111
				----	50 mg/L	111	70.0	130
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 2833751)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	95.5	82.0	122
				<1	500 mg/L	102	82.0	122
ED045G: Chloride by Discrete Analyser (QCLot: 2833752)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	110	80.9	127
				<1	1000 mg/L	102	80.9	127
ED093F: Dissolved Major Cations (QCLot: 2834390)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	104	80.0	114
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	107	90.0	116
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	98.7	82.0	120
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	94.6	85.0	113
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 2833090)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	103	72.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	107	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	104	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	113	69.0	134
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	105	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	108	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 2833090)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	108	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	120	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	117	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	122	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	101	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	119	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	117	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	110	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	118	72.0	134
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	106	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	90.7	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 2833090)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	115	67.0	137

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report Result	Laboratory Control Spike (LCS) Report Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%) Low	Recovery Limits (%) High
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 2833090) - continued								
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	126	70.0	130
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	115	70.0	130
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	126	70.0	130
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	117	70.0	130
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	119	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	103	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 2833090)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	111	63.0	143
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.25 µg/L	120	67.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.25 µg/L	122	67.0	138
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.25 µg/L	127	70.0	130

Matrix Spike (MS) Report

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

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report Spike Concentration	SpikeRecovery(%) MS	Recovery Limits (%) Low	Recovery Limits (%) High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 2833751)							
ES2002831-001	ID013_BORE	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	10 mg/L	95.7	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 2833752)							
ES2002831-001	ID013_BORE	ED045G: Chloride	16887-00-6	250 mg/L	108	70.0	130
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 2833090)							
ES2002831-002	ID013_SW01	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.25 µg/L	105	50.0	130
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.25 µg/L	103	50.0	130
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.25 µg/L	# Not Determined	50.0	130
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.25 µg/L	120	50.0	130
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.25 µg/L	# Not Determined	50.0	130
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.25 µg/L	121	50.0	130
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 2833090)							
ES2002831-002	ID013_SW01	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	1.25 µg/L	113	50.0	130

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report Spike Concentration	SpikeRecovery(%) MS	Recovery Limits (%) Low	High
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 2833090) - continued							
ES2002831-002	ID013_SW01	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.25 µg/L	123	50.0	130
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.25 µg/L	123	50.0	130
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.25 µg/L	121	50.0	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.25 µg/L	98.0	50.0	130
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.25 µg/L	120	50.0	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.25 µg/L	113	50.0	130
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.25 µg/L	113	50.0	130
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.25 µg/L	114	50.0	130
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.25 µg/L	106	50.0	130
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.625 µg/L	88.0	50.0	150
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 2833090)							
ES2002831-002	ID013_SW01	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.25 µg/L	121	50.0	130
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.625 µg/L	123	50.0	150
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.625 µg/L	103	50.0	150
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.625 µg/L	130	50.0	150
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.625 µg/L	135	50.0	150
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.25 µg/L	104	50.0	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.25 µg/L	98.4	50.0	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 2833090)							
ES2002831-002	ID013_SW01	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.25 µg/L	113	50.0	130
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.25 µg/L	124	50.0	130
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.25 µg/L	128	50.0	130
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.25 µg/L	125	50.0	130

ALS Environmental

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **ES2002833**

Client	: **SENVERSA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: LUCINDA TRICKEY	Contact	: Brenda Hong
Address	: Level 5, Grafton Bond Building 201 Kent Street SYDNEY NSW 2000	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: lucinda.trickey@senversa.com.au	E-mail	: Brenda.Hong@ALSGlobal.com
Telephone	: +61 03 9606 0070	Telephone	: +61 2 8784 8555
Facsimile	: +61 03 9606 0074	Facsimile	: +61-2-8784 8500
Project	: S17776 PSI	Page	: 1 of 2
Order number	: ----	Quote number	: ES2019SENVER0020 (SY/665/19)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	: LUCINDA TRICKEY		

Dates

Date Samples Received	: 29-Jan-2020 16:45	Issue Date	: 29-Jan-2020
Client Requested Due Date	: 03-Feb-2020	Scheduled Reporting Date	: **03-Feb-2020**

Delivery Details

Mode of Delivery	: Undefined	Security Seal	: Not Available
No. of coolers/boxes	: ----	Temperature	: 27.6'c - Ice Bricks present
Receipt Detail	:	No. of samples received / analysed	: 1 / 1

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**
- Please direct any queries you have regarding this work order to the above ALS laboratory contact.
- Analytical work for this work order will be conducted at ALS Sydney.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months ± 1 week) from receipt of samples.
- 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 PFAS - Full Suite (28 analytes)
ES2002833-001	24-Jan-2020 00:00	FRE_UL_TENDER1	✓

Proactive Holding Time Report

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

Requested Deliverables

CHRISTOPHER SANDIFORD

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

LUCINDA TRICKEY

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

SUPPLIER ACCOUNTS

- A4 - AU Tax Invoice (INV)	Email	supplieraccounts@senversa.com.au

senversa

Senversa Pty Ltd
www.senversa.com.au
ABN 89 132 231 380

Chain of Custody Documentation

Laboratory: ALS NSW
Address: 277-289 Woodpark Road, Smithfield
Contact: Brenda Hong
Phone: 02 8784 8515

Job Number:	S17776	**Purchase Order:**	
Project Name:	PSI	**Quote No:**	SY-665-19 V2
Sampled By:	LT/CW	**Turn Around Time:**	standard
Project Manager:	Lucinda Trickey	**Page:**	1 of 1
Email Report To:	lucinda.trickey@senversa.com.au	**Phone/Mobile:**	+61 424 172 065

Analysis Required — Comments: pure concentrate.

Lab ID	Sample ID	Matrix *	Date	Time	Container Information: Type / Code	Total Bottles	EP231X - PFAS - Full Suite (28 Analytes)
	FIRE_UL_TENDER1	W	24/1/20	AM		2	X
Total							

VERY HIGH PFAS CONCENTRATION see MSDS included.

Environmental Division
Sydney
Work Order Reference
ES2002833
Telephone : +61-2-8784 8555

Sampler: I attest that proper field sampling procedures in accordance with Senversa standard procedures and/or project specifications were used during the collection of these samples:

Sampler Name: Lucinda Trickey **Signature:** **Date:**

Relinquished By:

Name/Signature:	Lucinda Trickey	Date:	
Of:	Senversa	Time:	
Name/Signature:		Date:	
Of:		Time:	
Name/Signature:		Date:	
Of:		Time:	

Method of Shipment (if applicable):

Carrier / Reference #:	
Date/Time:	
Carrier / Reference #:	
Date/Time:	
Carrier / Reference #:	
Date/Time:	

Received by:

Name/Signature:		Date:	
Of:		Time:	
Name/Signature:		Date:	
Of:		Time:	
Name/Signature:		Date:	
Of:		Time:	

Water Container Codes: P = Unpreserved Plastic; N = Nitric Acid (HNO_3) Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide (NaOH)/Cadmium (Cd) Preserved; S = Sodium Hydroxide Preserved Plastic; STH = Sodium thiosulfate preserved plastic; V = VOA Vial Hydochloric Acid (HCl) Preserved; VS = VOA Vial Sulphuric Preserved; VSA = Sulphuric Preserved Amber Glass; H = HCl Preserved Plastic; HS = HCl Preserved Speciation Bottle; SP = Sulphuric Preserved Plastic; F = Formaldehyde Preserved Glass; Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; UA = Unpreserved Amber Glass; L=Lugol's iodine preserved white plastic bottle; SW= sulfuric acid preserved wide mouth glass jar

Completed by: ________
Checked by: ________

MATERIAL SAFETY DATA SHEET   ANSULITE 6%AFFF AFC-5

Manufacturer's Name	ANSUL INCORPORATED	Emergency Telephone No.	133 166 or 000
Address	One Stanton, Street Marinette, WI 54143-2542	Other Information Calls	133 166
Prepared By	Technical Services	Date Prepared	April 2004

SECTION 1 - IDENTITY

Common Name (used on lable)	Ansulite 6% AFFF AFC-5	CAS No.	N/A
Chemical Name	N/A this is a mixture	Chemical Family	Mixture
Formula	N/A		

SECTION 2 - INGREDIENTS

Pricipal Hazardous Component(s)	Wt.%	CAS No.	ACGIH TLV	Acute Toxicity Data
Proprietary mixture of hydrocarbon surfactants, fuorosurfactants, inorganic salts, and water.	>80	N/A		
Diethylene Glycol Monobutyl Ether (a)	19	112-34-5	TWA: 600ppm OSHA PEL TWA: 1000ppm (2950mg/m^3)	Oral (rat) LD_{50} 5660 mg/kg Dermal (rabbit) LD_{50} 2700 mg/kg
1 – Propanol	0.2	71-23-8	STEL:250ppm(skin) TWA:200ppm (skin) OSHA PEL TWA:200ppm (500mg/m^3)	Oral (rat) LD_{50} 1870 mg/kg Inhalation (mouse) LC_{50}
Hexylene Glycol	0.3	107-41-5	25 ppm	Oral(rat) LD_{50} 3700 mg/kg Inhalation (rat) LC_{50} >310 mg/m^3 /1hr

Other Component(s)	Wt.%	CAS No.	ACGIH TLV	Acute Toxicity Data
N/A	N/A	N/A	N/A	N/A

SECTION 3 – Physical & Chemical Charateristics (Fire & Explosion Data)

Boiling Point	97°C	Specific Gravity (H20 = 1)	1.02	Vapour Pressure (mm Hg)		Not Determined	
Percent Volatile by Volume (%)	Ca. 95	Vapour Density (air = 1)	<1	Evaporation Rate (Butyl acetate=1)		App 0.005	
Solubility in Water	Miscible	Reactivity in water		N/A			
Appearance & Odour	Straw yellow clear liquid, mild sweet odour.						
Flash Point	None	Flammable Limits in Air % by Volume	N/A	Extinguisher Media	THIS IS AN EXTINGUISHING AGENT	Auto-Ignition Temp	N/A
Special Fire Fighting Procedures	None						
Unusual Fire & Explosion Hazards	None						

SECTION 4 – Physical Hazards

Stability	Unstable	Stable	X	Conditions to avoid	None
Incompatibility (materials to avoid)	Any material reactive with water, electrically energized equipment, or strong oxidizers.				
Hazardous Decomposition Products	Not known, however, oxides of nitrogen and sulfur may be produced during fire conditions.				
Hazardous Polymerization	May Occur	Will Not Occur	X	Conditions to avoid	None

SECTION 5 – Health Hazards

Threshold Limit Value	The toxicity of the product mixture has not been determined.			
Routes of Entry	Eye Contact :	May cause mild to moderate tansient irritation.	Skin Contact:	May cause mild transient irritation and/or dermatitis.
Inhalation:	Not an expected route of entry.		Ingestion:	Irritating to mucous membranes. Large oral dose could produce narcosis.
Signs & Symptons – Acute Overexposure	Irritation of the eyes, skin and mucous membrane.			
Signs & Symptons – Chronic Overexposure	Kidney, liver, gastrointestinal and spleen.			
Medical Conditions Generally Aggravated by Exposure	Prior disease of the kidney and liver.			
Chemical Listed as Carcinogen or Potential	National Toxicology Program: No		I.A.R.C Monographs: No	OSHA: No

SECTION 6 – Emergency & First Aid Procedures

Eye Contact	Flush with large amounts of water. If irrtation persists, seek medical attention.
Skin Contact	Wash thoroughly with soap and water. If irritation persists, seek medical attention.
Inhalation	Remove victim to fresh air. Seek medical attention if discomfort continues.
Ingestion	If patient is conscious, give large amount of water and induce vomiting. Seek medical help.

SECTION 7 – Special Protection Information

Respiratory Protection (Specify Type)	None expected to be needed.			
Ventilation	Local Exhaust:	N/A	Mechanical (General):	Recommended.
Protective Gloves	Rubber or latex gloves are recommended.		Eye Protection	Chemical goggles are recommended.
Other Protective Clothing or Equipment	Standard fire fighting safety equipment should provide all protection which is necessary. Eye wash and safety showers are good safety practices.			

SECTION 8 – Special Precautions & Spill/Leak Procedures

Precautions to be Taken in Handling & Storage	Store in original container. Keep tightly closed. Avoid skin and eye contact. Avoid ingestion. Do not mix with other fire fighting agents. See incompatibility in section 4.
Other Precautions	See section 7.
Steps to be Taken in Case Material is Released/Spilled	Stop leaks. Contain spill. Remove as much as possible. Place in a closed container for proper disposal. Wash spill area with large amounts of water to remove traces as material is very slippery. Prevent material from reaching sewers or waterways to avoid nuisance foaming
Waste Disposal Methods	Dispose of in compliance with local, state and federal regulations.

SECTION 9 – Transport Information

Australian Dangerous Goods Code Hazard Class or Division	Not Hazardous

Hazardous Material Identification System Ratings

Hazard Index	4 – Severe, 3 – Serious, 2 – Moderate, 1 – Slight, 0 – Minimal hazard, N/A –Not applicable, NDA – No Data Available, N/E – None Established				
Health	1	Flammability	0	Reactivity	0

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Contact Us
Australia Phone 133 186
New Zealand Phone 0800-4-WORMALD
Fiji Phone 336 1455

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES2002833**	Page	: 1 of 5
Client	: **SENVERSA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: LUCINDA TRICKEY	Contact	: Brenda Hong
Address	: Level 5, Grafton Bond Building 201 Kent Street SYDNEY NSW 2000	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 03 9606 0070	Telephone	: +61 2 8784 8555
Project	: S17776 PSI	Date Samples Received	: 29-Jan-2020 16:45
Order number	: ----	Date Analysis Commenced	: 30-Jan-2020
C-O-C number	: ----	Issue Date	: 03-Feb-2020 09:14
Sampler	: LUCINDA TRICKEY		
Site	: ----		
Quote number	: SY/665/19		
No. of samples received	: 1		
No. of samples analysed	: 1		

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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Alex Rossi	Organic Chemist	Sydney Organics, Smithfield, NSW

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: Surrogates diluted out of analytical range, therefore % recoveries could not be determined.
- EP231X: Particular samples required dilution due to the presence of high level contaminants. LOR values have been adjusted accordingly.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	FRE_UL_TENDER1	----	----	----	----
			Client sampling date / time	24-Jan-2020 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	ES2002833-001	--------	--------	--------	--------
				Result	----	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	**35.0**	----	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<10.0	----	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	**210**	----	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<10.0	----	----	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	**473**	----	----	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<10.0	----	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.10	µg/L	**622**	----	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	**163**	----	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	**1160**	----	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	**101**	----	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	**539**	----	----	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	**30.0**	----	----	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	**76.0**	----	----	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<10.0	----	----	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<10.0	----	----	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<10.0	----	----	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<25.0	----	----	----	----
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<10.0	----	----	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<25.0	----	----	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<25.0	----	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	FRE_UL_TENDER1	----	----	----	----
			Client sampling date / time	24-Jan-2020 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	ES2002833-001	--------	--------	--------	--------
				Result	----	----	----	----
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<25.0	----	----	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<25.0	----	----	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<10.0	----	----	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<10.0	----	----	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<10.0	----	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	**141**	----	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	**614**	----	----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<10.0	----	----	----	----
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	**4160**	----	----	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	**683**	----	----	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L	**4060**	----	----	----	----
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	**Not Determined**	----	----	----	----
13C8-PFOA	----	0.02	%	**Not Determined**	----	----	----	----

Surrogate Control Limits

Sub-Matrix: **WATER**

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

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **ES2002833**	Page	: 1 of 4
Client	: **SENVERSA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: LUCINDA TRICKEY	Telephone	: +61 2 8784 8555
Project	: S17776 PSI	Date Samples Received	: 29-Jan-2020
Site	: ----	Issue Date	: 03-Feb-2020
Sampler	: LUCINDA TRICKEY	No. of samples received	: 1
Order number	: ----	No. of samples analysed	: 1

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

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

Summary of Outliers

Outliers : Quality Control Samples

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

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **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

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

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type / Method	Count QC	Count Regular	Rate (%) Actual	Rate (%) Expected	Quality Control Specification
Laboratory Duplicates (DUP)					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	0	1	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	0	1	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

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

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

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

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

Matrix: **WATER**

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

Method / *Container / Client Sample ID(s)*	*Sample Date*	Extraction / Preparation: *Date extracted*	*Due for extraction*	*Evaluation*	Analysis: *Date analysed*	*Due for analysis*	*Evaluation*
EP231A: Perfluoroalkyl Sulfonic Acids							
HDPE (no PTFE) (EP231X-INJ) FRE_UL_TENDER1	**24-Jan-2020**	**30-Jan-2020**	22-Jul-2020	✓	**31-Jan-2020**	22-Jul-2020	✓
EP231B: Perfluoroalkyl Carboxylic Acids							
HDPE (no PTFE) (EP231X-INJ) FRE_UL_TENDER1	**24-Jan-2020**	**30-Jan-2020**	22-Jul-2020	✓	**31-Jan-2020**	22-Jul-2020	✓
EP231C: Perfluoroalkyl Sulfonamides							
HDPE (no PTFE) (EP231X-INJ) FRE_UL_TENDER1	**24-Jan-2020**	**30-Jan-2020**	22-Jul-2020	✓	**31-Jan-2020**	22-Jul-2020	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE (no PTFE) (EP231X-INJ) FRE_UL_TENDER1	**24-Jan-2020**	**30-Jan-2020**	22-Jul-2020	✓	**31-Jan-2020**	22-Jul-2020	✓
EP231P: PFAS Sums							
HDPE (no PTFE) (EP231X-INJ) FRE_UL_TENDER1	**24-Jan-2020**	**30-Jan-2020**	22-Jul-2020	✓	**31-Jan-2020**	22-Jul-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)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X-INJ	0	1	**0.00**	**10.00**	✗	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X-INJ	1	1	**100.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X-INJ	1	1	**100.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X-INJ	0	1	**0.00**	**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*
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X-INJ	WATER	In house: Direct injection analysis of fresh waters after dilution (1:1) with methanol. Analysis by LC-Electrospray-MS-MS, Negative Mode using MRM. 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.

Preparation Methods	*Method*	*Matrix*	*Method Descriptions*
Preparation for PFAS in water.	EP231-PR	WATER	Method presumes direct injection without workup. Preparation includes addition of internal standard and surrogate, and filtration prior to anaylsis.

QUALITY CONTROL REPORT

Work Order	: **ES2002833**	Page	: 1 of 4
Client	: **SENVERSA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: LUCINDA TRICKEY	Contact	: Brenda Hong
Address	: Level 5, Grafton Bond Building 201 Kent Street SYDNEY NSW 2000	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 03 9606 0070	Telephone	: +61 2 8784 8555
Project	: S17776 PSI	Date Samples Received	: 29-Jan-2020
Order number	: ----	Date Analysis Commenced	: 30-Jan-2020
C-O-C number	: ----	Issue Date	: 03-Feb-2020
Sampler	: LUCINDA TRICKEY		
Site	: ----		
Quote number	: SY/665/19		
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*
Alex Rossi	Organic Chemist	Sydney Organics, Smithfield, NSW

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%.

- **No Laboratory Duplicate (DUP) Results are required to be reported.**

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: 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: 2833807)								
EP231X-INJ: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.5 µg/L	84.4	70.0	130
EP231X-INJ: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.5 µg/L	92.0	70.0	130
EP231X-INJ: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.5 µg/L	95.8	70.0	130
EP231X-INJ: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.5 µg/L	96.4	70.0	130
EP231X-INJ: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.5 µg/L	86.0	70.0	130
EP231X-INJ: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.5 µg/L	102	70.0	130
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 2833807)								
EP231X-INJ: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.10	2.5 µg/L	91.3	70.0	130
EP231X-INJ: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.5 µg/L	101	70.0	130
EP231X-INJ: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.5 µg/L	93.0	70.0	130
EP231X-INJ: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.5 µg/L	98.4	70.0	130
EP231X-INJ: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.5 µg/L	96.4	70.0	130
EP231X-INJ: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.5 µg/L	89.2	70.0	130
EP231X-INJ: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.5 µg/L	90.0	70.0	130
EP231X-INJ: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.5 µg/L	90.2	70.0	130
EP231X-INJ: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.5 µg/L	86.0	70.0	130
EP231X-INJ: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	0.5 µg/L	80.8	70.0	130
EP231X-INJ: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	1.25 µg/L	83.4	70.0	150
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 2833807)								
EP231X-INJ: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.5 µg/L	112	70.0	130
EP231X-INJ: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	1.25 µg/L	99.4	70.0	150
EP231X-INJ: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	1.25 µg/L	83.8	70.0	150
EP231X-INJ: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	1.25 µg/L	98.2	70.0	150
EP231X-INJ: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	1.25 µg/L	105	70.0	150
EP231X-INJ: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.5 µg/L	85.2	70.0	130
EP231X-INJ: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.5 µg/L	86.8	70.0	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 2833807)								
EP231X-INJ: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.5 µg/L	89.6	60.0	120
EP231X-INJ: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.5 µg/L	99.6	60.0	120

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
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 2833807) - continued								
EP231X-INJ: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.5 µg/L	102	70.0	130
EP231X-INJ: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.5 µg/L	101	70.0	130
EP231P: PFAS Sums (QCLot: 2833807)								
EP231X-INJ: Sum of PFAS	----	0.01	µg/L	<0.01	----	----	----	----
EP231X-INJ: Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	<0.01	----	----	----	----
EP231X-INJ: Sum of PFAS (WA DER List)	----	0.01	µg/L	<0.01	----	----	----	----

Matrix Spike (MS) Report

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

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

31.01.20

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ABN 89 132 231 380

Chain of Custody Documentation

Laboratory: ALS NSW
Address: 277-289 Woodpark Road, Smithfield
Contact: Brenda Hong
Phone: 02 8784 8515

Job Number:	S17776	**Purchase Order:**	
Project Name:	PSI	**Quote No:**	SY-665-19 V2
Sampled By:	LT/CW	**Turn Around Time:**	STANDARD
Project Manager:	Lucinda Trickey	**Page:**	1 of 1
Email Report To:	lucinda.trickey@senversa.com.au	**Phone/Mobile:**	+61 424 172 065

Analysis Required — **Comments:**

HT 699263

Lab ID	Sample ID	Matrix *	Date	Time	Type / Code	Total Bottles	EP231X - PFAS - Full Suite (28 Analytes)	Major anions + cations	Comments
1	PWS_SCH_BORE	W	16/01/20			3	X	X	
2	PWS_SCH_TANK1	W	16/01/20			2	X		
3	PWS_SCH_TAP	W	16/01/20			2	X		
4	QC102	W	16/01/20			2	X		
x	QC202	W	16/01/20			2	X		forward to Eurofins
8	QC300	W	16/01/20			2	X		
Total							0		

TAT

Subcon / Forward Lab / Split WO
Lab / Analysis: Eurofins
Organised By / Date: QC202
Relinquished By / Date:
Connote / Courier:
WO No: ES2002620
Attach By PO / Internal Sheet:

Environmental Division
Sydney
Work Order Reference
ES2002620
Telephone : + 61-2-8784 8555

Sampler: I attest that proper field sampling procedures in accordance with Senversa standard procedures and/or project specifications were used during the collection of these samples:	**Sampler Name:**	Lucinda Trickey	**Signature:**		**Date:** 16/01/20

Relinquished By:		Date / Time	**Method of Shipment (if applicable):**	**Received by:**	Date / Time
Name/Signature:	Lucinda Trickey	Date: 17/01/20	Carrier / Reference #:	Name/Signature: 17/1/20	Date:
Of:	Senversa	Time: 8:30	Date/Time:	Of:	Time:
Name/Signature:		Date:	Carrier / Reference #:	Name/Signature:	Date: 30/01/20
Of:		Time:	Date/Time:	Of:	Time: 12:05PM
Name/Signature:		Date:	Carrier / Reference #:	Name/Signature:	Date:
Of:		Time:	Date/Time:	Of:	Time:

Water Container Codes: P = Unpreserved Plastic; N = Nitric Acid (HNO_3) Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide (NaOH)/Cadmium (Cd) Preserved; S = Sodium Hydroxide Preserved Plastic; STH = Sodium thiosulfate preserved plastic;
V = VOA Vial Hydochloric Acid (HCl) Preserved; VS = VOA Vial Sulphuric Preserved; VSA = Sulphuric Preserved Amber Glass; H = HCl Preserved Plastic; HS = HCl Preserved Speciation Bottle; SP = Sulphuric Preserved Plastic;
F = Formaldehyde Preserved Glass; Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; UA = Unpreserved Amber Glass; L=Lugol's iodine preserved white plastic bottle; SW= sulfuric acid preserved wide mouth glass jar

T: 23.2°C

62

Completed by: ________
Checked by: ________

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Certificate of Analysis

NATA Accredited
Accreditation Number 1261
Site Number 18217

Accredited for compliance with ISO/IEC 17025 – Testing
The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

Senversa Pty Ltd NSW
Level 5, The Grafton Bond Building, 201 Kent Street
SYDNEY
NSW 2000

Attention: **Lucinda Trickey**

Report **699263-W**
Project name PSI
Project ID S17776
Received Date Jan 30, 2020

Client Sample ID			**QC202**
Sample Matrix			**Water**
Eurofins Sample No.			**S20-Ja29794**
Date Sampled			**Jan 16, 2020**
Test/Reference	LOR	Unit	
Perfluoroalkyl carboxylic acids (PFCAs)			
Perfluorobutanoic acid (PFBA)N11	0.05	ug/L	< 0.05
Perfluoropentanoic acid (PFPeA)N11	0.01	ug/L	< 0.01
Perfluorohexanoic acid (PFHxA)N11	0.01	ug/L	< 0.01
Perfluoroheptanoic acid (PFHpA)N11	0.01	ug/L	< 0.01
Perfluorooctanoic acid (PFOA)N11	0.01	ug/L	< 0.01
Perfluorononanoic acid (PFNA)N11	0.01	ug/L	< 0.01
Perfluorodecanoic acid (PFDA)N11	0.01	ug/L	< 0.01
Perfluoroundecanoic acid (PFUnDA)N11	0.01	ug/L	< 0.01
Perfluorododecanoic acid (PFDoDA)N11	0.01	ug/L	< 0.01
Perfluorotridecanoic acid (PFTrDA)N15	0.01	ug/L	< 0.01
Perfluorotetradecanoic acid (PFTeDA)N11	0.01	ug/L	< 0.01
13C4-PFBA (surr.)	1	%	135
13C5-PFPeA (surr.)	1	%	98
13C5-PFHxA (surr.)	1	%	104
13C4-PFHpA (surr.)	1	%	101
13C8-PFOA (surr.)	1	%	109
13C5-PFNA (surr.)	1	%	99
13C6-PFDA (surr.)	1	%	104
13C2-PFUnDA (surr.)	1	%	142
13C2-PFDoDA (surr.)	1	%	98
13C2-PFTeDA (surr.)	1	%	64
Perfluoroalkyl sulfonamido substances			
Perfluorooctane sulfonamide (FOSA)N11	0.05	ug/L	< 0.05
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)N11	0.05	ug/L	< 0.05
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)N11	0.05	ug/L	< 0.05
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)N11	0.05	ug/L	< 0.05
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)N11	0.05	ug/L	< 0.05
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)N11	0.05	ug/L	< 0.05
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)N11	0.05	ug/L	< 0.05
13C8-FOSA (surr.)	1	%	88
D3-N-MeFOSA (surr.)	1	%	89
D5-N-EtFOSA (surr.)	1	%	90

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Environment Testing

Client Sample ID			QC202
Sample Matrix			Water
Eurofins Sample No.			S20-Ja29794
Date Sampled			Jan 16, 2020
Test/Reference	LOR	Unit	
Perfluoroalkyl sulfonamido substances			
D7-N-MeFOSE (surr.)	1	%	146
D9-N-EtFOSE (surr.)	1	%	153
D5-N-EtFOSAA (surr.)	1	%	72
D3-N-MeFOSAA (surr.)	1	%	75
Perfluoroalkyl sulfonic acids (PFSAs)			
Perfluorobutanesulfonic acid (PFBS)[N11]	0.01	ug/L	< 0.01
Perfluorononanesulfonic acid (PFNS)[N15]	0.01	ug/L	< 0.01
Perfluoropropanesulfonic acid (PFPrS)[N15]	0.01	ug/L	< 0.01
Perfluoropentanesulfonic acid (PFPeS)[N15]	0.01	ug/L	< 0.01
Perfluorohexanesulfonic acid (PFHxS)[N11]	0.01	ug/L	< 0.01
Perfluoroheptanesulfonic acid (PFHpS)[N15]	0.01	ug/L	< 0.01
Perfluorooctanesulfonic acid (PFOS)[N11]	0.01	ug/L	< 0.01
Perfluorodecanesulfonic acid (PFDS)[N15]	0.01	ug/L	< 0.01
13C3-PFBS (surr.)	1	%	108
18O2-PFHxS (surr.)	1	%	135
13C8-PFOS (surr.)	1	%	131
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)			
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)[N11]	0.01	ug/L	< 0.01
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)[N11]	0.05	ug/L	< 0.05
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)[N11]	0.01	ug/L	< 0.01
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)[N15]	0.01	ug/L	< 0.01
13C2-4:2 FTSA (surr.)	1	%	97
13C2-6:2 FTSA (surr.)	1	%	102
13C2-8:2 FTSA (surr.)	1	%	92
PFASs Summations			
Sum (PFHxS + PFOS)*	0.01	ug/L	< 0.01
Sum of US EPA PFAS (PFOS + PFOA)*	0.01	ug/L	< 0.01
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	0.01	ug/L	< 0.01
Sum of WA DWER PFAS (n=10)*	0.05	ug/L	< 0.05
Sum of PFASs (n=30)*	0.1	ug/L	< 0.1

Sample History

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

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Per- and Polyfluoroalkyl Substances (PFASs)			
Perfluoroalkyl carboxylic acids (PFCAs)	Brisbane	Jan 31, 2020	14 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
Perfluoroalkyl sulfonamido substances	Brisbane	Jan 31, 2020	14 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
Perfluoroalkyl sulfonic acids (PFSAs)	Brisbane	Jan 31, 2020	14 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)	Brisbane	Jan 31, 2020	14 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			

Company Name:	Senversa Pty Ltd NSW	**Order No.:**		**Received:**	Jan 30, 2020 12:05 PM
Address:	Level 5, The Grafton Bond Building, 201 Kent Street SYDNEY NSW 2000	**Report #:**	699263	**Due:**	Feb 6, 2020
		Phone:	02 9994 8016	**Priority:**	5 Day
		Fax:	03 9606 0074	**Contact Name:**	Lucinda Trickey
Project Name:	PSI				
Project ID:	S17776				

Eurofins Analytical Services Manager : Ursula Long

Sample Detail						Per- and Polyfluoroalkyl Substances (PFASs)
Melbourne Laboratory - NATA Site # 1254 & 14271						
Sydney Laboratory - NATA Site # 18217						
Brisbane Laboratory - NATA Site # 20794						X
Perth Laboratory - NATA Site # 23736						
External Laboratory						
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**	
1	QC202	Jan 16, 2020		Water	S20-Ja29794	X
Test Counts						1

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Environment Testing

Internal Quality Control Review and Glossary

General

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

Holding Times

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

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

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

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

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

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

Units

mg/kg: milligrams per kilogram	**mg/L:** milligrams per litre	**ug/L:** micrograms per litre
ppm: Parts per million	**ppb:** Parts per billion	**%:** Percentage
org/100mL: Organisms per 100 millilitres	**NTU:** Nephelometric Turbidity Units	**MPN/100mL:** Most Probable Number of organisms per 100 millilitres

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery.
CRM	Certified Reference Material - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
QSM	US Department of Defense Quality Systems Manual Version 5.3
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

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

Results <10 times the LOR : No Limit

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

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

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

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.3 where no positive PFAS results have been reported have been reviewed and no data was affected.

WA DWER (n=10): PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC Data General Comments

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

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	ug/L	< 0.05			0.05	Pass	
Perfluoropentanoic acid (PFPeA)	ug/L	< 0.01			0.01	Pass	
Perfluorohexanoic acid (PFHxA)	ug/L	< 0.01			0.01	Pass	
Perfluoroheptanoic acid (PFHpA)	ug/L	< 0.01			0.01	Pass	
Perfluorooctanoic acid (PFOA)	ug/L	< 0.01			0.01	Pass	
Perfluorononanoic acid (PFNA)	ug/L	< 0.01			0.01	Pass	
Perfluorodecanoic acid (PFDA)	ug/L	< 0.01			0.01	Pass	
Perfluoroundecanoic acid (PFUnDA)	ug/L	< 0.01			0.01	Pass	
Perfluorododecanoic acid (PFDoDA)	ug/L	< 0.01			0.01	Pass	
Perfluorotridecanoic acid (PFTrDA)	ug/L	< 0.01			0.01	Pass	
Perfluorotetradecanoic acid (PFTeDA)	ug/L	< 0.01			0.01	Pass	
Method Blank							
Perfluoroalkyl sulfonamido substances							
Perfluorooctane sulfonamide (FOSA)	ug/L	< 0.05			0.05	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	ug/L	< 0.05			0.05	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	ug/L	< 0.05			0.05	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	ug/L	< 0.05			0.05	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	ug/L	< 0.05			0.05	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	ug/L	< 0.05			0.05	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	ug/L	< 0.05			0.05	Pass	
Method Blank							
Perfluoroalkyl sulfonic acids (PFSAs)							
Perfluorobutanesulfonic acid (PFBS)	ug/L	< 0.01			0.01	Pass	
Perfluorononanesulfonic acid (PFNS)	ug/L	< 0.01			0.01	Pass	
Perfluoropropanesulfonic acid (PFPrS)	ug/L	< 0.01			0.01	Pass	
Perfluoropentanesulfonic acid (PFPeS)	ug/L	< 0.01			0.01	Pass	
Perfluorohexanesulfonic acid (PFHxS)	ug/L	< 0.01			0.01	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	ug/L	< 0.01			0.01	Pass	
Perfluorooctanesulfonic acid (PFOS)	ug/L	< 0.01			0.01	Pass	
Perfluorodecanesulfonic acid (PFDS)	ug/L	< 0.01			0.01	Pass	
Method Blank							
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)							
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	ug/L	< 0.01			0.01	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	ug/L	< 0.05			0.05	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	ug/L	< 0.01			0.01	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	ug/L	< 0.01			0.01	Pass	
LCS - % Recovery							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	%	106			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	%	136			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	%	107			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	%	86			50-150	Pass	
Perfluorooctanoic acid (PFOA)	%	95			50-150	Pass	
Perfluorononanoic acid (PFNA)	%	106			50-150	Pass	
Perfluorodecanoic acid (PFDA)	%	84			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	%	88			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	%	122			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	%	107			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	%	113			50-150	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
LCS - % Recovery							
Perfluoroalkyl sulfonamido substances							
Perfluorooctane sulfonamide (FOSA)	%	98			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	%	78			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	%	66			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	%	94			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	%	67			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	%	94			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	%	84			50-150	Pass	
LCS - % Recovery							
Perfluoroalkyl sulfonic acids (PFSAs)							
Perfluorobutanesulfonic acid (PFBS)	%	83			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)	%	82			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)	%	117			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	%	85			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	%	88			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	%	88			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	%	98			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	%	73			50-150	Pass	
LCS - % Recovery							
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)							
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	%	105			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	%	98			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	%	127			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	%	95			50-150	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1					
Perfluorobutanoic acid (PFBA)	S20-Ja28320	NCP	%	99			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	S20-Ja28320	NCP	%	131			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	S20-Ja28320	NCP	%	108			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	S20-Ja28320	NCP	%	83			50-150	Pass	
Perfluorooctanoic acid (PFOA)	S20-Ja28320	NCP	%	91			50-150	Pass	
Perfluorononanoic acid (PFNA)	S20-Ja28320	NCP	%	103			50-150	Pass	
Perfluorodecanoic acid (PFDA)	S20-Ja28320	NCP	%	82			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	S20-Ja28320	NCP	%	89			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	S20-Ja28320	NCP	%	125			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	S20-Ja28320	NCP	%	125			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	S20-Ja28320	NCP	%	109			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonamido substances				Result 1					
Perfluorooctane sulfonamide (FOSA)	S20-Ja28320	NCP	%	100			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	S20-Ja28320	NCP	%	76			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	S20-Ja28320	NCP	%	68			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	S20-Ja28320	NCP	%	95			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	S20-Ja28320	NCP	%	77			50-150	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	S20-Ja28320	NCP	%	84			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	S20-Ja28320	NCP	%	81			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1					
Perfluorobutanesulfonic acid (PFBS)	S20-Ja28320	NCP	%	84			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)	S20-Ja28320	NCP	%	78			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)	S20-Ja28320	NCP	%	136			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	S20-Ja28320	NCP	%	96			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	S20-Ja28320	NCP	%	93			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	S20-Ja28320	NCP	%	83			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	S20-Ja28320	NCP	%	89			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	S20-Ja28320	NCP	%	80			50-150	Pass	
Spike - % Recovery									
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)				Result 1					
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	S20-Ja28320	NCP	%	103			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	S20-Ja28320	NCP	%	102			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	S20-Ja28320	NCP	%	126			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	S20-Ja28320	NCP	%	104			50-150	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Duplicate									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1	Result 2	RPD			
Perfluorobutanoic acid (PFBA)	S20-Ja28319	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
Perfluoropentanoic acid (PFPeA)	S20-Ja28319	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorohexanoic acid (PFHxA)	S20-Ja28319	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoroheptanoic acid (PFHpA)	S20-Ja28319	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorooctanoic acid (PFOA)	S20-Ja28319	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorononanoic acid (PFNA)	S20-Ja28319	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorodecanoic acid (PFDA)	S20-Ja28319	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoroundecanoic acid (PFUnDA)	S20-Ja28319	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorododecanoic acid (PFDoDA)	S20-Ja28319	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorotridecanoic acid (PFTrDA)	S20-Ja28319	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorotetradecanoic acid (PFTeDA)	S20-Ja28319	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	

Duplicate									
Perfluoroalkyl sulfonamido substances				Result 1	Result 2	RPD			
Perfluorooctane sulfonamide (FOSA)	S20-Ja28319	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	S20-Ja28319	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	S20-Ja28319	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	S20-Ja28319	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	S20-Ja28319	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	S20-Ja28319	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	S20-Ja28319	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
Duplicate									
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1	Result 2	RPD			
Perfluorobutanesulfonic acid (PFBS)	S20-Ja28319	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorononanesulfonic acid (PFNS)	S20-Ja28319	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoropropanesulfonic acid (PFPrS)	S20-Ja28319	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoropentanesulfonic acid (PFPeS)	S20-Ja28319	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorohexanesulfonic acid (PFHxS)	S20-Ja28319	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	S20-Ja28319	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorooctanesulfonic acid (PFOS)	S20-Ja28319	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorodecanesulfonic acid (PFDS)	S20-Ja28319	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Duplicate									
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)				Result 1	Result 2	RPD			
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	S20-Ja28319	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	S20-Ja28319	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	S20-Ja28319	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	S20-Ja28319	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	

Environment Testing

Comments

Sample Integrity

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

Qualifier Codes/Comments

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

Authorised By

Ursula Long	Analytical Services Manager
Sarah McCallion	Senior Analyst-PFAS (QLD)

Glenn Jackson
General Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

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

Measurement uncertainty of test data is available on request or please click here.

31.01.20

senversa

Chain of Custody Documentation

URGENT. #699266

Senversa Pty Ltd
www.senversa.com.au
ABN 89 132 231 380

Laboratory: ALS NSW
Address: 277-289 Woodpark Road, Smithfield
Contact: Brenda Hong
Phone: 02 8784 8515

Job Number:	S17776	Purchase Order:	
Project Name:	PSI	Quote No:	SY-665-19 V2
Sampled By:	LT/CW	Turn Around Time:	STANDARD
Project Manager:	Lucinda Trickey	Page:	of
Email Report To:	lucinda.trickey@senversa.com.au	Phone/Mobile:	+61 424 172 085

HTAT

Lab ID	Sample ID	Matrix *	Date	Time	Type / Code	Total Bottles	EP231X - PFAS - Full Suite (28 Analytes)	major anions / cations	HOLD		EP231X - PFAS - ULTRA TRACE	Comments
1	PWS_WWII_DAM	W	13-01-20	PM		2 bottles	X					
2	PWS_POUND_BOREA	W	14-01-20			2	X					
3	TC_SW01	W	14-01-20			2	X					
4	PWS_HESSIES_RESERVOIR	W	14-01-20			3	X	X				
5	PWS_DUCK_Dam	W	14-01-20			2	X					
6	BOMORAS_SW01	W	14-01-20			2	X					
7	PWS_HEAD_DAM	W	14-01-20			~~8~~ 7		X			X	*LOW LOR
8	PWS_KINGFISH_BOREA	W	14-01-20			3			X			
9	PWS_KINGFISH_BOREB	W	14-01-20			3	X	X				
10	PWS_AIRPORT_BORE	W	14-01-20			3	X	X				
11	A_BORE1	W	14-01-20			2	X					
12	BBC_SW01	W	15-01-20			2	X					
13	QC100	W	14-01-20			3	X					
14	QC101	W	14-01-20			~~8~~ 2	X					
15	QC103		16-01-20			2	X					
~~x~~	QC200	W	14-01-20			2	X					forward to Eurofins
~~x~~	QC201	W	14-01-20			2	X					forward to Eurofins
16	QC203		16-01-20			2	X					
17	TC_SW02	W	16/01/2020			2	X					
18	QC301	W	17-01-20			2	X					
Total												

Subcon / Forward Lab / Split WO: Eurofins
Lab / Analysis:
Organised By / Date: QC200
Relinquished By / Date: QC201
Connote / Courier:
WO No: ES2002626
Attach By PO / Internal Sheet:

Environmental Division
Sydney
Work Order Reference
ES2002626

Telephone : + 61-2-8784 8555

Sampler: I attest that proper field sampling procedures in accordance with Senversa standard procedures and/or project specifications were used during the collection of these samples:	Sampler Name: Lucinda Trickey	Signature:	Date: 15-01-20

Relinquished By:			Method of Shipment (if applicable):	Received by:	
Name/Signature: Lucinda Trickey		Date:	Carrier / Reference #:	Name/Signature: Fazi 28/1/20	Date:
Of: Senversa		Time:	Date/Time:	Of: AS	Time:
Name/Signature:		Date:	Carrier / Reference #:	Name/Signature:	Date: 30/01/20
Of:		Time:	Date/Time:	Of:	Time: 12:05 PM
Name/Signature:		Date:	Carrier / Reference #:	Name/Signature:	Date:
Of:		Time:	Date/Time:	Of:	Time:

Water Container Codes: P = Unpreserved Plastic; N = Nitric Acid (HNO_3) Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide (NaOH)/Cadmium (Cd) Preserved; S = Sodium Hydroxide Preserved Plastic; STH = Sodium thiosulfate preserved plastic; V = VOA Vial Hydochloric Acid (HCl) Preserved; VS = VOA Vial Sulphuric Preserved; VSA = Sulphuric Preserved Amber Glass; H = HCl Preserved Plastic; HS = HCl Preserved Speciation Bottle; SP = Sulphuric Preserved Plastic; F = Formaldehyde Preserved Glass; Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; UA = Unpreserved Amber Glass; L=Lugol's iodine preserved white plastic bottle; SW= sulfuric acid preserved wide mouth glass jar

1626

Completed by: ________
Checked by: ________

Tyler Cachia

From: Carlyn Williams <Carlyn.Williams@senversa.com.au>
Sent: Friday, 17 January 2020 1:25 PM
To: Tyler Cachia
Cc: Christopher Sandiford; Lucinda Trickey; Katie Richardson; Brenda Hong
Subject: RE: [EXTERNAL] - 17776 - COC for incoming samples from Norfolk Island

Categories: COC

Hi Tyler,

We need to update sample PWS_HEAD_DAM to standard LORs instead of ultratrace, i.e. all samples should be on standard LORs.

My understanding is that these are on standard TAT (however we cannot afford any delays beyond the 5 days). I'll confirm with the PM tonight that we don't need them any more urgently than this and let you know.

Kind regards,
Carlyn Williams
Environmental Geologist

senversa

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Level 6, 15 William Street, Melbourne VIC 3000

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t: +61 3 9606 0070 | w: www.senversa.com.au |

From: Tyler Cachia <tyler.cachia@ALSGlobal.com>
Sent: Friday, 17 January 2020 12:51 PM
To: Carlyn Williams <Carlyn.Williams@senversa.com.au>; Brenda Hong <Brenda.Hong@alsglobal.com>
Cc: Christopher Sandiford <Christopher.Sandiford@Senversa.com.au>; Lucinda Trickey <Lucinda.Trickey@senversa.com.au>; Katie Richardson <Katie.Richardson@senversa.com.au>
Subject: RE: [EXTERNAL] - 17776 - COC for incoming samples from Norfolk Island

Hi Carlyn,

Thanks for sending this through. Do you have a tracking number for this so we can track the consignment?

Can you also please confirm what date you require these samples by as I can see you have noted on your COCs that these are urgent, however you have also marked the turn around time as standard?

Kind Regards,

Tyler Cachia

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Certificate of Analysis

NATA Accredited
Accreditation Number 1261
Site Number 18217

Accredited for compliance with ISO/IEC 17025 – Testing
The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

Senversa Pty Ltd NSW
Level 5, The Grafton Bond Building, 201 Kent Street
SYDNEY
NSW 2000

Attention: **Lucinda Trickey**

Report	**699266-W**
Project name	PSI
Project ID	S17776
Received Date	Jan 30, 2020

Client Sample ID			**QC200**	**QC201**
Sample Matrix			**Water**	**Water**
Eurofins Sample No.			**S20-Ja29796**	**S20-Ja29797**
Date Sampled			**Jan 14, 2020**	**Jan 14, 2020**
Test/Reference	LOR	Unit		
Perfluoroalkyl carboxylic acids (PFCAs)				
Perfluorobutanoic acid (PFBA)N11	0.05	ug/L	< 0.05	0.15
Perfluoropentanoic acid (PFPeA)N11	0.01	ug/L	< 0.01	0.27
Perfluorohexanoic acid (PFHxA)N11	0.01	ug/L	< 0.01	1.2
Perfluoroheptanoic acid (PFHpA)N11	0.01	ug/L	< 0.01	0.25
Perfluorooctanoic acid (PFOA)N11	0.01	ug/L	< 0.01	N09 0.57
Perfluorononanoic acid (PFNA)N11	0.01	ug/L	< 0.01	< 0.01
Perfluorodecanoic acid (PFDA)N11	0.01	ug/L	< 0.01	< 0.01
Perfluoroundecanoic acid (PFUnDA)N11	0.01	ug/L	< 0.01	< 0.01
Perfluorododecanoic acid (PFDoDA)N11	0.01	ug/L	< 0.01	< 0.01
Perfluorotridecanoic acid (PFTrDA)N15	0.01	ug/L	< 0.01	< 0.01
Perfluorotetradecanoic acid (PFTeDA)N11	0.01	ug/L	< 0.01	< 0.01
13C4-PFBA (surr.)	1	%	105	107
13C5-PFPeA (surr.)	1	%	86	62
13C5-PFHxA (surr.)	1	%	105	59
13C4-PFHpA (surr.)	1	%	105	70
13C8-PFOA (surr.)	1	%	99	47
13C5-PFNA (surr.)	1	%	91	80
13C6-PFDA (surr.)	1	%	96	34
13C2-PFUnDA (surr.)	1	%	134	120
13C2-PFDoDA (surr.)	1	%	112	101
13C2-PFTeDA (surr.)	1	%	100	99
Perfluoroalkyl sulfonamido substances				
Perfluorooctane sulfonamide (FOSA)N11	0.05	ug/L	< 0.05	< 0.05
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)N11	0.05	ug/L	< 0.05	< 0.05
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)N11	0.05	ug/L	< 0.05	< 0.05
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)N11	0.05	ug/L	< 0.05	< 0.05
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)N11	0.05	ug/L	< 0.05	< 0.05
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)N11	0.05	ug/L	< 0.05	< 0.05
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)N11	0.05	ug/L	< 0.05	< 0.05
13C8-FOSA (surr.)	1	%	84	124
D3-N-MeFOSA (surr.)	1	%	99	76
D5-N-EtFOSA (surr.)	1	%	133	78

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Client Sample ID			QC200	QC201
Sample Matrix			Water	Water
Eurofins Sample No.			S20-Ja29796	S20-Ja29797
Date Sampled			Jan 14, 2020	Jan 14, 2020
Test/Reference	LOR	Unit		
Perfluoroalkyl sulfonamido substances				
D7-N-MeFOSE (surr.)	1	%	119	79
D9-N-EtFOSE (surr.)	1	%	132	73
D5-N-EtFOSAA (surr.)	1	%	62	INT
D3-N-MeFOSAA (surr.)	1	%	68	INT
Perfluoroalkyl sulfonic acids (PFSAs)				
Perfluorobutanesulfonic acid (PFBS)[N11]	0.01	ug/L	< 0.01	1.1
Perfluorononanesulfonic acid (PFNS)[N15]	0.01	ug/L	< 0.01	[N09]0.10
Perfluoropropanesulfonic acid (PFPrS)[N15]	0.01	ug/L	< 0.01	0.50
Perfluoropentanesulfonic acid (PFPeS)[N15]	0.01	ug/L	< 0.01	1.2
Perfluorohexanesulfonic acid (PFHxS)[N11]	0.01	ug/L	< 0.01	10
Perfluoroheptanesulfonic acid (PFHpS)[N15]	0.01	ug/L	< 0.01	[N09]0.62
Perfluorooctanesulfonic acid (PFOS)[N11]	0.01	ug/L	[N09]< 0.01	22
Perfluorodecanesulfonic acid (PFDS)[N15]	0.01	ug/L	< 0.01	< 0.01
13C3-PFBS (surr.)	1	%	97	60
18O2-PFHxS (surr.)	1	%	128	110
13C8-PFOS (surr.)	1	%	123	89
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)				
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)[N11]	0.01	ug/L	< 0.01	< 0.01
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)[N11]	0.05	ug/L	< 0.05	< 0.05
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)[N11]	0.01	ug/L	< 0.01	< 0.01
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)[N15]	0.01	ug/L	< 0.01	< 0.01
13C2-4:2 FTSA (surr.)	1	%	93	104
13C2-6:2 FTSA (surr.)	1	%	112	84
13C2-8:2 FTSA (surr.)	1	%	88	92
PFASs Summations				
Sum (PFHxS + PFOS)*	0.01	ug/L	< 0.01	32
Sum of US EPA PFAS (PFOS + PFOA)*	0.01	ug/L	< 0.01	22.57
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	0.01	ug/L	< 0.01	32.57
Sum of WA DWER PFAS (n=10)*	0.05	ug/L	< 0.05	35.54
Sum of PFASs (n=30)*	0.1	ug/L	< 0.1	37.96

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Sample History

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

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Per- and Polyfluoroalkyl Substances (PFASs)			
Perfluoroalkyl carboxylic acids (PFCAs)	Brisbane	Jan 31, 2020	14 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
Perfluoroalkyl sulfonamido substances	Brisbane	Jan 31, 2020	14 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
Perfluoroalkyl sulfonic acids (PFSAs)	Brisbane	Jan 31, 2020	14 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)	Brisbane	Jan 31, 2020	14 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			

Company Name:	Senversa Pty Ltd NSW	**Order No.:**		**Received:**	Jan 30, 2020 12:05 PM
Address:	Level 5, The Grafton Bond Building, 201 Kent Street SYDNEY NSW 2000	**Report #:**	699266	**Due:**	Feb 6, 2020
		Phone:	02 9994 8016	**Priority:**	5 Day
		Fax:	03 9606 0074	**Contact Name:**	Lucinda Trickey
Project Name:	PSI				
Project ID:	S17776				

Eurofins Analytical Services Manager : Ursula Long

Sample Detail						Per- and Polyfluoroalkyl Substances (PFASs)
Melbourne Laboratory - NATA Site # 1254 & 14271						
Sydney Laboratory - NATA Site # 18217						
Brisbane Laboratory - NATA Site # 20794						X
Perth Laboratory - NATA Site # 23736						
External Laboratory						
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**	
1	QC200	Jan 14, 2020		Water	S20-Ja29796	X
2	QC201	Jan 14, 2020		Water	S20-Ja29797	X
Test Counts						2

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Internal Quality Control Review and Glossary

General

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

Holding Times

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

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

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

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

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

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

Units

mg/kg: milligrams per kilogram	**mg/L:** milligrams per litre	**ug/L:** micrograms per litre
ppm: Parts per million	**ppb:** Parts per billion	**%:** Percentage
org/100mL: Organisms per 100 millilitres	**NTU:** Nephelometric Turbidity Units	**MPN/100mL:** Most Probable Number of organisms per 100 millilitres

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery.
CRM	Certified Reference Material - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
QSM	US Department of Defense Quality Systems Manual Version 5.3
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

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

Results <10 times the LOR : No Limit

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

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

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

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.3 where no positive PFAS results have been reported have been reviewed and no data was affected.

WA DWER (n=10): PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC Data General Comments

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

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	ug/L	< 0.05			0.05	Pass	
Perfluoropentanoic acid (PFPeA)	ug/L	< 0.01			0.01	Pass	
Perfluorohexanoic acid (PFHxA)	ug/L	< 0.01			0.01	Pass	
Perfluoroheptanoic acid (PFHpA)	ug/L	< 0.01			0.01	Pass	
Perfluorooctanoic acid (PFOA)	ug/L	< 0.01			0.01	Pass	
Perfluorononanoic acid (PFNA)	ug/L	< 0.01			0.01	Pass	
Perfluorodecanoic acid (PFDA)	ug/L	< 0.01			0.01	Pass	
Perfluoroundecanoic acid (PFUnDA)	ug/L	< 0.01			0.01	Pass	
Perfluorododecanoic acid (PFDoDA)	ug/L	< 0.01			0.01	Pass	
Perfluorotridecanoic acid (PFTrDA)	ug/L	< 0.01			0.01	Pass	
Perfluorotetradecanoic acid (PFTeDA)	ug/L	< 0.01			0.01	Pass	
Method Blank							
Perfluoroalkyl sulfonamido substances							
Perfluorooctane sulfonamide (FOSA)	ug/L	< 0.05			0.05	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	ug/L	< 0.05			0.05	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	ug/L	< 0.05			0.05	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	ug/L	< 0.05			0.05	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	ug/L	< 0.05			0.05	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	ug/L	< 0.05			0.05	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	ug/L	< 0.05			0.05	Pass	
Method Blank							
Perfluoroalkyl sulfonic acids (PFSAs)							
Perfluorobutanesulfonic acid (PFBS)	ug/L	< 0.01			0.01	Pass	
Perfluorononanesulfonic acid (PFNS)	ug/L	< 0.01			0.01	Pass	
Perfluoropropanesulfonic acid (PFPrS)	ug/L	< 0.01			0.01	Pass	
Perfluoropentanesulfonic acid (PFPeS)	ug/L	< 0.01			0.01	Pass	
Perfluorohexanesulfonic acid (PFHxS)	ug/L	< 0.01			0.01	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	ug/L	< 0.01			0.01	Pass	
Perfluorooctanesulfonic acid (PFOS)	ug/L	< 0.01			0.01	Pass	
Perfluorodecanesulfonic acid (PFDS)	ug/L	< 0.01			0.01	Pass	
Method Blank							
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)							
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	ug/L	< 0.01			0.01	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	ug/L	< 0.05			0.05	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	ug/L	< 0.01			0.01	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	ug/L	< 0.01			0.01	Pass	
LCS - % Recovery							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	%	106			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	%	136			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	%	107			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	%	86			50-150	Pass	
Perfluorooctanoic acid (PFOA)	%	95			50-150	Pass	
Perfluorononanoic acid (PFNA)	%	106			50-150	Pass	
Perfluorodecanoic acid (PFDA)	%	84			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	%	88			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	%	122			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	%	107			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	%	113			50-150	Pass	

Test			Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
LCS - % Recovery									
Perfluoroalkyl sulfonamido substances									
Perfluorooctane sulfonamide (FOSA)			%	98			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)			%	78			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)			%	66			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)			%	94			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)			%	67			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)			%	94			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)			%	84			50-150	Pass	
LCS - % Recovery									
Perfluoroalkyl sulfonic acids (PFSAs)									
Perfluorobutanesulfonic acid (PFBS)			%	83			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)			%	82			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)			%	117			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)			%	85			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)			%	88			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)			%	88			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)			%	98			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)			%	73			50-150	Pass	
LCS - % Recovery									
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)									
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)			%	105			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)			%	98			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)			%	127			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)			%	95			50-150	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Spike - % Recovery									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1					
Perfluorobutanoic acid (PFBA)	S20-Ja28320	NCP	%	99			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	S20-Ja28320	NCP	%	131			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	S20-Ja28320	NCP	%	108			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	S20-Ja28320	NCP	%	83			50-150	Pass	
Perfluorooctanoic acid (PFOA)	S20-Ja28320	NCP	%	91			50-150	Pass	
Perfluorononanoic acid (PFNA)	S20-Ja28320	NCP	%	103			50-150	Pass	
Perfluorodecanoic acid (PFDA)	S20-Ja28320	NCP	%	82			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	S20-Ja28320	NCP	%	89			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	S20-Ja28320	NCP	%	125			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	S20-Ja28320	NCP	%	125			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	S20-Ja28320	NCP	%	109			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonamido substances				Result 1					
Perfluorooctane sulfonamide (FOSA)	S20-Ja28320	NCP	%	100			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	S20-Ja28320	NCP	%	76			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	S20-Ja28320	NCP	%	68			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	S20-Ja28320	NCP	%	95			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	S20-Ja28320	NCP	%	77			50-150	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	S20-Ja28320	NCP	%	84			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	S20-Ja28320	NCP	%	81			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1					
Perfluorobutanesulfonic acid (PFBS)	S20-Ja28320	NCP	%	84			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)	S20-Ja28320	NCP	%	78			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)	S20-Ja28320	NCP	%	136			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	S20-Ja28320	NCP	%	96			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	S20-Ja28320	NCP	%	93			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	S20-Ja28320	NCP	%	83			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	S20-Ja28320	NCP	%	89			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	S20-Ja28320	NCP	%	80			50-150	Pass	
Spike - % Recovery									
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)				Result 1					
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	S20-Ja28320	NCP	%	103			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	S20-Ja28320	NCP	%	102			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	S20-Ja28320	NCP	%	126			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	S20-Ja28320	NCP	%	104			50-150	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Duplicate									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1	Result 2	RPD			
Perfluorobutanoic acid (PFBA)	S20-Ja29797	CP	ug/L	0.15	0.15	1.0	30%	Pass	
Perfluoropentanoic acid (PFPeA)	S20-Ja29797	CP	ug/L	0.27	0.28	2.0	30%	Pass	
Perfluorohexanoic acid (PFHxA)	S20-Ja29797	CP	ug/L	1.2	1.1	2.0	30%	Pass	
Perfluoroheptanoic acid (PFHpA)	S20-Ja29797	CP	ug/L	0.25	0.26	1.0	30%	Pass	
Perfluorooctanoic acid (PFOA)	S20-Ja29797	CP	ug/L	0.57	0.58	1.0	30%	Pass	
Perfluorononanoic acid (PFNA)	S20-Ja29797	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorodecanoic acid (PFDA)	S20-Ja29797	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoroundecanoic acid (PFUnDA)	S20-Ja29797	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorododecanoic acid (PFDoDA)	S20-Ja29797	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorotridecanoic acid (PFTrDA)	S20-Ja29797	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorotetradecanoic acid (PFTeDA)	S20-Ja29797	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	

Environment Testing

Duplicate									
Perfluoroalkyl sulfonamido substances				Result 1	Result 2	RPD			
Perfluorooctane sulfonamide (FOSA)	S20-Ja29797	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	S20-Ja29797	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	S20-Ja29797	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	S20-Ja29797	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	S20-Ja29797	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	S20-Ja29797	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	S20-Ja29797	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
Duplicate									
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1	Result 2	RPD			
Perfluorobutanesulfonic acid (PFBS)	S20-Ja29797	CP	ug/L	1.1	1.1	1.0	30%	Pass	
Perfluorononanesulfonic acid (PFNS)	S20-Ja29797	CP	ug/L	0.10	0.10	2.0	30%	Pass	
Perfluoropropanesulfonic acid (PFPrS)	S20-Ja29797	CP	ug/L	0.50	0.52	5.0	30%	Pass	
Perfluoropentanesulfonic acid (PFPeS)	S20-Ja29797	CP	ug/L	1.2	1.2	4.0	30%	Pass	
Perfluorohexanesulfonic acid (PFHxS)	S20-Ja29797	CP	ug/L	10	11	1.0	30%	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	S20-Ja29797	CP	ug/L	0.62	0.64	3.0	30%	Pass	
Perfluorooctanesulfonic acid (PFOS)	S20-Ja29797	CP	ug/L	22	22	<1	30%	Pass	
Perfluorodecanesulfonic acid (PFDS)	S20-Ja29797	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Duplicate									
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)				Result 1	Result 2	RPD			
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	S20-Ja29797	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	S20-Ja29797	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	S20-Ja29797	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	S20-Ja29797	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	

Comments

Sample Integrity

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

Qualifier Codes/Comments

Code	Description
N09	Quantification of linear and branched isomers has been conducted as a single total response using the relative response factor for the corresponding linear/branched standard.
N11	Isotope dilution is used for calibration of each native compound for which an exact labelled analogue is available (Isotope Dilution Quantitation). The isotopically labelled analogues allow identification and recovery correction of the concentration of the associated native PFAS compounds.
N15	Where the native PFAS compound does not have labelled analogue then the quantification is made using the Extracted Internal Standard Analyte with the closest retention time to the analyte and no recovery correction has been made (Internal Standard Quantitation).

Authorised By

Ursula Long	Analytical Services Manager
Sarah McCallion	Senior Analyst-PFAS (QLD)

Glenn Jackson
General Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

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

Measurement uncertainty of test data is available on request or please click here.

max

#699303

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Senversa Pty Ltd
www.senversa.com.au
ABN 89 132 231 380

Chain of Custody Documentation

Laboratory: ALS NSW
Address: 277-289 Woodpark Road, Smithfield
Contact: Brenda Hong
Phone: 02 8784 8515

Environmental Division
Sydney
Work Order Reference
ES2002803

Telephone : + 61-2-8784 8555

Job Number:	S17776	Purchase Order:	
Project Name:	PSI	Quote No:	SY-665-19 V2
Sampled By:	LT/CW	Turn Around Time:	Standard
Project Manager:	Lucinda Trickey	Page:	1 of 2
Email Report To:	lucinda.trickey@senversa.com.au	Phone/Mobile:	+61 424 172 065

Lab ID	Sample ID	Matrix *	Date	Time	Type / Code	Total Bottles	EP231X - PFAS - Full Suite (28 Analytes)	
1	QC104	W	18-1-20			2	X	
	QC204	W	18-1-20			2	X	forward to eurofins
2	QC105	S	20-1-20			1 JAR	X	
	QC205	S	20-1-20			1 JAR	X	forward to eurofins
3	QC106	S	20-1-20			1	X	
	QC206	S	20-1-20			1	X	forward to eurofins
4	QC107	S	20-1-20			1	X	
	QC207	S	20-1-20			1	X	forward to eurofins
5	QC108	S	21-1-20			1	X	
	QC208	S	21-1-20			1	X	forward to eurofins
6	QC109	S	21-1-20			1	X	
	QC209	S	21-1-20			1	X	forward to eurofins
7	QC110	W	21-1-20			2	X	
	QC210	W	21-1-20			2	X	forward to eurofins.
8	QC302	W	20-1-20			2	X	
~~8~~	~~QC110~~	~~W~~	~~21-1-20~~			~~2~~	~~X~~	
	~~QC210~~	~~W~~	~~21-1-20~~			~~2~~	~~X~~	~~forward to eurofins~~
9	QC111	S	22-1-20			1	X	
	QC211	S	22-1-20			1	X	forward to eurofins
10	QC112	S	22-1-20			1	X	
Total							0	

Subcontract / Forward Lab / Split
Lab / Analysis: Eurofins
Organised By / Date:
Relinquished By / Date: 29/1/20
Connote / Courier:
WO No: ES2002803
Attach By PO / Internal Sheet

Sampler: I attest that proper field sampling procedures in accordance with Senversa standard procedures and/or project specifications were used during the collection of these samples:

Sampler Name: Lucinda Trickey | Signature: | Date: 21-1-20

Relinquished By:				Method of Shipment (if applicable):	Received by:		
Name/Signature:	Lucinda Trickey	Date:	24/01	Carrier / Reference #:	Name/Signature: Volen	Date:	29/1/20
Of:	Senversa	Time:	9:00	Date/Time:	Of: ALS	Time:	16:45
Name/Signature:		Date:		Carrier / Reference #:	Name/Signature:	Date:	30/01/20
Of:		Time:		Date/Time:	Of:	Time:	2:53PM
Name/Signature:		Date:		Carrier / Reference #:	Name/Signature:	Date:	
Of:		Time:		Date/Time:	Of:	Time:	

Water Container Codes: P = Unpreserved Plastic; N = Nitric Acid (HNO_3) Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide (NaOH)/Cadmium (Cd) Preserved; S = Sodium Hydroxide Preserved Plastic; STH = Sodium thiosulfate preserved plastic; V = VOA Vial Hydochloric Acid (HCl) Preserved; VS = VOA Vial Sulphuric Preserved; VSA = Sulphuric Preserved Amber Glass; H = HCl Preserved Plastic; HS = HCl Preserved Speciation Bottle; SP = Sulphuric Preserved Plastic; F = Formaldehyde Preserved Glass; Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; UA = Unpreserved Amber Glass; L=Lugol's iodine preserved white plastic bottle; SW= sulfuric acid preserved wide mouth glass jar

Completed by: ________
Checked by: ________

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www.senversa.com.au
ABN 89 132 231 380

Chain of Custody Documentation

Laboratory:	ALS NSW
Address:	277-289 Woodpark Road, Smithfield
Contact:	Brenda Hong
Phone:	02 8784 8515

Job Number:	S17776	Purchase Order:	
Project Name:	PSI	Quote No:	SY-665-19 V2
Sampled By:	LT/CW	Turn Around Time:	Standard
Project Manager:	Lucinda Trickey	Page:	2 of 2
Email Report To:	lucinda.trickey@senversa.com.au	Phone/Mobile:	+61 424 172 065

Analysis Required

Lab ID	Sample ID	Matrix *	Date	Time	Type / Code	Total Bottles	EP231X - PFAS - Full Suite (28 Analytes)	Comments:
	QC212	S	22-1-20			1	X	
11	QC113	S				1	X	forward to eurofins
	QC213	S				1	X	
12	QC114	S				1	X	forward to eurofins
	QC214	S				1	X	
13	QC115	S				1	X	forward to eurofins
	QC215	S				1	X	
14	QC116	S	23-1-20			1	X	forward to eurofins
	QC216	S	23-1-20			1	X	
15	QC117	W	23-1-20			2	X	forward to eurofins
~~15~~	QC217	W	23-1-20			2	X	
16	QC303	W	21-1-20			2	X	forward to eurofins
17	QC304	W	22-1-20			2	X	
18	QC305	W	22-1-20			2	X	
	~~QC306~~	~~W~~	~~23-1-20~~			~~2~~	~~X~~	
Total							0	

Sampler: I attest that proper field sampling procedures in accordance with Senversa standard procedures and/or project specifications were used during the collection of samples:

Sampler Name: Lucinda Trickey | Signature: | Date: 24/01/20

Relinquished By:			Method of Shipment (if applicable):	Received by:	
Name/Signature: Lucinda Trickey	Date: 24/01		Carrier / Reference #:	Name/Signature:	Date: 24/1/20
Of: Senversa	Time: 9:30		Date/Time:	Of: ALS	Time: 16:45
Name/Signature:	Date:		Carrier / Reference #:	Name/Signature:	Date: 30/01/20
Of:	Time:		Date/Time:	Of:	Time: 2:53 PM
Name/Signature:	Date:		Carrier / Reference #:	Name/Signature:	Date:
Of:	Time:		Date/Time:	Of:	Time:

Water Container Codes: P = Unpreserved Plastic; N = Nitric Acid (HNO_3) Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide (NaOH)/Cadmium (Cd) Preserved; S = Sodium Hydroxide Preserved Plastic; STH = Sodium thiosulfate preserved plastic; V = VOA Vial Hydochloric Acid (HCl) Preserved; VS = VOA Vial Sulphuric Preserved; VSA = Sulphuric Preserved Amber Glass; H = HCl Preserved Plastic; HS = HCl Preserved Speciation Bottle; SP = Sulphuric Preserved Plastic; F = Formaldehyde Preserved Glass; Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; UA = Unpreserved Amber Glass; L=Lugol's Iodine preserved white plastic bottle; SW= sulfuric acid preserved wide mouth glass jar

Completed by: ________
Checked by: ________

eurofins | Environment Testing

Certificate of Analysis

Senversa Pty Ltd NSW
Level 5, The Grafton Bond Building, 201 Kent Street
SYDNEY
NSW 2000

NATA Accredited
Accreditation Number 1261
Site Number 18217

Accredited for compliance with ISO/IEC 17025 – Testing
The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

Attention:	**Lucinda Trickey**
Report	**699303-S**
Project name	PSI
Project ID	S17776
Received Date	Jan 30, 2020

Client Sample ID			**QC205**	**QC206**	**QC207**	**QC208**
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins Sample No.			**S20-Ja30174**	**S20-Ja30175**	**S20-Ja30176**	**S20-Ja30177**
Date Sampled			**Jan 20, 2020**	**Jan 20, 2020**	**Jan 20, 2020**	**Jan 21, 2020**
Test/Reference	LOR	Unit				
% Moisture	1	%	11	19	9.4	2.7
Perfluoroalkyl carboxylic acids (PFCAs)						
Perfluorobutanoic acid (PFBA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluoropentanoic acid (PFPeA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorohexanoic acid (PFHxA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluoroheptanoic acid (PFHpA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorooctanoic acid (PFOA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorononanoic acid (PFNA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorodecanoic acid (PFDA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluoroundecanoic acid (PFUnDA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorododecanoic acid (PFDoDA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorotridecanoic acid (PFTrDA)[N15]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorotetradecanoic acid (PFTeDA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
13C4-PFBA (surr.)	1	%	120	109	85	110
13C5-PFPeA (surr.)	1	%	111	96	73	101
13C5-PFHxA (surr.)	1	%	164	140	106	143
13C4-PFHpA (surr.)	1	%	143	137	98	127
13C8-PFOA (surr.)	1	%	132	129	94	130
13C5-PFNA (surr.)	1	%	110	100	74	96
13C6-PFDA (surr.)	1	%	157	144	108	148
13C2-PFUnDA (surr.)	1	%	107	89	76	85
13C2-PFDoDA (surr.)	1	%	95	86	78	78
13C2-PFTeDA (surr.)	1	%	116	93	88	91
Perfluoroalkyl sulfonamido substances						
Perfluorooctane sulfonamide (FOSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)[N11]	10	ug/kg	< 10	< 10	< 10	< 10
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)[N11]	10	ug/kg	< 10	< 10	< 10	< 10
13C8-FOSA (surr.)	1	%	131	120	104	111

Client Sample ID			QC205	QC206	QC207	QC208
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			S20-Ja30174	S20-Ja30175	S20-Ja30176	S20-Ja30177
Date Sampled			Jan 20, 2020	Jan 20, 2020	Jan 20, 2020	Jan 21, 2020
Test/Reference	LOR	Unit				
Perfluoroalkyl sulfonamido substances						
D3-N-MeFOSA (surr.)	1	%	94	87	79	76
D5-N-EtFOSA (surr.)	1	%	94	85	81	72
D7-N-MeFOSE (surr.)	1	%	119	138	93	95
D9-N-EtFOSE (surr.)	1	%	82	63	65	59
D5-N-EtFOSAA (surr.)	1	%	93	71	59	75
D3-N-MeFOSAA (surr.)	1	%	92	69	57	69
Perfluoroalkyl sulfonic acids (PFSAs)						
Perfluorobutanesulfonic acid (PFBS)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorononanesulfonic acid (PFNS)[N15]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluoropropanesulfonic acid (PFPrS)[N15]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluoropentanesulfonic acid (PFPeS)[N15]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorohexanesulfonic acid (PFHxS)[N11]	5	ug/kg	< 5	[N09]14	< 5	< 5
Perfluoroheptanesulfonic acid (PFHpS)[N15]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorooctanesulfonic acid (PFOS)[N11]	5	ug/kg	< 5	[N09]130	< 5	< 5
Perfluorodecanesulfonic acid (PFDS)[N15]	5	ug/kg	< 5	< 5	< 5	< 5
13C3-PFBS (surr.)	1	%	109	102	88	100
18O2-PFHxS (surr.)	1	%	106	93	77	89
13C8-PFOS (surr.)	1	%	105	82	82	87
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)						
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)[N11]	10	ug/kg	< 10	< 10	< 10	< 10
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)[N15]	5	ug/kg	< 5	< 5	< 5	< 5
13C2-4:2 FTSA (surr.)	1	%	181	146	71	188
13C2-6:2 FTSA (surr.)	1	%	143	117	55	126
13C2-8:2 FTSA (surr.)	1	%	98	100	65	83
PFASs Summations						
Sum (PFHxS + PFOS)*	5	ug/kg	< 5	144	< 5	< 5
Sum of US EPA PFAS (PFOS + PFOA)*	5	ug/kg	< 5	130	< 5	< 5
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	5	ug/kg	< 5	144	< 5	< 5
Sum of WA DWER PFAS (n=10)*	10	ug/kg	< 10	144	< 10	< 10
Sum of PFASs (n=30)*	50	ug/kg	< 50	144	< 50	< 50

Client Sample ID			QC209	QC211	QC212	QC213
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			S20-Ja30178	S20-Ja30180	S20-Ja30181	S20-Ja30182
Date Sampled			Jan 21, 2020	Jan 22, 2020	Jan 22, 2020	Jan 22, 2020
Test/Reference	LOR	Unit				
% Moisture	1	%	84	8.9	12	8.4
Perfluoroalkyl carboxylic acids (PFCAs)						
Perfluorobutanoic acid (PFBA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluoropentanoic acid (PFPeA)[N11]	5	ug/kg	6.0	< 5	5.3	< 5
Perfluorohexanoic acid (PFHxA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
Perfluoroheptanoic acid (PFHpA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5

Environment Testing

Client Sample ID			QC209	QC211	QC212	QC213
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			S20-Ja30178	S20-Ja30180	S20-Ja30181	S20-Ja30182
Date Sampled			Jan 21, 2020	Jan 22, 2020	Jan 22, 2020	Jan 22, 2020
Test/Reference	LOR	Unit				
Perfluoroalkyl carboxylic acids (PFCAs)						
Perfluorooctanoic acid (PFOA)N11	5	ug/kg	< 5	< 5	25	< 5
Perfluorononanoic acid (PFNA)N11	5	ug/kg	< 5	< 5	21	< 5
Perfluorodecanoic acid (PFDA)N11	5	ug/kg	< 5	< 5	9.9	< 5
Perfluoroundecanoic acid (PFUnDA)N11	5	ug/kg	< 5	< 5	5.3	< 5
Perfluorododecanoic acid (PFDoDA)N11	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorotridecanoic acid (PFTrDA)N15	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorotetradecanoic acid (PFTeDA)N11	5	ug/kg	< 5	< 5	< 5	< 5
13C4-PFBA (surr.)	1	%	47	85	112	124
13C5-PFPeA (surr.)	1	%	55	91	110	113
13C5-PFHxA (surr.)	1	%	90	123	179	165
13C4-PFHpA (surr.)	1	%	96	120	172	170
13C8-PFOA (surr.)	1	%	87	109	162	166
13C5-PFNA (surr.)	1	%	66	75	111	115
13C6-PFDA (surr.)	1	%	81	101	165	156
13C2-PFUnDA (surr.)	1	%	59	74	95	104
13C2-PFDoDA (surr.)	1	%	60	74	96	100
13C2-PFTeDA (surr.)	1	%	51	75	111	115
Perfluoroalkyl sulfonamido substances						
Perfluorooctane sulfonamide (FOSA)N11	5	ug/kg	< 5	< 5	5.3	< 5
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)N11	5	ug/kg	< 5	< 5	< 5	< 5
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)N11	5	ug/kg	< 5	< 5	< 5	< 5
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)N11	5	ug/kg	5.7	< 5	< 5	< 5
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)N11	5	ug/kg	9.2	< 5	< 5	< 5
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)N11	10	ug/kg	< 10	< 10	< 10	< 10
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)N11	10	ug/kg	< 10	< 10	< 10	< 10
13C8-FOSA (surr.)	1	%	89	105	127	146
D3-N-MeFOSA (surr.)	1	%	65	72	66	101
D5-N-EtFOSA (surr.)	1	%	88	78	81	95
D7-N-MeFOSE (surr.)	1	%	93	92	96	135
D9-N-EtFOSE (surr.)	1	%	94	45	42	68
D5-N-EtFOSAA (surr.)	1	%	56	75	91	96
D3-N-MeFOSAA (surr.)	1	%	61	73	84	96
Perfluoroalkyl sulfonic acids (PFSAs)						
Perfluorobutanesulfonic acid (PFBS)N11	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorononanesulfonic acid (PFNS)N15	5	ug/kg	< 5	N09 8.6	< 5	< 5
Perfluoropropanesulfonic acid (PFPrS)N15	5	ug/kg	< 5	< 5	< 5	< 5
Perfluoropentanesulfonic acid (PFPeS)N15	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorohexanesulfonic acid (PFHxS)N11	5	ug/kg	< 5	< 5	N09 10	< 5
Perfluoroheptanesulfonic acid (PFHpS)N15	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorooctanesulfonic acid (PFOS)N11	5	ug/kg	8.3	N09 55	N09 160	28
Perfluorodecanesulfonic acid (PFDS)N15	5	ug/kg	< 5	N09 23	N09 14	< 5
13C3-PFBS (surr.)	1	%	81	96	114	120
18O2-PFHxS (surr.)	1	%	79	82	104	109
13C8-PFOS (surr.)	1	%	74	75	81	103

Client Sample ID			QC209	QC211	QC212	QC213
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			S20-Ja30178	S20-Ja30180	S20-Ja30181	S20-Ja30182
Date Sampled			Jan 21, 2020	Jan 22, 2020	Jan 22, 2020	Jan 22, 2020
Test/Reference	LOR	Unit				
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)						
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)[N11]	5	ug/kg	< 5	< 5	< 5	< 5
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)[N11]	10	ug/kg	< 10	< 10	< 10	< 10
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)[N11]	5	ug/kg	< 5	< 5	12	< 5
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)[N15]	5	ug/kg	< 5	< 5	< 5	< 5
13C2-4:2 FTSA (surr.)	1	%	115	144	INT	191
13C2-6:2 FTSA (surr.)	1	%	89	121	INT	144
13C2-8:2 FTSA (surr.)	1	%	57	62	118	96
PFASs Summations						
Sum (PFHxS + PFOS)*	5	ug/kg	8.3	55	170	28
Sum of US EPA PFAS (PFOS + PFOA)*	5	ug/kg	8.3	55	185	28
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	5	ug/kg	8.3	55	195	28
Sum of WA DWER PFAS (n=10)*	10	ug/kg	14.3	55	212.3	28
Sum of PFASs (n=30)*	50	ug/kg	< 50	86.6	267.8	< 50

Client Sample ID			QC214	QC215	QC216
Sample Matrix			Soil	Soil	Soil
Eurofins Sample No.			S20-Ja30183	S20-Ja30184	S20-Ja30185
Date Sampled			Jan 22, 2020	Jan 22, 2020	Jan 23, 2020
Test/Reference	LOR	Unit			
% Moisture	1	%	7.2	4.1	14
Perfluoroalkyl carboxylic acids (PFCAs)					
Perfluorobutanoic acid (PFBA)[N11]	5	ug/kg	< 5	< 5	< 5
Perfluoropentanoic acid (PFPeA)[N11]	5	ug/kg	< 5	< 5	< 5
Perfluorohexanoic acid (PFHxA)[N11]	5	ug/kg	< 5	< 5	< 5
Perfluoroheptanoic acid (PFHpA)[N11]	5	ug/kg	< 5	< 5	< 5
Perfluorooctanoic acid (PFOA)[N11]	5	ug/kg	< 5	< 5	< 5
Perfluorononanoic acid (PFNA)[N11]	5	ug/kg	< 5	< 5	< 5
Perfluorodecanoic acid (PFDA)[N11]	5	ug/kg	< 5	< 5	< 5
Perfluoroundecanoic acid (PFUnDA)[N11]	5	ug/kg	< 5	< 5	< 5
Perfluorododecanoic acid (PFDoDA)[N11]	5	ug/kg	< 5	< 5	< 5
Perfluorotridecanoic acid (PFTrDA)[N15]	5	ug/kg	< 5	< 5	< 5
Perfluorotetradecanoic acid (PFTeDA)[N11]	5	ug/kg	< 5	< 5	< 5
13C4-PFBA (surr.)	1	%	109	117	132
13C5-PFPeA (surr.)	1	%	97	112	116
13C5-PFHxA (surr.)	1	%	141	164	179
13C4-PFHpA (surr.)	1	%	129	172	170
13C8-PFOA (surr.)	1	%	116	169	157
13C5-PFNA (surr.)	1	%	87	131	126
13C6-PFDA (surr.)	1	%	139	184	164
13C2-PFUnDA (surr.)	1	%	99	86	99
13C2-PFDoDA (surr.)	1	%	95	86	96
13C2-PFTeDA (surr.)	1	%	109	83	106

Environment Testing

Client Sample ID			QC214	QC215	QC216
Sample Matrix			Soil	Soil	Soil
Eurofins Sample No.			S20-Ja30183	S20-Ja30184	S20-Ja30185
Date Sampled			Jan 22, 2020	Jan 22, 2020	Jan 23, 2020
Test/Reference	LOR	Unit			
Perfluoroalkyl sulfonamido substances					
Perfluorooctane sulfonamide (FOSA)[N11]	5	ug/kg	< 5	< 5	< 5
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)[N11]	5	ug/kg	< 5	< 5	< 5
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)[N11]	5	ug/kg	< 5	< 5	< 5
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)[N11]	5	ug/kg	< 5	< 5	< 5
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)[N11]	5	ug/kg	< 5	< 5	< 5
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)[N11]	10	ug/kg	< 10	< 10	< 10
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)[N11]	10	ug/kg	< 10	< 10	< 10
13C8-FOSA (surr.)	1	%	136	104	131
D3-N-MeFOSA (surr.)	1	%	104	41	77
D5-N-EtFOSA (surr.)	1	%	101	42	79
D7-N-MeFOSE (surr.)	1	%	111	116	175
D9-N-EtFOSE (surr.)	1	%	79	28	58
D5-N-EtFOSAA (surr.)	1	%	92	86	100
D3-N-MeFOSAA (surr.)	1	%	87	85	98
Perfluoroalkyl sulfonic acids (PFSAs)					
Perfluorobutanesulfonic acid (PFBS)[N11]	5	ug/kg	< 5	< 5	< 5
Perfluorononanesulfonic acid (PFNS)[N15]	5	ug/kg	< 5	< 5	< 5
Perfluoropropanesulfonic acid (PFPrS)[N15]	5	ug/kg	< 5	< 5	< 5
Perfluoropentanesulfonic acid (PFPeS)[N15]	5	ug/kg	< 5	< 5	< 5
Perfluorohexanesulfonic acid (PFHxS)[N11]	5	ug/kg	< 5	< 5	< 5
Perfluoroheptanesulfonic acid (PFHpS)[N15]	5	ug/kg	< 5	< 5	< 5
Perfluorooctanesulfonic acid (PFOS)[N11]	5	ug/kg	[N09]18	[N09]37	[N09]31
Perfluorodecanesulfonic acid (PFDS)[N15]	5	ug/kg	< 5	< 5	< 5
13C3-PFBS (surr.)	1	%	113	107	112
18O2-PFHxS (surr.)	1	%	99	102	107
13C8-PFOS (surr.)	1	%	101	96	102
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)					
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)[N11]	5	ug/kg	< 5	< 5	< 5
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)[N11]	10	ug/kg	< 10	< 10	< 10
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)[N11]	5	ug/kg	< 5	< 5	< 5
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)[N15]	5	ug/kg	< 5	< 5	< 5
13C2-4:2 FTSA (surr.)	1	%	88	INT	INT
13C2-6:2 FTSA (surr.)	1	%	60	INT	INT
13C2-8:2 FTSA (surr.)	1	%	72	142	119
PFASs Summations					
Sum (PFHxS + PFOS)*	5	ug/kg	18	37	31
Sum of US EPA PFAS (PFOS + PFOA)*	5	ug/kg	18	37	31
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	5	ug/kg	18	37	31
Sum of WA DWER PFAS (n=10)*	10	ug/kg	18	37	31
Sum of PFASs (n=30)*	50	ug/kg	< 50	< 50	< 50

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Sample History

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

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
% Moisture	Brisbane	Jan 30, 2020	14 Days
- Method: LTM-GEN-7080 Moisture			
Per- and Polyfluoroalkyl Substances (PFASs)			
Perfluoroalkyl carboxylic acids (PFCAs)	Brisbane	Jan 31, 2020	180 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
Perfluoroalkyl sulfonamido substances	Brisbane	Jan 31, 2020	180 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
Perfluoroalkyl sulfonic acids (PFSAs)	Brisbane	Jan 31, 2020	180 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)	Brisbane	Jan 31, 2020	180 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			

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Site # 1254 & 14271

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NATA # 1261 Site # 18217

Brisbane
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NATA # 1261 Site # 20794

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Company Name: Senversa Pty Ltd NSW
Address: Level 5, The Grafton Bond Building, 201 Kent Street
SYDNEY
NSW 2000

Project Name: PSI
Project ID: S17776

Order No.:
Report #: 699303
Phone: 02 9994 8016
Fax: 03 9606 0074

Received: Jan 30, 2020 2:53 PM
Due: Feb 6, 2020
Priority: 5 Day
Contact Name: Lucinda Trickey

Eurofins Analytical Services Manager : Ursula Long

Sample Detail						Moisture Set	Per- and Polyfluoroalkyl Substances (PFASs)
Melbourne Laboratory - NATA Site # 1254 & 14271							
Sydney Laboratory - NATA Site # 18217							
Brisbane Laboratory - NATA Site # 20794						X	X
Perth Laboratory - NATA Site # 23736							
External Laboratory							
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**		
1	QC204	Jan 18, 2020		Water	S20-Ja30173		X
2	QC205	Jan 20, 2020		Soil	S20-Ja30174	X	X
3	QC206	Jan 20, 2020		Soil	S20-Ja30175	X	X
4	QC207	Jan 20, 2020		Soil	S20-Ja30176	X	X
5	QC208	Jan 21, 2020		Soil	S20-Ja30177	X	X
6	QC209	Jan 21, 2020		Soil	S20-Ja30178	X	X
7	QC210	Jan 21, 2020		Water	S20-Ja30179		X
8	QC211	Jan 22, 2020		Soil	S20-Ja30180	X	X
9	QC212	Jan 22, 2020		Soil	S20-Ja30181	X	X
10	QC213	Jan 22, 2020		Soil	S20-Ja30182	X	X

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Received: Jan 30, 2020 2:53 PM
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Priority: 5 Day
Contact Name: Lucinda Trickey

Eurofins Analytical Services Manager : Ursula Long

Sample Detail						Moisture Set	Per- and Polyfluoroalkyl Substances (PFASs)
Melbourne Laboratory - NATA Site # 1254 & 14271							
Sydney Laboratory - NATA Site # 18217							
Brisbane Laboratory - NATA Site # 20794						X	X
Perth Laboratory - NATA Site # 23736							
11	QC214	Jan 22, 2020		Soil	S20-Ja30183	X	X
12	QC215	Jan 22, 2020		Soil	S20-Ja30184	X	X
13	QC216	Jan 23, 2020		Soil	S20-Ja30185	X	X
14	QC217	Jan 23, 2020		Water	S20-Ja30186		X
Test Counts						11	14

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Internal Quality Control Review and Glossary

General

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

Holding Times

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

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

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

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

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

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

Units

mg/kg: milligrams per kilogram	**mg/L:** milligrams per litre	**ug/L:** micrograms per litre
ppm: Parts per million	**ppb:** Parts per billion	**%:** Percentage
org/100mL: Organisms per 100 millilitres	**NTU:** Nephelometric Turbidity Units	**MPN/100mL:** Most Probable Number of organisms per 100 millilitres

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery.
CRM	Certified Reference Material - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
QSM	US Department of Defense Quality Systems Manual Version 5.3
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

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

Results <10 times the LOR : No Limit

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

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

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

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.3 where no positive PFAS results have been reported have been reviewed and no data was affected.

WA DWER (n=10): PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC Data General Comments

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

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Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	ug/kg	< 5			5	Pass	
Perfluoropentanoic acid (PFPeA)	ug/kg	< 5			5	Pass	
Perfluorohexanoic acid (PFHxA)	ug/kg	< 5			5	Pass	
Perfluoroheptanoic acid (PFHpA)	ug/kg	< 5			5	Pass	
Perfluorooctanoic acid (PFOA)	ug/kg	< 5			5	Pass	
Perfluorononanoic acid (PFNA)	ug/kg	< 5			5	Pass	
Perfluorodecanoic acid (PFDA)	ug/kg	< 5			5	Pass	
Perfluoroundecanoic acid (PFUnDA)	ug/kg	< 5			5	Pass	
Perfluorododecanoic acid (PFDoDA)	ug/kg	< 5			5	Pass	
Perfluorotridecanoic acid (PFTrDA)	ug/kg	< 5			5	Pass	
Perfluorotetradecanoic acid (PFTeDA)	ug/kg	< 5			5	Pass	
Method Blank							
Perfluoroalkyl sulfonamido substances							
Perfluorooctane sulfonamide (FOSA)	ug/kg	< 5			5	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	ug/kg	< 5			5	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	ug/kg	< 5			5	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	ug/kg	< 5			5	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	ug/kg	< 5			5	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	ug/kg	< 10			10	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	ug/kg	< 10			10	Pass	
Method Blank							
Perfluoroalkyl sulfonic acids (PFSAs)							
Perfluorobutanesulfonic acid (PFBS)	ug/kg	< 5			5	Pass	
Perfluorononanesulfonic acid (PFNS)	ug/kg	< 5			5	Pass	
Perfluoropropanesulfonic acid (PFPrS)	ug/kg	< 5			5	Pass	
Perfluoropentanesulfonic acid (PFPeS)	ug/kg	< 5			5	Pass	
Perfluorohexanesulfonic acid (PFHxS)	ug/kg	< 5			5	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	ug/kg	< 5			5	Pass	
Perfluorooctanesulfonic acid (PFOS)	ug/kg	< 5			5	Pass	
Perfluorodecanesulfonic acid (PFDS)	ug/kg	< 5			5	Pass	
Method Blank							
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)							
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	ug/kg	< 5			5	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	ug/kg	< 10			10	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	ug/kg	< 5			5	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	ug/kg	< 5			5	Pass	
LCS - % Recovery							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	%	96			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	%	100			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	%	101			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	%	91			50-150	Pass	
Perfluorooctanoic acid (PFOA)	%	105			50-150	Pass	
Perfluorononanoic acid (PFNA)	%	106			50-150	Pass	
Perfluorodecanoic acid (PFDA)	%	94			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	%	107			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	%	97			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	%	103			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	%	106			50-150	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
LCS - % Recovery							
Perfluoroalkyl sulfonamido substances							
Perfluorooctane sulfonamide (FOSA)	%	95			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	%	102			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	%	98			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	%	80			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	%	91			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	%	104			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	%	106			50-150	Pass	
LCS - % Recovery							
Perfluoroalkyl sulfonic acids (PFSAs)							
Perfluorobutanesulfonic acid (PFBS)	%	88			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)	%	97			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)	%	97			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	%	83			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	%	89			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	%	93			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	%	89			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	%	89			50-150	Pass	
LCS - % Recovery							
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)							
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	%	93			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	%	122			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	%	91			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	%	98			50-150	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1					
Perfluorobutanoic acid (PFBA)	M20-Ja32025	NCP	%	94			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	M20-Ja32025	NCP	%	102			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	M20-Ja32025	NCP	%	112			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	M20-Ja32025	NCP	%	97			50-150	Pass	
Perfluorooctanoic acid (PFOA)	M20-Ja32025	NCP	%	101			50-150	Pass	
Perfluorononanoic acid (PFNA)	M20-Ja32025	NCP	%	103			50-150	Pass	
Perfluorodecanoic acid (PFDA)	M20-Ja32025	NCP	%	95			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	M20-Ja32025	NCP	%	107			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	M20-Ja32025	NCP	%	101			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	M20-Ja32025	NCP	%	98			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	M20-Ja32025	NCP	%	108			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonamido substances				Result 1					
Perfluorooctane sulfonamide (FOSA)	M20-Ja32025	NCP	%	87			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	M20-Ja32025	NCP	%	96			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	M20-Ja32025	NCP	%	86			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	M20-Ja32025	NCP	%	74			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	M20-Ja32025	NCP	%	84			50-150	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	M20-Ja32025	NCP	%	97			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	M20-Ja32025	NCP	%	105			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1					
Perfluorobutanesulfonic acid (PFBS)	M20-Ja32025	NCP	%	84			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)	M20-Ja32025	NCP	%	110			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)	M20-Ja32025	NCP	%	100			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	M20-Ja32025	NCP	%	88			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	M20-Ja32025	NCP	%	92			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	M20-Ja32025	NCP	%	101			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	M20-Ja32025	NCP	%	84			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	M20-Ja32025	NCP	%	105			50-150	Pass	
Spike - % Recovery									
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)				Result 1					
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	M20-Ja32025	NCP	%	71			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	M20-Ja32025	NCP	%	120			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	M20-Ja32025	NCP	%	111			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	M20-Ja32025	NCP	%	89			50-150	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Duplicate									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1	Result 2	RPD			
Perfluorobutanoic acid (PFBA)	M20-Ja32024	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoropentanoic acid (PFPeA)	M20-Ja32024	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorohexanoic acid (PFHxA)	M20-Ja32024	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoroheptanoic acid (PFHpA)	M20-Ja32024	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorooctanoic acid (PFOA)	M20-Ja32024	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorononanoic acid (PFNA)	M20-Ja32024	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorodecanoic acid (PFDA)	M20-Ja32024	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoroundecanoic acid (PFUnDA)	M20-Ja32024	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorododecanoic acid (PFDoDA)	M20-Ja32024	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorotridecanoic acid (PFTrDA)	M20-Ja32024	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorotetradecanoic acid (PFTeDA)	M20-Ja32024	NCP	ug/kg	< 5	< 5	<1	30%	Pass	

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Duplicate									
Perfluoroalkyl sulfonamido substances				Result 1	Result 2	RPD			
Perfluorooctane sulfonamide (FOSA)	M20-Ja32024	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	M20-Ja32024	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	M20-Ja32024	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	M20-Ja32024	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	M20-Ja32024	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	M20-Ja32024	NCP	ug/kg	< 10	< 10	<1	30%	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	M20-Ja32024	NCP	ug/kg	< 10	< 10	<1	30%	Pass	
Duplicate									
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1	Result 2	RPD			
Perfluorobutanesulfonic acid (PFBS)	M20-Ja32024	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorononanesulfonic acid (PFNS)	M20-Ja32024	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoropropanesulfonic acid (PFPrS)	M20-Ja32024	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Duplicate									
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)				Result 1	Result 2	RPD			
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	M20-Ja32024	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	M20-Ja32024	NCP	ug/kg	< 10	< 10	<1	30%	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	M20-Ja32024	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	M20-Ja32024	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
% Moisture	S20-Ja30181	CP	%	12	12	2.0	30%	Pass	

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Comments

Sample Integrity

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

Qualifier Codes/Comments

Code	Description
N09	Quantification of linear and branched isomers has been conducted as a single total response using the relative response factor for the corresponding linear/branched standard.
N11	Isotope dilution is used for calibration of each native compound for which an exact labelled analogue is available (Isotope Dilution Quantitation). The isotopically labelled analogues allow identification and recovery correction of the concentration of the associated native PFAS compounds.
N15	Where the native PFAS compound does not have labelled analogue then the quantification is made using the Extracted Internal Standard Analyte with the closest retention time to the analyte and no recovery correction has been made (Internal Standard Quantitation).

Authorised By

Ursula Long	Analytical Services Manager
Sarah McCallion	Senior Analyst-PFAS (QLD)

Glenn Jackson
General Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

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

Measurement uncertainty of test data is available on request or please click here.

Senversa Pty Ltd NSW
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SYDNEY
NSW 2000

NATA Accredited
Accreditation Number 1261
Site Number 18217

Accredited for compliance with ISO/IEC 17025 – Testing
The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

Attention:	**Lucinda Trickey**
Report	**699303-W**
Project name	PSI
Project ID	S17776
Received Date	Jan 30, 2020

Client Sample ID			**QC204**	**QC210**	**QC217**
Sample Matrix			**Water**	**Water**	**Water**
Eurofins Sample No.			**S20-Ja30173**	**S20-Ja30179**	**S20-Ja30186**
Date Sampled			**Jan 18, 2020**	**Jan 21, 2020**	**Jan 23, 2020**
Test/Reference	LOR	Unit			
Perfluoroalkyl carboxylic acids (PFCAs)					
Perfluorobutanoic acid (PFBA)N11	0.05	ug/L	< 0.05	< 0.05	< 0.05
Perfluoropentanoic acid (PFPeA)N11	0.01	ug/L	< 0.01	< 0.01	0.03
Perfluorohexanoic acid (PFHxA)N11	0.01	ug/L	< 0.01	< 0.01	0.11
Perfluoroheptanoic acid (PFHpA)N11	0.01	ug/L	< 0.01	< 0.01	0.02
Perfluorooctanoic acid (PFOA)N11	0.01	ug/L	< 0.01	< 0.01	N09 0.03
Perfluorononanoic acid (PFNA)N11	0.01	ug/L	< 0.01	< 0.01	< 0.01
Perfluorodecanoic acid (PFDA)N11	0.01	ug/L	< 0.01	< 0.01	< 0.01
Perfluoroundecanoic acid (PFUnDA)N11	0.01	ug/L	< 0.01	< 0.01	< 0.01
Perfluorododecanoic acid (PFDoDA)N11	0.01	ug/L	< 0.01	< 0.01	< 0.01
Perfluorotridecanoic acid (PFTrDA)N15	0.01	ug/L	< 0.01	< 0.01	< 0.01
Perfluorotetradecanoic acid (PFTeDA)N11	0.01	ug/L	< 0.01	< 0.01	< 0.01
13C4-PFBA (surr.)	1	%	106	129	111
13C5-PFPeA (surr.)	1	%	87	100	86
13C5-PFHxA (surr.)	1	%	91	101	86
13C4-PFHpA (surr.)	1	%	85	99	83
13C8-PFOA (surr.)	1	%	99	105	84
13C5-PFNA (surr.)	1	%	91	98	90
13C6-PFDA (surr.)	1	%	93	102	76
13C2-PFUnDA (surr.)	1	%	132	144	139
13C2-PFDoDA (surr.)	1	%	89	111	92
13C2-PFTeDA (surr.)	1	%	97	139	90
Perfluoroalkyl sulfonamido substances					
Perfluorooctane sulfonamide (FOSA)N11	0.05	ug/L	< 0.05	< 0.05	< 0.05
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)N11	0.05	ug/L	< 0.05	< 0.05	< 0.05
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)N11	0.05	ug/L	< 0.05	< 0.05	< 0.05
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)N11	0.05	ug/L	< 0.05	< 0.05	< 0.05
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)N11	0.05	ug/L	< 0.05	< 0.05	< 0.05
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)N11	0.05	ug/L	< 0.05	< 0.05	< 0.05
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)N11	0.05	ug/L	< 0.05	< 0.05	< 0.05
13C8-FOSA (surr.)	1	%	136	143	117
D3-N-MeFOSA (surr.)	1	%	86	101	73
D5-N-EtFOSA (surr.)	1	%	88	108	71

Client Sample ID			QC204	QC210	QC217
Sample Matrix			Water	Water	Water
Eurofins Sample No.			S20-Ja30173	S20-Ja30179	S20-Ja30186
Date Sampled			Jan 18, 2020	Jan 21, 2020	Jan 23, 2020
Test/Reference	LOR	Unit			
Perfluoroalkyl sulfonamido substances					
D7-N-MeFOSE (surr.)	1	%	73	99	67
D9-N-EtFOSE (surr.)	1	%	68	85	66
D5-N-EtFOSAA (surr.)	1	%	INT	INT	INT
D3-N-MeFOSAA (surr.)	1	%	INT	INT	INT
Perfluoroalkyl sulfonic acids (PFSAs)					
Perfluorobutanesulfonic acid (PFBS)[N11]	0.01	ug/L	< 0.01	0.01	0.11
Perfluorononanesulfonic acid (PFNS)[N15]	0.01	ug/L	< 0.01	< 0.01	< 0.01
Perfluoropropanesulfonic acid (PFPrS)[N15]	0.01	ug/L	< 0.01	< 0.01	0.04
Perfluoropentanesulfonic acid (PFPeS)[N15]	0.01	ug/L	< 0.01	< 0.01	0.10
Perfluorohexanesulfonic acid (PFHxS)[N11]	0.01	ug/L	< 0.01	< 0.01	[N09]0.74
Perfluoroheptanesulfonic acid (PFHpS)[N15]	0.01	ug/L	< 0.01	< 0.01	[N09]0.05
Perfluorooctanesulfonic acid (PFOS)[N11]	0.01	ug/L	[N09]0.01	< 0.01	1.5
Perfluorodecanesulfonic acid (PFDS)[N15]	0.01	ug/L	< 0.01	< 0.01	< 0.01
13C3-PFBS (surr.)	1	%	101	105	95
18O2-PFHxS (surr.)	1	%	107	108	81
13C8-PFOS (surr.)	1	%	92	95	119
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)					
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)[N11]	0.01	ug/L	< 0.01	< 0.01	< 0.01
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)[N11]	0.05	ug/L	< 0.05	< 0.05	< 0.05
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)[N11]	0.01	ug/L	< 0.01	< 0.01	< 0.01
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)[N15]	0.01	ug/L	< 0.01	< 0.01	< 0.01
13C2-4:2 FTSA (surr.)	1	%	117	119	107
13C2-6:2 FTSA (surr.)	1	%	176	145	154
13C2-8:2 FTSA (surr.)	1	%	121	126	121
PFASs Summations					
Sum (PFHxS + PFOS)*	0.01	ug/L	0.01	< 0.01	2.24
Sum of US EPA PFAS (PFOS + PFOA)*	0.01	ug/L	0.01	< 0.01	1.53
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	0.01	ug/L	0.01	< 0.01	2.27
Sum of WA DWER PFAS (n=10)*	0.05	ug/L	< 0.05	< 0.05	2.54
Sum of PFASs (n=30)*	0.1	ug/L	< 0.1	< 0.1	2.73

Sample History

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

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Per- and Polyfluoroalkyl Substances (PFASs)			
Perfluoroalkyl carboxylic acids (PFCAs)	Brisbane	Jan 31, 2020	14 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
Perfluoroalkyl sulfonamido substances	Brisbane	Jan 31, 2020	14 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
Perfluoroalkyl sulfonic acids (PFSAs)	Brisbane	Jan 31, 2020	14 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)	Brisbane	Jan 31, 2020	14 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			

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Site # 1254 & 14271

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Phone : +61 2 9900 8400
NATA # 1261 Site # 18217

Brisbane
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NATA # 1261 Site # 20794

Perth
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NATA # 1261
Site # 23736

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Company Name: Senversa Pty Ltd NSW
Address: Level 5, The Grafton Bond Building, 201 Kent Street
SYDNEY
NSW 2000

Project Name: PSI
Project ID: S17776

Order No.:
Report #: 699303
Phone: 02 9994 8016
Fax: 03 9606 0074

Received: Jan 30, 2020 2:53 PM
Due: Feb 6, 2020
Priority: 5 Day
Contact Name: Lucinda Trickey

Eurofins Analytical Services Manager : Ursula Long

Sample Detail						Moisture Set	Per- and Polyfluoroalkyl Substances (PFASs)
Melbourne Laboratory - NATA Site # 1254 & 14271							
Sydney Laboratory - NATA Site # 18217							
Brisbane Laboratory - NATA Site # 20794						X	X
Perth Laboratory - NATA Site # 23736							
External Laboratory							
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**		
1	QC204	Jan 18, 2020		Water	S20-Ja30173		X
2	QC205	Jan 20, 2020		Soil	S20-Ja30174	X	X
3	QC206	Jan 20, 2020		Soil	S20-Ja30175	X	X
4	QC207	Jan 20, 2020		Soil	S20-Ja30176	X	X
5	QC208	Jan 21, 2020		Soil	S20-Ja30177	X	X
6	QC209	Jan 21, 2020		Soil	S20-Ja30178	X	X
7	QC210	Jan 21, 2020		Water	S20-Ja30179		X
8	QC211	Jan 22, 2020		Soil	S20-Ja30180	X	X
9	QC212	Jan 22, 2020		Soil	S20-Ja30181	X	X
10	QC213	Jan 22, 2020		Soil	S20-Ja30182	X	X

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NATA # 1261 Site # 20794

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Company Name: Senversa Pty Ltd NSW
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SYDNEY
NSW 2000

Project Name: PSI
Project ID: S17776

Order No.:
Report #: 699303
Phone: 02 9994 8016
Fax: 03 9606 0074

Received: Jan 30, 2020 2:53 PM
Due: Feb 6, 2020
Priority: 5 Day
Contact Name: Lucinda Trickey

Eurofins Analytical Services Manager : Ursula Long

Sample Detail						Moisture Set	Per- and Polyfluoroalkyl Substances (PFASs)
Melbourne Laboratory - NATA Site # 1254 & 14271							
Sydney Laboratory - NATA Site # 18217							
Brisbane Laboratory - NATA Site # 20794						X	X
Perth Laboratory - NATA Site # 23736							
11	QC214	Jan 22, 2020		Soil	S20-Ja30183	X	X
12	QC215	Jan 22, 2020		Soil	S20-Ja30184	X	X
13	QC216	Jan 23, 2020		Soil	S20-Ja30185	X	X
14	QC217	Jan 23, 2020		Water	S20-Ja30186		X
Test Counts						11	14

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Internal Quality Control Review and Glossary

General

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

Holding Times

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

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

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

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

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

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

Units

mg/kg: milligrams per kilogram	**mg/L:** milligrams per litre	**ug/L:** micrograms per litre
ppm: Parts per million	**ppb:** Parts per billion	**%:** Percentage
org/100mL: Organisms per 100 millilitres	**NTU:** Nephelometric Turbidity Units	**MPN/100mL:** Most Probable Number of organisms per 100 millilitres

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery.
CRM	Certified Reference Material - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
QSM	US Department of Defense Quality Systems Manual Version 5.3
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

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

Results <10 times the LOR : No Limit

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

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

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

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.3 where no positive PFAS results have been reported have been reviewed and no data was affected.

WA DWER (n=10): PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC Data General Comments

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

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	ug/L	< 0.05			0.05	Pass	
Perfluoropentanoic acid (PFPeA)	ug/L	< 0.01			0.01	Pass	
Perfluorohexanoic acid (PFHxA)	ug/L	< 0.01			0.01	Pass	
Perfluoroheptanoic acid (PFHpA)	ug/L	< 0.01			0.01	Pass	
Perfluorooctanoic acid (PFOA)	ug/L	< 0.01			0.01	Pass	
Perfluorononanoic acid (PFNA)	ug/L	< 0.01			0.01	Pass	
Perfluorodecanoic acid (PFDA)	ug/L	< 0.01			0.01	Pass	
Perfluoroundecanoic acid (PFUnDA)	ug/L	< 0.01			0.01	Pass	
Perfluorododecanoic acid (PFDoDA)	ug/L	< 0.01			0.01	Pass	
Perfluorotridecanoic acid (PFTrDA)	ug/L	< 0.01			0.01	Pass	
Perfluorotetradecanoic acid (PFTeDA)	ug/L	< 0.01			0.01	Pass	
Method Blank							
Perfluoroalkyl sulfonamido substances							
Perfluorooctane sulfonamide (FOSA)	ug/L	< 0.05			0.05	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	ug/L	< 0.05			0.05	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	ug/L	< 0.05			0.05	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	ug/L	< 0.05			0.05	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	ug/L	< 0.05			0.05	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	ug/L	< 0.05			0.05	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	ug/L	< 0.05			0.05	Pass	
Method Blank							
Perfluoroalkyl sulfonic acids (PFSAs)							
Perfluorobutanesulfonic acid (PFBS)	ug/L	< 0.01			0.01	Pass	
Perfluorononanesulfonic acid (PFNS)	ug/L	< 0.01			0.01	Pass	
Perfluoropropanesulfonic acid (PFPrS)	ug/L	< 0.01			0.01	Pass	
Perfluoropentanesulfonic acid (PFPeS)	ug/L	< 0.01			0.01	Pass	
Perfluorohexanesulfonic acid (PFHxS)	ug/L	< 0.01			0.01	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	ug/L	< 0.01			0.01	Pass	
Perfluorooctanesulfonic acid (PFOS)	ug/L	< 0.01			0.01	Pass	
Perfluorodecanesulfonic acid (PFDS)	ug/L	< 0.01			0.01	Pass	
Method Blank							
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)							
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	ug/L	< 0.01			0.01	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	ug/L	< 0.05			0.05	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	ug/L	< 0.01			0.01	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	ug/L	< 0.01			0.01	Pass	
LCS - % Recovery							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	%	88			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	%	107			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	%	110			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	%	107			50-150	Pass	
Perfluorooctanoic acid (PFOA)	%	97			50-150	Pass	
Perfluorononanoic acid (PFNA)	%	122			50-150	Pass	
Perfluorodecanoic acid (PFDA)	%	104			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	%	114			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	%	127			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	%	94			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	%	131			50-150	Pass	

Test			Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
LCS - % Recovery									
Perfluoroalkyl sulfonamido substances									
Perfluorooctane sulfonamide (FOSA)			%	91			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)			%	113			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)			%	101			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)			%	118			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)			%	109			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)			%	110			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)			%	110			50-150	Pass	
LCS - % Recovery									
Perfluoroalkyl sulfonic acids (PFSAs)									
Perfluorobutanesulfonic acid (PFBS)			%	85			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)			%	68			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)			%	101			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)			%	97			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)			%	90			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)			%	95			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)			%	101			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)			%	62			50-150	Pass	
LCS - % Recovery									
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)									
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)			%	94			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)			%	117			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)			%	121			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)			%	96			50-150	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Spike - % Recovery									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1					
Perfluorobutanoic acid (PFBA)	B20-Ja31306	NCP	%	87			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	B20-Ja31306	NCP	%	110			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	B20-Ja31306	NCP	%	112			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	B20-Ja31306	NCP	%	107			50-150	Pass	
Perfluorooctanoic acid (PFOA)	B20-Ja31306	NCP	%	95			50-150	Pass	
Perfluorononanoic acid (PFNA)	B20-Ja31306	NCP	%	120			50-150	Pass	
Perfluorodecanoic acid (PFDA)	B20-Ja31306	NCP	%	103			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	B20-Ja31306	NCP	%	115			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	B20-Ja31306	NCP	%	121			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	B20-Ja31306	NCP	%	99			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	B20-Ja31306	NCP	%	130			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonamido substances				Result 1					
Perfluorooctane sulfonamide (FOSA)	B20-Ja31306	NCP	%	95			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	B20-Ja31306	NCP	%	118			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	B20-Ja31306	NCP	%	105			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	B20-Ja31306	NCP	%	116			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	B20-Ja31306	NCP	%	123			50-150	Pass	

Environment Testing

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	B20-Ja31306	NCP	%	122			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	B20-Ja31306	NCP	%	93			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1					
Perfluorobutanesulfonic acid (PFBS)	B20-Ja31306	NCP	%	92			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)	B20-Ja31306	NCP	%	83			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)	B20-Ja31306	NCP	%	108			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	B20-Ja31306	NCP	%	103			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	B20-Ja31306	NCP	%	100			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	B20-Ja31306	NCP	%	96			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	B20-Ja31306	NCP	%	101			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	B20-Ja31306	NCP	%	76			50-150	Pass	
Spike - % Recovery									
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)				Result 1					
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	B20-Ja31306	NCP	%	93			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	B20-Ja31306	NCP	%	116			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	B20-Ja31306	NCP	%	123			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	B20-Ja31306	NCP	%	102			50-150	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Duplicate									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1	Result 2	RPD			
Perfluorobutanoic acid (PFBA)	S20-Ja29797	NCP	ug/L	0.15	0.15	1.0	30%	Pass	
Perfluoropentanoic acid (PFPeA)	S20-Ja29797	NCP	ug/L	0.27	0.28	2.0	30%	Pass	
Perfluorohexanoic acid (PFHxA)	S20-Ja29797	NCP	ug/L	1.2	1.1	2.0	30%	Pass	
Perfluoroheptanoic acid (PFHpA)	S20-Ja29797	NCP	ug/L	0.25	0.26	1.0	30%	Pass	
Perfluorooctanoic acid (PFOA)	S20-Ja29797	NCP	ug/L	0.57	0.58	1.0	30%	Pass	
Perfluorononanoic acid (PFNA)	S20-Ja29797	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorodecanoic acid (PFDA)	S20-Ja29797	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoroundecanoic acid (PFUnDA)	S20-Ja29797	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorododecanoic acid (PFDoDA)	S20-Ja29797	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorotridecanoic acid (PFTrDA)	S20-Ja29797	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorotetradecanoic acid (PFTeDA)	S20-Ja29797	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	

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Duplicate									
Perfluoroalkyl sulfonamido substances				Result 1	Result 2	RPD			
Perfluorooctane sulfonamide (FOSA)	S20-Ja29797	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	S20-Ja29797	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	S20-Ja29797	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	S20-Ja29797	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	S20-Ja29797	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	S20-Ja29797	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	S20-Ja29797	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
Duplicate									
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1	Result 2	RPD			
Perfluorobutanesulfonic acid (PFBS)	S20-Ja29797	NCP	ug/L	1.1	1.1	1.0	30%	Pass	
Perfluorononanesulfonic acid (PFNS)	S20-Ja29797	NCP	ug/L	0.10	0.10	2.0	30%	Pass	
Perfluoropropanesulfonic acid (PFPrS)	S20-Ja29797	NCP	ug/L	0.50	0.52	5.0	30%	Pass	
Perfluoropentanesulfonic acid (PFPeS)	S20-Ja29797	NCP	ug/L	1.2	1.2	4.0	30%	Pass	
Perfluorohexanesulfonic acid (PFHxS)	B20-Ja31291	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	S20-Ja29797	NCP	ug/L	0.62	0.64	3.0	30%	Pass	
Perfluorooctanesulfonic acid (PFOS)	B20-Ja31291	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorodecanesulfonic acid (PFDS)	S20-Ja29797	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Duplicate									
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)				Result 1	Result 2	RPD			
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	S20-Ja29797	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	S20-Ja29797	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	S20-Ja29797	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	S20-Ja29797	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	

Comments

Sample Integrity

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

Qualifier Codes/Comments

Code	Description
N09	Quantification of linear and branched isomers has been conducted as a single total response using the relative response factor for the corresponding linear/branched standard.
N11	Isotope dilution is used for calibration of each native compound for which an exact labelled analogue is available (Isotope Dilution Quantitation). The isotopically labelled analogues allow identification and recovery correction of the concentration of the associated native PFAS compounds.
N15	Where the native PFAS compound does not have labelled analogue then the quantification is made using the Extracted Internal Standard Analyte with the closest retention time to the analyte and no recovery correction has been made (Internal Standard Quantitation).

Authorised By

Ursula Long	Analytical Services Manager
Sarah McCallion	Senior Analyst-PFAS (QLD)

Glenn Jackson
General Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

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

Measurement uncertainty of test data is available on request or please click here.

ALS Environmental

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **ES2005692**

Client	: **SENVERSA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: LUCINDA TRICKEY	Contact	: Brenda Hong
Address	: Level 5, Grafton Bond Building 201 Kent Street SYDNEY NSW 2000	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: lucinda.trickey@senversa.com.au	E-mail	: Brenda.Hong@ALSGlobal.com
Telephone	: +61 03 9606 0070	Telephone	: +61 2 8784 8555
Facsimile	: +61 03 9606 0074	Facsimile	: +61-2-8784 8500
Project	: S17776 PSI	Page	: 1 of 3
Order number	: ----	Quote number	: ES2019SENVER0020 (SY/665/19)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	: LT/CW		

Dates

Date Samples Received	: 29-Jan-2020 16:45	Issue Date	: 19-Feb-2020
Client Requested Due Date	: 25-Feb-2020	Scheduled Reporting Date	: **25-Feb-2020**

Delivery Details

Mode of Delivery	: Samples On Hand	Security Seal	: Not Available
No. of coolers/boxes	: ----	Temperature	: 4.1
Receipt Detail	:	No. of samples received / analysed	: 28 / 28

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 refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**
- **This is a rebatch of ES2002806, ES2002803, ES2002810, ES2002812, ES2002810, ES2002829 & ES2002830.**
- Please direct any queries you have regarding this work order to the above ALS laboratory contact.
- Analytical work for this work order will be conducted at ALS Sydney.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months ± 1 week) from receipt of samples.
- 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 - EN60-DIa Deionised Water Leach	SOIL - EP231X PFAS - Full Suite (28 analytes)
ES2005692-001	21-Jan-2020 00:00	A_SS02	✓	✓
ES2005692-002	21-Jan-2020 00:00	A_SS06	✓	✓
ES2005692-003	22-Jan-2020 00:00	A_SS11	✓	✓
ES2005692-004	22-Jan-2020 00:00	A_SS13	✓	✓
ES2005692-005	22-Jan-2020 00:00	A_SS19	✓	✓
ES2005692-006	22-Jan-2020 00:00	A_SS20	✓	✓
ES2005692-007	22-Jan-2020 00:00	A_SS22	✓	✓
ES2005692-008	22-Jan-2020 00:00	A_SS23	✓	✓
ES2005692-009	22-Jan-2020 00:00	A_SS24	✓	✓
ES2005692-010	22-Jan-2020 00:00	A_SS28	✓	✓
ES2005692-011	22-Jan-2020 00:00	A_SS30	✓	✓
ES2005692-012	22-Jan-2020 00:00	A_SS34	✓	✓
ES2005692-013	22-Jan-2020 00:00	A_SS38	✓	✓
ES2005692-014	22-Jan-2020 00:00	A_SS45	✓	✓
ES2005692-015	22-Jan-2020 00:00	A_SS54	✓	✓
ES2005692-016	23-Jan-2020 00:00	A_SS58	✓	✓
ES2005692-017	23-Jan-2020 00:00	A_SS62	✓	✓
ES2005692-018	22-Jan-2020 00:00	A_SD01	✓	✓
ES2005692-019	22-Jan-2020 00:00	QC112	✓	✓
ES2005692-020	20-Jan-2020 00:00	QC106	✓	✓
ES2005692-021	20-Jan-2020 00:00	CHAP_SS02	✓	✓
ES2005692-022	20-Jan-2020 00:00	AD_SD09	✓	✓
ES2005692-023	20-Jan-2020 00:00	AD_SD10	✓	✓
ES2005692-024	20-Jan-2020 00:00	MC_SD03	✓	✓
ES2005692-025	20-Jan-2020 00:00	MC_SD04	✓	✓
ES2005692-026	20-Jan-2020 00:00	MC_SD08	✓	✓
ES2005692-027	21-Jan-2020 00:00	ID011_SD02	✓	✓
ES2005692-028	21-Jan-2020 00:00	ID012_SD01	✓	✓

Proactive Holding Time Report

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

Requested Deliverables

LUCINDA TRICKEY

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

Tyler Cachia

17/ms: 19/2/20 12:20pm

From: Christopher Sandiford <Christopher.Sandiford@Senversa.com.au>
Sent: Wednesday, 19 February 2020 9:45 AM
To: Tyler Cachia; Lucinda Trickey
Subject: RE: [EXTERNAL] - Leachability analysis - 17776

Hi Tyler – Standard ASLP leach at neutral pH please. C

Christopher Sandiford
Principal Environmental Scientist / BSc(Hons), BGeomE, MEnv(EnvSc)
Certified Environmental Practitioner - Site Contamination Specialist (CEnvP SC40061)

senversa

Senversa Pty Ltd
Level 6, 15 William Street, Melbourne VIC 3000

m: +61 421 394 984 | e: christopher.sandiford@senversa.com.au
t: +61 3 9606 0070 | w: www.senversa.com.au | www.linkedin.com/company/senversa

From: Tyler Cachia <tyler.cachia@ALSGlobal.com>
Sent: Wednesday, 19 February 2020 9:42 AM
To: Lucinda Trickey <Lucinda.Trickey@senversa.com.au>
Cc: Christopher Sandiford <Christopher.Sandiford@Senversa.com.au>
Subject: RE: [EXTERNAL] - Leachability analysis - 17776

Environmental Division
Sydney
Work Order Reference
ES2005692
Telephone : + 61-2-8784 8555

Hi Lucinda,

Can you please confirm if this was a TCLP or ASLP leach?

Kind Regards,

Tyler Cachia
Client Services Coordinator, Environmental
Sydney

T +61 2 8784 8555 F +61 2 8784 8500
D +61 2 8784 8501
tyler.cachia@alsglobal.com
277-289 Woodpark Road
Smithfield NSW 2164 AUSTRALIA

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From: Lucinda Trickey [mailto:Lucinda.Trickey@senversa.com.au]
Sent: Wednesday, 19 February 2020 9:36 AM
To: Tyler Cachia <tyler.cachia@ALSGlobal.com>
Cc: Christopher Sandiford <Christopher.Sandiford@Senversa.com.au>
Subject: [EXTERNAL] - Leachability analysis - 17776

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

Hi Tyler,
Can we please get the following samples analysed for PFAS leachability (28 compounds) on **48 hour TAT**

Batch ES2002806 → S686-691
1 A_SS02, 2 A_SS06, 3 A_SS11, 4 A_SS13, 5 A_SS19, 6 A_SS20, 7 A_SS22, 8 A_SS23, 9 A_SS24, 10 A_SS28, 11 A_SS30, 12 A_SS34, 13 A_SS38,
14 A_SS45, 15 A_SS54, 16 A_SS58, 17 A_SS62, 18 A_SD01

#2, 6, 11, 13, 19, 20, 22, 23, 24, 28, 30, 34, 38
45, 54, 58, 62, 64

Batch ES2002803 → S685-686
19 QC112, 20 QC106 #3, 10

Batch ES2002810 → S691-692
21 CHAP_SS02 #12

Batch ES2002812 → S692
22 AD_SD09, 23 AD_SD10, #9-10

Batch ES2002810 → S691-692
24 MC_SD03, 25 MC_SD04, 26 MC_SD08 #3, 4, 8

Batch ES2002829 → S695
27 ID011_SD02, #2

Batch ES2002830 → S695
28 ID012_SD01, #1

Thank you
Lucinda Trickey
Senior Environmental Engineer

senversa

Senversa Pty Ltd
Level 6, 15 William Street, Melbourne VIC 3000

m: +61 424 172 065 | e: lucinda.trickey@senversa.com.au
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CERTIFICATE OF ANALYSIS

Work Order	: **ES2005692**	Page	: 1 of 21
Client	: **SENVERSA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: LUCINDA TRICKEY	Contact	: Brenda Hong
Address	: Level 5, Grafton Bond Building 201 Kent Street SYDNEY NSW 2000	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 03 9606 0070	Telephone	: +61 2 8784 8555
Project	: S17776 PSI	Date Samples Received	: 29-Jan-2020 16:45
Order number	: ----	Date Analysis Commenced	: 19-Feb-2020
C-O-C number	: ----	Issue Date	: 25-Feb-2020 17:18
Sampler	: LT/CW		
Site	: ----		
Quote number	: SY/665/19		
No. of samples received	: 28		
No. of samples analysed	: 28		

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
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW

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 - Per- and Polyfluoroalkyl Substances (PFAS): Samples received in 20ml or 125ml bottles have been tested in accordance with the QSM5.3 compliant, NATA accredited method. 60mL or 250mL bottles have been tested to the legacy QSM 5.1 aligned, NATA accredited method.
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.

Analytical Results

Sub-Matrix: DI WATER LEACHATE (Matrix: WATER)			Client sample ID	A_SS02	A_SS06	A_SS11	A_SS13	A_SS19
			Client sampling date / time	21-Jan-2020 00:00	21-Jan-2020 00:00	22-Jan-2020 00:00	22-Jan-2020 00:00	22-Jan-2020 00:00
Compound	CAS Number	LOR	Unit	ES2005692-001	ES2005692-002	ES2005692-003	ES2005692-004	ES2005692-005
				Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	<0.02	**0.04**	**0.04**
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	<0.02	**0.04**	**0.04**
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	**0.06**	<0.02	**0.20**	**0.45**	**0.40**
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	**0.02**	<0.02	<0.02	**0.04**
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	**0.28**	**0.80**	**0.14**	**0.26**	**10.6**
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	**0.04**
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	**0.02**	<0.02	**0.03**	**0.20**	**0.18**
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	**0.06**	**0.09**	**0.45**
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	<0.02	**0.03**	**0.12**
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	**0.01**	**0.02**	**0.02**	**0.04**	**0.41**
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	<0.02	**0.02**	**0.30**
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	**0.48**
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	**0.06**
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	**0.07**
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05

Analytical Results

Sub-Matrix: DI WATER LEACHATE (Matrix: WATER)			Client sample ID	A_SS02	A_SS06	A_SS11	A_SS13	A_SS19
			Client sampling date / time	21-Jan-2020 00:00	21-Jan-2020 00:00	22-Jan-2020 00:00	22-Jan-2020 00:00	22-Jan-2020 00:00
Compound	CAS Number	LOR	Unit	ES2005692-001	ES2005692-002	ES2005692-003	ES2005692-004	ES2005692-005
				Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	**0.20**
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	**3.02**
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	**0.37**	**0.84**	**0.45**	**1.17**	**16.4**
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	**0.34**	**0.80**	**0.34**	**0.71**	**11.0**
Sum of PFAS (WA DER List)	----	0.01	µg/L	**0.37**	**0.82**	**0.45**	**1.11**	**15.4**
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	**76.4**	**83.9**	**74.2**	**73.5**	**80.7**
13C8-PFOA	----	0.02	%	**104**	**106**	**102**	**104**	**105**

Analytical Results

Sub-Matrix: DI WATER LEACHATE (Matrix: WATER)			Client sample ID	A_SS20	A_SS22	A_SS23	A_SS24	A_SS28
			Client sampling date / time	22-Jan-2020 00:00	22-Jan-2020 00:00	22-Jan-2020 00:00	22-Jan-2020 00:00	22-Jan-2020 00:00
Compound	CAS Number	LOR	Unit	ES2005692-006	ES2005692-007	ES2005692-008	ES2005692-009	ES2005692-010
				Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	**0.14**	**0.24**	<0.02
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	**0.18**	**0.24**	<0.02
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	**0.20**	**0.22**	**2.42**	**2.03**	**0.24**
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	**0.14**	**0.14**	**0.02**
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	**0.68**	**1.90**	**10.1**	**9.12**	**0.71**
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	**0.02**	**0.04**	**0.34**	**0.22**	**0.05**
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	**0.09**	**0.12**	**0.29**	**0.28**	**0.16**
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	**0.08**	**0.11**	**0.47**	**0.63**	**0.14**
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	**0.03**	**0.04**	**0.13**	**0.22**	<0.02
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	**0.08**	**0.13**	**0.43**	**0.68**	**0.06**
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	**0.05**	**0.08**	**0.32**	**0.38**	<0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	**0.03**	**0.10**	**0.22**	**0.29**	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	**0.09**	**0.09**	**0.30**	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	**0.02**	**0.11**	<0.02
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	<0.02	**0.02**	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	**0.02**	**0.04**	**0.25**	**0.09**	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05

Analytical Results

Sub-Matrix: DI WATER LEACHATE (Matrix: WATER)			Client sample ID	A_SS20	A_SS22	A_SS23	A_SS24	A_SS28
			Client sampling date / time	22-Jan-2020 00:00	22-Jan-2020 00:00	22-Jan-2020 00:00	22-Jan-2020 00:00	22-Jan-2020 00:00
Compound	CAS Number	LOR	Unit	ES2005692-006	ES2005692-007	ES2005692-008	ES2005692-009	ES2005692-010
				Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	**0.05**	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	**0.08**	**0.69**	**0.15**	**1.30**	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	**1.36**	**3.56**	**15.7**	**16.3**	**1.38**
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	**0.88**	**2.12**	**12.5**	**11.2**	**0.95**
Sum of PFAS (WA DER List)	----	0.01	µg/L	**1.24**	**3.21**	**14.2**	**14.5**	**1.31**
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	**74.3**	**79.3**	**75.6**	**78.8**	**76.9**
13C8-PFOA	----	0.02	%	**104**	**105**	**104**	**105**	**103**

Analytical Results

Sub-Matrix: DI WATER LEACHATE (Matrix: WATER)

Compound	CAS Number	LOR	Unit	A_SS30	A_SS34	A_SS38	A_SS45	A_SS54
Client sampling date / time				22-Jan-2020 00:00	22-Jan-2020 00:00	22-Jan-2020 00:00	22-Jan-2020 00:00	22-Jan-2020 00:00
				ES2005692-011	ES2005692-012	ES2005692-013	ES2005692-014	ES2005692-015
				Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	**0.02**	<0.02	**0.08**
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	**0.03**	<0.02	**0.28**
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	**0.33**	**0.13**	**0.60**	**0.12**	**4.84**
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	**0.03**	<0.02	**0.04**	<0.02	**0.18**
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	**1.52**	**0.24**	**1.80**	**0.52**	**0.70**
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	**0.24**	<0.02	**0.27**	**0.05**	**0.07**
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	**0.17**	**0.04**	**0.15**	**0.04**	**0.62**
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	**0.12**	<0.02	**0.07**	**0.04**	**0.06**
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	**0.88**	**0.03**	**0.16**	**0.17**	**0.17**
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	**0.69**	<0.02	**0.10**	**0.09**	<0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	**0.12**	<0.02	**0.02**	**0.03**	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05

Analytical Results

Sub-Matrix: DI WATER LEACHATE (Matrix: WATER)			Client sample ID	A_SS30	A_SS34	A_SS38	A_SS45	A_SS54
			Client sampling date / time	22-Jan-2020 00:00	22-Jan-2020 00:00	22-Jan-2020 00:00	22-Jan-2020 00:00	22-Jan-2020 00:00
Compound	CAS Number	LOR	Unit	ES2005692-011	ES2005692-012	ES2005692-013	ES2005692-014	ES2005692-015
				Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	**0.28**
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	**0.22**	<0.05	<0.05	**0.14**	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	**4.32**	**0.44**	**3.26**	**1.20**	**7.28**
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	**1.85**	**0.37**	**2.40**	**0.64**	**5.54**
Sum of PFAS (WA DER List)	----	0.01	µg/L	**3.48**	**0.44**	**3.07**	**1.08**	**6.82**
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	**77.5**	**74.2**	**73.7**	**73.0**	**75.8**
13C8-PFOA	----	0.02	%	**103**	**104**	**106**	**108**	**106**

Analytical Results

Sub-Matrix: DI WATER LEACHATE (Matrix: WATER)			Client sample ID	A_SS58	A_SS62	A_SD01	QC112	QC106
			Client sampling date / time	23-Jan-2020 00:00	23-Jan-2020 00:00	22-Jan-2020 00:00	22-Jan-2020 00:00	20-Jan-2020 00:00
Compound	CAS Number	LOR	Unit	ES2005692-016	ES2005692-017	ES2005692-018	ES2005692-019	ES2005692-020
				Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	**0.05**
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	**0.04**
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	**0.03**	**0.02**	**0.02**	**0.31**	**0.50**
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	<0.02	**0.02**	**0.06**
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	**0.23**	**0.33**	**0.11**	**2.10**	**3.47**
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	<0.1	**0.2**	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	**0.07**	<0.02	**0.27**	<0.02
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	**0.02**	**0.08**	<0.02	**0.17**	**0.06**
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	**0.03**	<0.02	**0.13**	<0.02
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	**0.02**	**0.07**	**0.01**	**0.99**	**0.04**
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	<0.02	**0.70**	<0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	<0.02	**0.17**	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05

Analytical Results

Sub-Matrix: DI WATER LEACHATE (Matrix: WATER)			Client sample ID	A_SS58	A_SS62	A_SD01	QC112	QC106
			Client sampling date / time	23-Jan-2020 00:00	23-Jan-2020 00:00	22-Jan-2020 00:00	22-Jan-2020 00:00	20-Jan-2020 00:00
Compound	CAS Number	LOR	Unit	ES2005692-016	ES2005692-017	ES2005692-018	ES2005692-019	ES2005692-020
				Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	<0.05	**0.22**	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	**0.30**	**0.60**	**0.14**	**5.28**	**4.22**
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	**0.26**	**0.35**	**0.13**	**2.41**	**3.97**
Sum of PFAS (WA DER List)	----	0.01	µg/L	**0.30**	**0.60**	**0.14**	**4.39**	**4.12**
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	**79.1**	**77.8**	**77.0**	**103**	**91.8**
13C8-PFOA	----	0.02	%	**101**	**105**	**107**	**95.7**	**97.3**

Analytical Results

Sub-Matrix: DI WATER LEACHATE (Matrix: WATER)			Client sample ID	CHAP_SS02	AD_SD09	AD_SD10	MC_SD03	MC_SD04
			Client sampling date / time	20-Jan-2020 00:00	20-Jan-2020 00:00	20-Jan-2020 00:00	20-Jan-2020 00:00	20-Jan-2020 00:00
Compound	CAS Number	LOR	Unit	ES2005692-021	ES2005692-022	ES2005692-023	ES2005692-024	ES2005692-025
				Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	<0.02	**0.04**	<0.02
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	<0.02	**0.02**	<0.02
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	**0.02**	**0.14**	**0.03**	**0.19**	**0.08**
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	**0.12**	**2.44**	**0.14**	**0.18**	**0.11**
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	**0.04**	<0.02	<0.02	<0.02
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	**0.08**	<0.02	<0.02	<0.02
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	**0.12**	<0.02	<0.02	<0.02
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	**0.24**	<0.01	**0.01**	<0.01
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	**0.22**	<0.02	<0.02	<0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	**0.10**	<0.02	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05

Analytical Results

Sub-Matrix: DI WATER LEACHATE (Matrix: WATER)			Client sample ID	CHAP_SS02	AD_SD09	AD_SD10	MC_SD03	MC_SD04
			Client sampling date / time	20-Jan-2020 00:00	20-Jan-2020 00:00	20-Jan-2020 00:00	20-Jan-2020 00:00	20-Jan-2020 00:00
Compound	CAS Number	LOR	Unit	ES2005692-021	ES2005692-022	ES2005692-023	ES2005692-024	ES2005692-025
				Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	**0.10**	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	**0.14**	**3.48**	**0.17**	**0.44**	**0.19**
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	**0.14**	**2.58**	**0.17**	**0.37**	**0.19**
Sum of PFAS (WA DER List)	----	0.01	µg/L	**0.14**	**3.16**	**0.17**	**0.42**	**0.19**
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	**101**	**96.9**	**97.2**	**94.1**	**96.5**
13C8-PFOA	----	0.02	%	**94.9**	**96.0**	**94.8**	**96.5**	**95.0**

Analytical Results

Sub-Matrix: DI WATER LEACHATE (Matrix: WATER)			Client sample ID	MC_SD08	ID011_SD02	ID012_SD01	----	----
			Client sampling date / time	20-Jan-2020 00:00	21-Jan-2020 00:00	21-Jan-2020 00:00	----	----
Compound	CAS Number	LOR	Unit	ES2005692-026	ES2005692-027	ES2005692-028	--------	--------
				Result	Result	Result	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	**0.06**	<0.02	<0.02	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	**0.04**	<0.02	<0.02	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	**0.54**	<0.02	<0.02	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	**0.06**	<0.02	<0.02	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	**3.73**	**0.22**	<0.01	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	<0.02	----	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	<0.1	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	**0.06**	<0.02	<0.02	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	**0.04**	<0.01	<0.01	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	<0.05	----	----
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	<0.02	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	<0.05	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	<0.05	----	----

Analytical Results

Sub-Matrix: DI WATER LEACHATE (Matrix: WATER)			Client sample ID	MC_SD08	ID011_SD02	ID012_SD01	----	----
			Client sampling date / time	20-Jan-2020 00:00	21-Jan-2020 00:00	21-Jan-2020 00:00	----	----
Compound	CAS Number	LOR	Unit	ES2005692-026	ES2005692-027	ES2005692-028	--------	--------
				Result	Result	Result	----	----
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	<0.05	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	<0.05	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	<0.02	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	<0.02	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	<0.05	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	<0.05	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	<0.05	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	----	----
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	**4.53**	**0.22**	<0.01	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	**4.27**	**0.22**	<0.01	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L	**4.43**	**0.22**	<0.01	----	----
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	**93.2**	**97.9**	**92.6**	----	----
13C8-PFOA	----	0.02	%	**92.1**	**91.4**	**86.3**	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	A_SS02	A_SS06	A_SS11	A_SS13	A_SS19
			Client sampling date / time	21-Jan-2020 00:00	21-Jan-2020 00:00	22-Jan-2020 00:00	22-Jan-2020 00:00	22-Jan-2020 00:00
Compound	CAS Number	LOR	Unit	ES2005692-001	ES2005692-002	ES2005692-003	ES2005692-004	ES2005692-005
				Result	Result	Result	Result	Result
EN60: Bottle Leaching Procedure								
Final pH	----	0.1	pH Unit	**8.0**	**7.2**	**6.8**	**7.8**	**7.5**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	A_SS20	A_SS22	A_SS23	A_SS24	A_SS28
			Client sampling date / time	22-Jan-2020 00:00	22-Jan-2020 00:00	22-Jan-2020 00:00	22-Jan-2020 00:00	22-Jan-2020 00:00
Compound	CAS Number	LOR	Unit	ES2005692-006	ES2005692-007	ES2005692-008	ES2005692-009	ES2005692-010
				Result	Result	Result	Result	Result
EN60: Bottle Leaching Procedure								
Final pH	----	0.1	pH Unit	**7.8**	**8.0**	**7.8**	**7.4**	**7.3**

Analytical Results

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

			Client sample ID	A_SS30	A_SS34	A_SS38	A_SS45	A_SS54
			Client sampling date / time	22-Jan-2020 00:00	22-Jan-2020 00:00	22-Jan-2020 00:00	22-Jan-2020 00:00	22-Jan-2020 00:00
Compound	CAS Number	LOR	Unit	ES2005692-011	ES2005692-012	ES2005692-013	ES2005692-014	ES2005692-015
				Result	Result	Result	Result	Result
EN60: Bottle Leaching Procedure								
Final pH	----	0.1	pH Unit	**7.2**	**7.1**	**7.2**	**7.0**	**8.0**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	A_SS58	A_SS62	A_SD01	QC112	QC106
			Client sampling date / time	23-Jan-2020 00:00	23-Jan-2020 00:00	22-Jan-2020 00:00	22-Jan-2020 00:00	20-Jan-2020 00:00
Compound	CAS Number	LOR	Unit	ES2005692-016	ES2005692-017	ES2005692-018	ES2005692-019	ES2005692-020
				Result	Result	Result	Result	Result
EN60: Bottle Leaching Procedure								
Final pH	----	0.1	pH Unit	7.9	8.0	8.4	7.5	7.6

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			Client sample ID	**CHAP_SS02**	**AD_SD09**	**AD_SD10**	**MC_SD03**	**MC_SD04**
			Client sampling date / time	20-Jan-2020 00:00	20-Jan-2020 00:00	20-Jan-2020 00:00	20-Jan-2020 00:00	20-Jan-2020 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES2005692-021**	**ES2005692-022**	**ES2005692-023**	**ES2005692-024**	**ES2005692-025**
				Result	Result	Result	Result	Result
EN60: Bottle Leaching Procedure								
Final pH	----	0.1	pH Unit	**7.4**	**8.0**	**8.2**	**3.4**	**3.2**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	MC_SD08	ID011_SD02	ID012_SD01	----	----
			Client sampling date / time	20-Jan-2020 00:00	21-Jan-2020 00:00	21-Jan-2020 00:00	----	----
Compound	CAS Number	LOR	Unit	ES2005692-026	ES2005692-027	ES2005692-028	--------	--------
				Result	Result	Result	----	----
EN60: Bottle Leaching Procedure								
Final pH	----	0.1	pH Unit	**6.6**	**6.8**	**3.1**	----	----

Surrogate Control Limits

Sub-Matrix: **DI WATER LEACHATE**

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

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **ES2005692**	Page	: 1 of 7
Client	: **SENVERSA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: LUCINDA TRICKEY	Telephone	: +61 2 8784 8555
Project	: S17776 PSI	Date Samples Received	: 29-Jan-2020
Site	: ----	Issue Date	: 25-Feb-2020
Sampler	: LT/CW	No. of samples received	: 28
Order number	: ----	No. of samples analysed	: 28

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

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

Summary of Outliers

Outliers : Quality Control Samples

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

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

Outliers : Analysis Holding Time Compliance

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

Outliers : Frequency of Quality Control Samples

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

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
EP231A: Perfluoroalkyl Sulfonic Acids	ES2005692--005	A_SS19	**Perfluorooctane sulfonic acid (PFOS)**	1763-23-1	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EP231D: (n:2) Fluorotelomer Sulfonic Acids	ES2005692--005	A_SS19	**8:2 Fluorotelomer sulfonic acid (8:2 FTS)**	39108-34-4	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**

Analysis Holding Time Compliance

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

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

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

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

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

Method		*Sample Date*	*Extraction / Preparation*			*Analysis*		
Container / Client Sample ID(s)			*Date extracted*	*Due for extraction*	*Evaluation*	*Date analysed*	*Due for analysis*	*Evaluation*
EN60: Bottle Leaching Procedure								
Non-Volatile Leach: 180 day HT (e.g. PFAS, metals ex.Hg) (EN60-Dla)								
QC106,	CHAP_SS02,	**20-Jan-2020**	**19-Feb-2020**	18-Jul-2020	✓	**----**	----	----
AD_SD09,	AD_SD10,							
MC_SD03,	MC_SD04,							
MC_SD08								
Non-Volatile Leach: 180 day HT (e.g. PFAS, metals ex.Hg) (EN60-Dla)								
A_SS02,	A_SS06,	**21-Jan-2020**	**19-Feb-2020**	19-Jul-2020	✓	**----**	----	----
ID011_SD02,	ID012_SD01							
Non-Volatile Leach: 180 day HT (e.g. PFAS, metals ex.Hg) (EN60-Dla)								
A_SS11,	A_SS13,	**22-Jan-2020**	**19-Feb-2020**	20-Jul-2020	✓	**----**	----	----
A_SS19,	A_SS20,							
A_SS22,	A_SS23,							
A_SS24,	A_SS28,							
A_SS30,	A_SS34,							
A_SS38,	A_SS45,							
A_SS54,	A_SD01,							
QC112								
Non-Volatile Leach: 180 day HT (e.g. PFAS, metals ex.Hg) (EN60-Dla)								
A_SS58,	A_SS62	**23-Jan-2020**	**19-Feb-2020**	21-Jul-2020	✓	**----**	----	----

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

Matrix: **WATER**

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

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation: Date extracted	Due for extraction	Evaluation	Analysis: Date analysed	Due for analysis	Evaluation
EP231A: Perfluoroalkyl Sulfonic Acids								
HDPE (no PTFE) (EP231X)								
A_SS02,	A_SS06,	**19-Feb-2020**	**21-Feb-2020**	17-Aug-2020	✓	**24-Feb-2020**	17-Aug-2020	✓
A_SS11,	A_SS13,							
A_SS19,	A_SS20,							
A_SS22,	A_SS23,							
A_SS24,	A_SS28,							
A_SS30,	A_SS34,							
A_SS38,	A_SS45,							
A_SS54,	A_SS58,							
A_SS62,	A_SD01							
HDPE (no PTFE) (EP231X)								
QC112,	QC106,	**19-Feb-2020**	**25-Feb-2020**	17-Aug-2020	✓	**25-Feb-2020**	17-Aug-2020	✓
CHAP_SS02,	AD_SD09,							
AD_SD10,	MC_SD03,							
MC_SD04,	MC_SD08,							
ID011_SD02,	ID012_SD01							
EP231B: Perfluoroalkyl Carboxylic Acids								
HDPE (no PTFE) (EP231X)								
A_SS02,	A_SS06,	**19-Feb-2020**	**21-Feb-2020**	17-Aug-2020	✓	**24-Feb-2020**	17-Aug-2020	✓
A_SS11,	A_SS13,							
A_SS19,	A_SS20,							
A_SS22,	A_SS23,							
A_SS24,	A_SS28,							
A_SS30,	A_SS34,							
A_SS38,	A_SS45,							
A_SS54,	A_SS58,							
A_SS62,	A_SD01							
HDPE (no PTFE) (EP231X)								
QC112,	QC106,	**19-Feb-2020**	**25-Feb-2020**	17-Aug-2020	✓	**25-Feb-2020**	17-Aug-2020	✓
CHAP_SS02,	AD_SD09,							
AD_SD10,	MC_SD03,							
MC_SD04,	MC_SD08,							
ID011_SD02,	ID012_SD01							

Matrix: **WATER**

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

Method Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP231C: Perfluoroalkyl Sulfonamides								
HDPE (no PTFE) (EP231X)								
A_SS02,	A_SS06,	**19-Feb-2020**	**21-Feb-2020**	17-Aug-2020	✓	**24-Feb-2020**	17-Aug-2020	✓
A_SS11,	A_SS13,							
A_SS19,	A_SS20,							
A_SS22,	A_SS23,							
A_SS24,	A_SS28,							
A_SS30,	A_SS34,							
A_SS38,	A_SS45,							
A_SS54,	A_SS58,							
A_SS62,	A_SD01							
HDPE (no PTFE) (EP231X)								
QC112,	QC106,	**19-Feb-2020**	**25-Feb-2020**	17-Aug-2020	✓	**25-Feb-2020**	17-Aug-2020	✓
CHAP_SS02,	AD_SD09,							
AD_SD10,	MC_SD03,							
MC_SD04,	MC_SD08,							
ID011_SD02,	ID012_SD01							
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
HDPE (no PTFE) (EP231X)								
A_SS02,	A_SS06,	**19-Feb-2020**	**21-Feb-2020**	17-Aug-2020	✓	**24-Feb-2020**	17-Aug-2020	✓
A_SS11,	A_SS13,							
A_SS19,	A_SS20,							
A_SS22,	A_SS23,							
A_SS24,	A_SS28,							
A_SS30,	A_SS34,							
A_SS38,	A_SS45,							
A_SS54,	A_SS58,							
A_SS62,	A_SD01							
HDPE (no PTFE) (EP231X)								
QC112,	QC106,	**19-Feb-2020**	**25-Feb-2020**	17-Aug-2020	✓	**25-Feb-2020**	17-Aug-2020	✓
CHAP_SS02,	AD_SD09,							
AD_SD10,	MC_SD03,							
MC_SD04,	MC_SD08,							
ID011_SD02,	ID012_SD01							

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)								
A_SS02,	A_SS06,	**19-Feb-2020**	**21-Feb-2020**	17-Aug-2020	✓	**24-Feb-2020**	17-Aug-2020	✓
A_SS11,	A_SS13,							
A_SS19,	A_SS20,							
A_SS22,	A_SS23,							
A_SS24,	A_SS28,							
A_SS30,	A_SS34,							
A_SS38,	A_SS45,							
A_SS54,	A_SS58,							
A_SS62,	A_SD01							
HDPE (no PTFE) (EP231X)								
QC112,	QC106,	**19-Feb-2020**	**25-Feb-2020**	17-Aug-2020	✓	**25-Feb-2020**	17-Aug-2020	✓
CHAP_SS02,	AD_SD09,							
AD_SD10,	MC_SD03,							
MC_SD04,	MC_SD08,							
ID011_SD02,	ID012_SD01							

Quality Control Parameter Frequency Compliance

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

Matrix: **WATER**

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

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	4	35	**11.43**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	35	**5.71**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	35	**5.71**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	35	**5.71**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

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

Analytical Methods	*Method*	*Matrix*	*Method Descriptions*
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	SOIL	In-house: Analysis of fresh and saline waters by Solid Phase Extraction (SPE) followed by LC-Electrospray-MS-MS, Negative Mode using MRM and internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.

Preparation Methods	*Method*	*Matrix*	*Method Descriptions*
Deionised Water Leach	EN60-DIa	SOIL	In house QWI-EN/60 referenced to AS4439.3 Preparation of Leachates
Solid Phase Extraction (SPE) for PFAS in water	ORG72	SOIL	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **ES2005692**	Page	: 1 of 11
Client	: **SENVERSA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: LUCINDA TRICKEY	Contact	: Brenda Hong
Address	: Level 5, Grafton Bond Building 201 Kent Street SYDNEY NSW 2000	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 03 9606 0070	Telephone	: +61 2 8784 8555
Project	: S17776 PSI	Date Samples Received	: 29-Jan-2020
Order number	: ----	Date Analysis Commenced	: 19-Feb-2020
C-O-C number	: ----	Issue Date	: 25-Feb-2020
Sampler	: LT/CW		
Site	: ----		
Quote number	: SY/665/19		
No. of samples received	: 28		
No. of samples analysed	: 28		

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*
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW

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 (%)*
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 2872240)									
ES2005692-004	A_SS13	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	0.26	0.31	17.2	0% - 20%
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	0.04	0.04	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	0.04	0.04	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	0.45	0.46	2.19	0% - 20%
		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
ES2005692-011	A_SS30	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	1.52	1.55	2.35	0% - 20%
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.02	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	0.33	0.37	11.4	0% - 50%
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	0.03	0.04	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 2872245)									
EP2001631-001	Anonymous	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	0.05	0.05	0.00	No Limit
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
ES2005692-024	MC_SD03	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	0.18	0.20	6.01	0% - 50%
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	0.04	0.04	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	0.02	0.03	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	0.19	0.20	5.49	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

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 2872240)									
ES2005692-004	A_SS13	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	0.04	0.04	0.00	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	0.20	0.21	0.00	0% - 50%
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	0.09	0.10	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	0.03	0.03	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
ES2005692-011	A_SS30	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	0.88	0.98	10.6	0% - 20%
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	0.24	0.26	10.3	0% - 50%
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	0.17	0.19	12.2	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	0.12	0.13	9.41	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	0.69	0.77	10.7	0% - 20%
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	0.12	0.14	12.6	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.00	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 2872245)									
EP2001631-001	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	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.00	No Limit
ES2005692-024	MC_SD03	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	0.01	<0.01	0.00	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.00	No Limit

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 2872245) - continued									
ES2005692-024	MC_SD03	EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.00	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 2872240)									
ES2005692-004	A_SS13	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
ES2005692-011	A_SS30	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 2872245)									
EP2001631-001	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
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.00	No Limit

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 2872245) - continued									
EP2001631-001	Anonymous	EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	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
ES2005692-024	MC_SD03	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 2872240)									
ES2005692-004	A_SS13	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
ES2005692-011	A_SS30	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	0.14	96.1	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	0.22	0.23	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 2872245)									
EP2001631-001	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

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 2872245) - continued									
EP2001631-001	Anonymous	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
ES2005692-024	MC_SD03	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP231P: PFAS Sums (QC Lot: 2872240)									
ES2005692-004	A_SS13	EP231X: Sum of PFAS	----	0.01	µg/L	1.17	1.35	14.3	0% - 20%
ES2005692-011	A_SS30	EP231X: Sum of PFAS	----	0.01	µg/L	4.32	4.82	10.9	0% - 20%
EP231P: PFAS Sums (QC Lot: 2872245)									
EP2001631-001	Anonymous	EP231X: Sum of PFAS	----	0.01	µg/L	0.05	0.05	0.00	No Limit
ES2005692-024	MC_SD03	EP231X: Sum of PFAS	----	0.01	µg/L	0.44	0.47	6.59	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
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 2872240)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	75.4	72.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	73.8	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	80.0	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	87.4	69.0	134
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	69.0	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	95.2	53.0	142
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 2872245)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	92.8	72.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	83.4	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	78.8	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	85.2	69.0	134
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	80.6	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	116	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 2872240)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	93.5	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	92.4	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	89.8	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	86.8	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	107	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	93.8	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	76.4	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	86.8	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	92.0	72.0	134
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	79.4	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	128	71.0	132
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 2872245)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	103	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	108	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	95.4	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	108	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	116	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	93.8	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	111	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	92.4	69.0	133

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: 2872245) - continued								
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	103	72.0	134
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	79.4	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	104	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 2872240)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	94.0	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	100	70.0	130
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	115	70.0	130
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	90.9	70.0	130
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	94.9	70.0	130
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	98.0	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	94.8	61.0	135
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 2872245)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	103	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	103	70.0	130
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	104	70.0	130
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	91.6	70.0	130
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	71.3	70.0	130
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	111	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	96.0	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 2872240)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	91.4	63.0	143
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.25 µg/L	92.6	67.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.25 µg/L	98.4	67.0	138
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.25 µg/L	99.2	70.0	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 2872245)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	102	63.0	143
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.25 µg/L	105	67.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.25 µg/L	111	67.0	138
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.25 µg/L	116	70.0	130

Matrix Spike (MS) Report

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

Sub-Matrix: **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: 2872240)							
ES2005692-005	A_SS19	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.25 µg/L	82.4	50.0	130
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.25 µg/L	80.8	50.0	130
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.25 µg/L	73.0	50.0	130
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.25 µg/L	89.4	50.0	130
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.25 µg/L	# Not Determined	50.0	130
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.25 µg/L	95.8	50.0	130
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 2872245)							
EP2001631-002	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.25 µg/L	92.8	50.0	130
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.25 µg/L	88.0	50.0	130
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.25 µg/L	81.2	50.0	130
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.25 µg/L	86.0	50.0	130
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.25 µg/L	69.0	50.0	130
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.25 µg/L	107	50.0	130
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 2872240)							
ES2005692-005	A_SS19	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	1.25 µg/L	108	50.0	130
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.25 µg/L	94.2	50.0	130
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.25 µg/L	93.2	50.0	130
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.25 µg/L	97.8	50.0	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.25 µg/L	111	50.0	130
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.25 µg/L	109	50.0	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.25 µg/L	84.0	50.0	130
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.25 µg/L	89.4	50.0	130
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.25 µg/L	93.4	50.0	130
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.25 µg/L	79.6	50.0	130
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.625 µg/L	125	50.0	150
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 2872245)							
EP2001631-002	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	1.25 µg/L	107	50.0	130
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.25 µg/L	113	50.0	130
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.25 µg/L	97.2	50.0	130
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.25 µg/L	114	50.0	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.25 µg/L	113	50.0	130
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.25 µg/L	89.0	50.0	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.25 µg/L	116	50.0	130

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report Spike Concentration	SpikeRecovery(%) MS	Recovery Limits (%) Low	High
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 2872245) - continued							
EP2001631-002	Anonymous	EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.25 µg/L	101	50.0	130
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.25 µg/L	110	50.0	130
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.25 µg/L	88.6	50.0	130
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.625 µg/L	102	50.0	150
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 2872240)							
ES2005692-005	A_SS19	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.25 µg/L	82.2	50.0	130
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.625 µg/L	104	50.0	150
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.625 µg/L	122	50.0	150
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.625 µg/L	111	50.0	150
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.625 µg/L	110	50.0	150
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.25 µg/L	99.2	50.0	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.25 µg/L	103	50.0	130
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 2872245)							
EP2001631-002	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.25 µg/L	103	50.0	130
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.625 µg/L	107	50.0	150
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.625 µg/L	108	50.0	150
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.625 µg/L	92.0	50.0	150
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.625 µg/L	71.1	50.0	150
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.25 µg/L	108	50.0	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.25 µg/L	96.4	50.0	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 2872240)							
ES2005692-005	A_SS19	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.25 µg/L	103	50.0	130
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.25 µg/L	91.4	50.0	130
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.25 µg/L	# Not Determined	50.0	130
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.25 µg/L	96.0	50.0	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 2872245)							
EP2001631-002	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.25 µg/L	109	50.0	130

Work Order : ES2005692
Client : SENVERSA PTY LTD
Project : S17776 PSI

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report Spike Concentration	SpikeRecovery(%) MS	Recovery Limits (%) Low	High
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 2872245) - continued							
EP2001631-002	Anonymous	EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.25 µg/L	109	50.0	130
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.25 µg/L	115	50.0	130
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.25 µg/L	123	50.0	130

#702872

#AU03_EnviroSampleBris

From:	#AU_CAU001_EnviroSampleVic
Sent:	Wednesday, 19 February 2020 9:19 AM
To:	#AU03_EnviroSampleBris
Cc:	Harry Bacalis
Subject:	FW: Leachability analysis - 699303

Hi Brisbane,

Can you please log in the below samples IDs for ASLP PFASFULL?

30175 30181

~~Ja31075~~ and Ja~~30181,~~ BSFE004, 016.

Please note – 2 DAY TAT

Thanks,
Canh

Sample Receipt

Eurofins Environment Testing
6 Monterey Rd
Dandenong South 3175
AUSTRALIA
Phone : +61 3 8564 5000

Email : EnviroSampleVic@eurofins.com
Website : http://environment.eurofins.com.au

From: Harry Bacalis
Sent: Wednesday, 19 February 2020 10:14 AM
To: Lucinda Trickey
Cc: Christopher Sandiford; #AU_CAU001_EnviroSampleVic
Subject: RE: Leachability analysis - 699303

No worries Lucy

Canh – 2 DAY TAT – you will need to liaise with Brisbane with regards to this.

Kind regards,

Harry Bacalis
Phone: +61 3 8564 5064
Mobile: +61 438 858 924
Email : HarryBacalis@eurofins.com

Certificate of Analysis

eurofins | Environment Testing

NATA Accredited
Accreditation Number 1261
Site Number 20794

Accredited for compliance with ISO/IEC 17025 – Testing
The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

Senversa Pty Ltd NSW
Level 5, The Grafton Bond Building, 201 Kent Street
SYDNEY
NSW 2000

Attention: **Lucinda Trickey**

Report **702872-L**
Project name PSI
Project ID S17776
Received Date Feb 19, 2020

Client Sample ID			**QC206**	**QC212**
Sample Matrix			**AUS Leachate**	**AUS Leachate**
Eurofins Sample No.			**B20-Fe24643**	**B20-Fe24644**
Date Sampled			**Jan 20, 2020**	**Jan 22, 2020**
Test/Reference	LOR	Unit		
AUS Leaching Procedure				
Leachate Fluid[C01]		comment	1.0	1.0
pH (initial)	0.1	pH Units	5.0	5.0
pH (Leachate fluid)	0.1	pH Units	5.0	5.0
pH (off)	0.1	pH Units	5.0	5.0
Perfluoroalkyl carboxylic acids (PFCAs)				
Perfluorobutanoic acid (PFBA)[N11]	0.05	ug/L	< 0.05	0.21
Perfluoropentanoic acid (PFPeA)[N11]	0.01	ug/L	< 0.01	0.24
Perfluorohexanoic acid (PFHxA)[N11]	0.01	ug/L	0.05	0.17
Perfluoroheptanoic acid (PFHpA)[N11]	0.01	ug/L	0.02	0.13
Perfluorooctanoic acid (PFOA)[N11]	0.01	ug/L	0.03	0.65
Perfluorononanoic acid (PFNA)[N11]	0.01	ug/L	< 0.01	0.35
Perfluorodecanoic acid (PFDA)[N11]	0.01	ug/L	< 0.01	0.06
Perfluoroundecanoic acid (PFUnDA)[N11]	0.01	ug/L	< 0.01	< 0.01
Perfluorododecanoic acid (PFDoDA)[N11]	0.01	ug/L	< 0.01	< 0.01
Perfluorotridecanoic acid (PFTrDA)[N15]	0.01	ug/L	< 0.01	< 0.01
Perfluorotetradecanoic acid (PFTeDA)[N11]	0.01	ug/L	< 0.01	< 0.01
13C4-PFBA (surr.)	1	%	112	97
13C5-PFPeA (surr.)	1	%	96	78
13C5-PFHxA (surr.)	1	%	101	91
13C4-PFHpA (surr.)	1	%	122	108
13C8-PFOA (surr.)	1	%	118	88
13C5-PFNA (surr.)	1	%	124	98
13C6-PFDA (surr.)	1	%	106	108
13C2-PFUnDA (surr.)	1	%	113	91
13C2-PFDoDA (surr.)	1	%	88	75
13C2-PFTeDA (surr.)	1	%	41	47
Perfluoroalkyl sulfonamido substances				
Perfluorooctane sulfonamide (FOSA)[N11]	0.05	ug/L	< 0.05	< 0.05
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)[N11]	0.05	ug/L	< 0.05	< 0.05
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)[N11]	0.05	ug/L	< 0.05	< 0.05
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)[N11]	0.05	ug/L	< 0.05	< 0.05
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)[N11]	0.05	ug/L	< 0.05	< 0.05

Client Sample ID			QC206	QC212
Sample Matrix			AUS Leachate	AUS Leachate
Eurofins Sample No.			B20-Fe24643	B20-Fe24644
Date Sampled			Jan 20, 2020	Jan 22, 2020
Test/Reference	LOR	Unit		
Perfluoroalkyl sulfonamido substances				
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)[N11]	0.05	ug/L	< 0.05	< 0.05
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)[N11]	0.05	ug/L	< 0.05	< 0.05
13C8-FOSA (surr.)	1	%	99	88
D3-N-MeFOSA (surr.)	1	%	60	77
D5-N-EtFOSA (surr.)	1	%	55	77
D7-N-MeFOSE (surr.)	1	%	89	78
D9-N-EtFOSE (surr.)	1	%	82	83
D5-N-EtFOSAA (surr.)	1	%	101	85
D3-N-MeFOSAA (surr.)	1	%	101	68
Perfluoroalkyl sulfonic acids (PFSAs)				
Perfluorobutanesulfonic acid (PFBS)[N11]	0.01	ug/L	0.04	0.02
Perfluorononanesulfonic acid (PFNS)[N15]	0.01	ug/L	< 0.01	< 0.01
Perfluoropropanesulfonic acid (PFPrS)[N15]	0.01	ug/L	0.02	< 0.01
Perfluoropentanesulfonic acid (PFPeS)[N15]	0.01	ug/L	[N09]0.04	[N09]0.02
Perfluorohexanesulfonic acid (PFHxS)[N11]	0.01	ug/L	[N09]0.46	[N09]0.26
Perfluoroheptanesulfonic acid (PFHpS)[N15]	0.01	ug/L	[N09]0.04	[N09]0.01
Perfluorooctanesulfonic acid (PFOS)[N11]	0.01	ug/L	[N09]2.3	[N09]0.81
Perfluorodecanesulfonic acid (PFDS)[N15]	0.01	ug/L	< 0.01	< 0.01
13C3-PFBS (surr.)	1	%	144	127
18O2-PFHxS (surr.)	1	%	124	118
13C8-PFOS (surr.)	1	%	92	89
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)				
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)[N11]	0.01	ug/L	< 0.01	< 0.01
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)[N11]	0.05	ug/L	< 0.05	< 0.05
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)[N11]	0.01	ug/L	< 0.01	0.12
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)[N11]	0.01	ug/L	< 0.01	< 0.01
13C2-4:2 FTSA (surr.)	1	%	66	73
13C2-6:2 FTSA (surr.)	1	%	96	93
13C2-8:2 FTSA (surr.)	1	%	89	72
PFASs Summations				
Sum (PFHxS + PFOS)*	0.01	ug/L	2.76	1.07
Sum of US EPA PFAS (PFOS + PFOA)*	0.01	ug/L	2.33	1.46
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	0.01	ug/L	2.79	1.72
Sum of WA DWER PFAS (n=10)*	0.05	ug/L	2.9	2.61
Sum of PFASs (n=30)*	0.1	ug/L	3	3.05

Sample History

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

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
AUS Leaching Procedure	Brisbane	Feb 19, 2020	7 Days
- Method: LTM-GEN-7010 Leaching Procedure for Soils & Solid Wastes			
Per- and Polyfluoroalkyl Substances (PFASs)			
Perfluoroalkyl carboxylic acids (PFCAs)	Brisbane	Feb 19, 2020	14 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
Perfluoroalkyl sulfonamido substances	Brisbane	Feb 19, 2020	14 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
Perfluoroalkyl sulfonic acids (PFSAs)	Brisbane	Feb 19, 2020	14 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)	Brisbane	Feb 19, 2020	14 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			

eurofins
Environment Testing

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

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NATA # 1261
Site # 1254 & 14271

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

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

Perth
2/91 Leach Highway
Kewdale WA 6105
Phone : +61 8 9251 9600
NATA # 1261
Site # 23736

New Zealand

Auckland
35 O'Rorke Road
Penrose, Auckland 1061
Phone : +64 9 526 45 51
IANZ # 1327

Christchurch
43 Detroit Drive
Rolleston, Christchurch 7675
Phone : 0800 856 450
IANZ # 1290

Company Name:	Senversa Pty Ltd NSW	**Order No.:**		**Received:**	Feb 19, 2020 9:19 AM
Address:	Level 5, The Grafton Bond Building, 201 Kent Street SYDNEY NSW 2000	**Report #:**	702872	**Due:**	Feb 21, 2020
		Phone:	02 9994 8016	**Priority:**	2 Day
		Fax:	03 9606 0074	**Contact Name:**	Lucinda Trickey
Project Name:	PSI				
Project ID:	S17776				

Eurofins Analytical Services Manager : Ursula Long

Sample Detail						AUS Leaching Procedure	Per- and Polyfluoroalkyl Substances (PFASs)
Melbourne Laboratory - NATA Site # 1254 & 14271							
Sydney Laboratory - NATA Site # 18217							
Brisbane Laboratory - NATA Site # 20794						X	X
Perth Laboratory - NATA Site # 23736							
External Laboratory							
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**		
1	QC206	Jan 20, 2020		AUS Leachate	B20-Fe24643	X	X
2	QC212	Jan 22, 2020		AUS Leachate	B20-Fe24644	X	X
Test Counts						2	2

Environment Testing

Internal Quality Control Review and Glossary

General

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

Holding Times

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

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

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

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

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

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

Units

mg/kg: milligrams per kilogram	**mg/L:** milligrams per litre	**ug/L:** micrograms per litre
ppm: Parts per million	**ppb:** Parts per billion	**%:** Percentage
org/100mL: Organisms per 100 millilitres	**NTU:** Nephelometric Turbidity Units	**MPN/100mL:** Most Probable Number of organisms per 100 millilitres

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery.
CRM	Certified Reference Material - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
QSM	US Department of Defense Quality Systems Manual Version 5.3
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

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

Results <10 times the LOR : No Limit

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

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

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

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.3 where no positive PFAS results have been reported have been reviewed and no data was affected.

WA DWER (n=10): PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC Data General Comments

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

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	ug/L	< 0.05			0.05	Pass	
Perfluoropentanoic acid (PFPeA)	ug/L	< 0.01			0.01	Pass	
Perfluorohexanoic acid (PFHxA)	ug/L	< 0.01			0.01	Pass	
Perfluoroheptanoic acid (PFHpA)	ug/L	< 0.01			0.01	Pass	
Perfluorooctanoic acid (PFOA)	ug/L	< 0.01			0.01	Pass	
Perfluorononanoic acid (PFNA)	ug/L	< 0.01			0.01	Pass	
Perfluorodecanoic acid (PFDA)	ug/L	< 0.01			0.01	Pass	
Perfluoroundecanoic acid (PFUnDA)	ug/L	< 0.01			0.01	Pass	
Perfluorododecanoic acid (PFDoDA)	ug/L	< 0.01			0.01	Pass	
Perfluorotridecanoic acid (PFTrDA)	ug/L	< 0.01			0.01	Pass	
Perfluorotetradecanoic acid (PFTeDA)	ug/L	< 0.01			0.01	Pass	
Method Blank							
Perfluoroalkyl sulfonamido substances							
Perfluorooctane sulfonamide (FOSA)	ug/L	< 0.05			0.05	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	ug/L	< 0.05			0.05	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	ug/L	< 0.05			0.05	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	ug/L	< 0.05			0.05	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	ug/L	< 0.05			0.05	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	ug/L	< 0.05			0.05	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	ug/L	< 0.05			0.05	Pass	
Method Blank							
Perfluoroalkyl sulfonic acids (PFSAs)							
Perfluorobutanesulfonic acid (PFBS)	ug/L	< 0.01			0.01	Pass	
Perfluorononanesulfonic acid (PFNS)	ug/L	< 0.01			0.01	Pass	
Perfluoropropanesulfonic acid (PFPrS)	ug/L	< 0.01			0.01	Pass	
Perfluoropentanesulfonic acid (PFPeS)	ug/L	< 0.01			0.01	Pass	
Perfluorohexanesulfonic acid (PFHxS)	ug/L	< 0.01			0.01	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	ug/L	< 0.01			0.01	Pass	
Perfluorooctanesulfonic acid (PFOS)	ug/L	< 0.01			0.01	Pass	
Perfluorodecanesulfonic acid (PFDS)	ug/L	< 0.01			0.01	Pass	
Method Blank							
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)							
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	ug/L	< 0.01			0.01	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	ug/L	< 0.05			0.05	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	ug/L	< 0.01			0.01	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	ug/L	< 0.01			0.01	Pass	
LCS - % Recovery							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	%	95			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	%	92			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	%	102			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	%	101			50-150	Pass	
Perfluorooctanoic acid (PFOA)	%	95			50-150	Pass	
Perfluorononanoic acid (PFNA)	%	105			50-150	Pass	
Perfluorodecanoic acid (PFDA)	%	93			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	%	80			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	%	85			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	%	78			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	%	75			50-150	Pass	

Test			Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
LCS - % Recovery									
Perfluoroalkyl sulfonamido substances									
Perfluorooctane sulfonamide (FOSA)			%	87			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)			%	77			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)			%	75			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)			%	76			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)			%	79			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)			%	81			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)			%	88			50-150	Pass	
LCS - % Recovery									
Perfluoroalkyl sulfonic acids (PFSAs)									
Perfluorobutanesulfonic acid (PFBS)			%	83			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)			%	77			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)			%	83			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)			%	89			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)			%	92			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)			%	90			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)			%	93			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)			%	61			50-150	Pass	
LCS - % Recovery									
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)									
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)			%	60			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)			%	94			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)			%	104			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)			%	83			50-150	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Spike - % Recovery									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1					
Perfluorobutanoic acid (PFBA)	B20-Fe16065	NCP	%	86			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	B20-Fe16065	NCP	%	86			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	B20-Fe16065	NCP	%	93			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	B20-Fe16065	NCP	%	89			50-150	Pass	
Perfluorooctanoic acid (PFOA)	B20-Fe16065	NCP	%	94			50-150	Pass	
Perfluorononanoic acid (PFNA)	B20-Fe16065	NCP	%	93			50-150	Pass	
Perfluorodecanoic acid (PFDA)	B20-Fe16065	NCP	%	87			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	B20-Fe16065	NCP	%	79			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	B20-Fe16065	NCP	%	78			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	B20-Fe16065	NCP	%	77			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	B20-Fe16065	NCP	%	63			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonamido substances				Result 1					
Perfluorooctane sulfonamide (FOSA)	B20-Fe16065	NCP	%	77			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	B20-Fe16065	NCP	%	68			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	B20-Fe16065	NCP	%	69			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	B20-Fe16065	NCP	%	64			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	B20-Fe16065	NCP	%	67			50-150	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	B20-Fe16065	NCP	%	74			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	B20-Fe16065	NCP	%	81			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1					
Perfluorobutanesulfonic acid (PFBS)	B20-Fe16065	NCP	%	75			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)	B20-Fe16065	NCP	%	70			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)	B20-Fe16065	NCP	%	85			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	B20-Fe16065	NCP	%	82			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	B20-Fe16065	NCP	%	87			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	B20-Fe16065	NCP	%	72			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	B20-Fe16065	NCP	%	85			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	B20-Fe16065	NCP	%	53			50-150	Pass	
Spike - % Recovery									
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)				Result 1					
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	B20-Fe16065	NCP	%	83			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	B20-Fe16065	NCP	%	91			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	B20-Fe16065	NCP	%	100			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	B20-Fe16065	NCP	%	71			50-150	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Duplicate									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1	Result 2	RPD			
Perfluorobutanoic acid (PFBA)	B20-Fe23916	NCP	ug/L	0.09	0.09	2.0	30%	Pass	
Perfluoropentanoic acid (PFPeA)	B20-Fe23916	NCP	ug/L	0.15	0.14	8.0	30%	Pass	
Perfluorohexanoic acid (PFHxA)	B20-Fe23916	NCP	ug/L	0.87	0.86	1.0	30%	Pass	
Perfluoroheptanoic acid (PFHpA)	B20-Fe23916	NCP	ug/L	0.10	0.11	4.0	30%	Pass	
Perfluorooctanoic acid (PFOA)	B20-Fe23916	NCP	ug/L	0.24	0.24	2.0	30%	Pass	
Perfluorononanoic acid (PFNA)	B20-Fe23916	NCP	ug/L	0.52	0.50	2.0	30%	Pass	
Perfluorodecanoic acid (PFDA)	B20-Fe23916	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoroundecanoic acid (PFUnDA)	B20-Fe23916	NCP	ug/L	0.06	0.06	3.0	30%	Pass	
Perfluorododecanoic acid (PFDoDA)	B20-Fe23916	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorotridecanoic acid (PFTrDA)	B20-Fe23916	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorotetradecanoic acid (PFTeDA)	B20-Fe23916	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	

Duplicate									
Perfluoroalkyl sulfonamido substances				Result 1	Result 2	RPD			
Perfluorooctane sulfonamide (FOSA)	B20-Fe23916	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	B20-Fe23916	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	B20-Fe23916	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	B20-Fe23916	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	B20-Fe23916	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	B20-Fe23916	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	B20-Fe23916	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
Duplicate									
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1	Result 2	RPD			
Perfluorobutanesulfonic acid (PFBS)	B20-Fe23916	NCP	ug/L	0.26	0.24	8.0	30%	Pass	
Perfluorononanesulfonic acid (PFNS)	B20-Fe23916	NCP	ug/L	0.09	0.09	<1	30%	Pass	
Perfluoropropanesulfonic acid (PFPrS)	B20-Fe23916	NCP	ug/L	0.10	0.11	2.0	30%	Pass	
Perfluoropentanesulfonic acid (PFPeS)	B20-Fe23916	NCP	ug/L	0.38	0.37	3.0	30%	Pass	
Perfluorohexanesulfonic acid (PFHxS)	B20-Fe16064	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	B20-Fe23916	NCP	ug/L	0.34	0.33	2.0	30%	Pass	
Perfluorooctanesulfonic acid (PFOS)	B20-Fe23916	NCP	ug/L	31	30	4.0	30%	Pass	
Perfluorodecanesulfonic acid (PFDS)	B20-Fe23916	NCP	ug/L	0.02	0.02	11	30%	Pass	
Duplicate									
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)				Result 1	Result 2	RPD			
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	B20-Fe23916	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	B20-Fe23916	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	B20-Fe23916	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	B20-Fe23916	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	

Comments

Sample Integrity

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

Qualifier Codes/Comments

Code	Description
C01	Leachate Fluid Key: 1 - pH 5.0; 2 - pH 2.9; 3 - pH 9.2; 4 - Reagent (DI) water; 5 - Client sample, 6 - other
N09	Quantification of linear and branched isomers has been conducted as a single total response using the relative response factor for the corresponding linear/branched standard.
N11	Isotope dilution is used for calibration of each native compound for which an exact labelled analogue is available (Isotope Dilution Quantitation). The isotopically labelled analogues allow identification and recovery correction of the concentration of the associated native PFAS compounds.
N15	Where the native PFAS compound does not have labelled analogue then the quantification is made using the Extracted Internal Standard Analyte with the closest retention time to the analyte and no recovery correction has been made (Internal Standard Quantitation).

Authorised By

Ursula Long	Analytical Services Manager
Sarah McCallion	Senior Analyst-PFAS (QLD)

Glenn Jackson
General Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

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

Measurement uncertainty of test data is available on request or please click here.

Appendix L: Data Validation

Appendix L: Quality Assurance / Quality Control

The data quality assurance and control (QA/QC) procedures adopted by Senversa provide a consistent approach to evaluation of whether the data quality objectives (DQO's) required by the project have been achieved. The process focuses on assessment of the useability of the data in terms of accuracy and reliability in forming conclusions on the condition of the element of the environment being investigated. The approach is generally based on guidance from the following sources:

- Australian Standard (AS) 4482.1-2005: *Guide to the investigation and sampling of sites with potentially contaminated soil, Part 1: Non-volatile and semi-volatile compounds.*
- National Environment Protection Council (NEPC), *National Environment Protection (Assessment of Site Contamination) Amendment Measure No. 1 2013 (NEPM), Schedule B2: Guideline on Site Characterisation*.
- NEPC – *National Environment Protection (Assessment of Site Contamination) Amendment Measure No. 1 2013 (NEPM), Schedule B3: Guideline on Laboratory Analysis of Potentially Contaminated Soils*.
- United States Environmental Protection Agency (USEPA) – *Guidance on Systematic Planning Using the Data Quality Objectives Process* (EPA QA/G-4).
- USEPA – *Guidance on Environmental Data Verification and Data Validation* (EPA QA/G-8).

Quality Assurance Procedure

The following data quality objectives, measures and acceptance criteria were adopted to verify compliance with the planned QA procedures:

Quality Assurance Process	Data Quality Element	Objectives and Measure	Acceptance Criteria
Standard Procedures	Comparability, Reproducibility, Representativeness	Standard field sampling procedures and forms used	No deviation from standard procedure and forms used
Equipment Calibration	Accuracy	All equipment calibrated in accordance with manufacturers specifications	All equipment calibrated in accordance with manufacturers specifications
Testing Method Accreditation	Accuracy and Comparability	NATA accredited methods used for all analyses determined	Primary and secondary laboratories to use NATA accredited methods for all analytes determined
Quality Control Sampling Frequency	Precision and Repeatability	Field QC sampling frequency in accordance with AS4482.1-2005	Field Duplicates – ≥ 1 in 20 primary samples Secondary Duplicates – ≥ 1 in 20 primary samples Rinsate Blanks – ≥ 1 per day, per matrix per equipment Trip Blanks – ≥ 1 per esky containing samples for volatile analyses

Quality Assurance Process	Data Quality Element	Objectives and Measure	Acceptance Criteria
	Accuracy, Precision and Comparability	Laboratory QC analysis frequency in accordance with NEPC (2013), Schedule B3	Laboratory Duplicates – at least 1 in 10 analyses or one per process batch Method Blanks – at least 1 per process batch Surrogate Recoveries – all samples spiked where appropriate (e.g. chromatographic analysis of organics) Laboratory Control Samples – at least 1 per process batch Matrix Spikes – at least 1 per matrix type per process batch
Sample Preservation, Handling and Holding Times	Accuracy	Samples appropriately preserved upon collection , stored and transported, and analysed within holding times	Sample containers, holding times and preservation in accordance laboratory specific method requirements.
Data Management	Accuracy	No errors in data transcription	Entry of field data verified by peer.
Data Useability	Completeness	Limits of reporting less than adopted beneficial use investigation levels. Sample volumes and analytical methods selected to enable required limits of reporting to be achieved	Limits of reporting less than investigation levels.

Quality Control Sampling and Analysis

The following data quality objectives, measures and acceptance criteria were adopted to evaluate the validity of the analytical data produced.

Quality Control Process	Data Quality Element	Objectives and Measure	Acceptance Criteria
Field Duplicate Sampling and Analysis	Precision and Field Repeatability	Field duplicate samples used assess the variability in analyte concentration between samples collected from the sample location and the reproducibility of the laboratory analysis. Where required, resubmission of previously analysed samples for chemicals within their holding times may be undertaken to further assess level of precision.	Analysed for same chemicals as primary sample RPD[1] <30% of mean concentration where both concentrations >20 x limit of reporting RPD <50% of mean concentration where higher concentration 10 – 20 x limit of reporting RPD - No limit where both concentrations < 10 x limit of reporting
Secondary Duplicate Sampling and Analysis	Accuracy	Results are accurate and free from laboratory error. Secondary duplicate samples sent to a secondary laboratory to assess the accuracy of the analyte concentrations reported by the primary laboratory	Analysed for same chemicals as primary sample RPD <30% of mean concentration where both concentrations >20 x limit of reporting RPD <50% of mean concentration where higher concentration 10 – 20 x limit of reporting RPD - No limit where both concentrations < 10 x limit of reporting

[1] Relative Percent Difference (%): Calculated as: (Result No.1 – Result No. 2/Mean Result)*100

Quality Control Process	Data Quality Element	Objectives and Measure	Acceptance Criteria
Field Rinsate Blank Preparation and Analysis	Accuracy and Representativeness	Cross contamination of samples does not occur between sampling locations due to carry-over from sampling equipment. Rinsate blank samples prepared for each sampling procedure. Where possible the rinsate blanks are prepared immediately after sampling locations known to contain concentrations of the chemicals of concern above the limit of quantification and / or before sampling locations where the chemicals being targeted in the laboratory analysis are to be compared to investigation levels near the limit of quantification of the chemical.	Analyte concentrations below limits of reporting
Trip Blank Sampling and Analysis	Accuracy and Representativeness	Cross contamination between samples does not occur in transit or as an artefact of the sample handling procedure. Trip blank samples prepared by the laboratory which accompany the empty sampling containers from the laboratory to the sampling site, and return with the samples to the laboratory to assess whether cross contamination occurs between samples or as an artefact of the sampling procedure.	Analyte concentrations below limits of reporting
Laboratory QC Analysis	Laboratory Precision and Accuracy	Laboratory duplicates	As specified by the laboratory.
		Laboratory control spike	Dynamic recovery limits as specified by the laboratory.
		Certified reference material	As specified by the laboratory (generally dynamic recovery limits).
		Surrogate recovery	Dynamic recovery limits as specified by the laboratory.
		Matrix spike recovery	Recovery 70% – 130% or dynamic recovery limits specified by laboratory. However note that recovery of phenols is generally significantly lower and a recovery in the range 20% to 130% is considered acceptable by most laboratories.
		Matrix spike recovery duplicate	RPD < 30%, or as specified by the laboratory.

Data Verification and Validation

The data validation process involved the checking of analytical procedure compliance with acceptance criteria and an assessment of the accuracy and precision of analytical data from the range of quality control indicators generated from both the sampling and analytical programmes.

The checks undertaken are summarised in the attached data validation checklist tables (one table per sample batch/delivery group). Field replicate and field blank analytical results relevant to the project are summarised in **Table L-1, Table L-2 and Table L-3.**

Instances where the data quality acceptance criteria were not achieved are discussed below:

Quality Control Duplicate Frequency and Results

The laboratory reports were issued in 29 batches to assist with individual private property results delivery; however, the quality control samples were collected for the project as an entirety rather than a per batch basis. The table below demonstrates that the frequency of duplicate samples collected is consistent with the 1 in 10 proposed.

Sample Type	Number of Samples Analysed	Number of duplicate pairs collected*		Number of blank samples collected		
		Number	Rate (1 in 10)	Number of rinsate blanks	Number of field blanks	Number of trip blanks
Soil	73	11	1 pair of duplicate samples per 9.81 primary samples	3 Rinsate collected off trowel on days when used.	3 2 blanks collected off clean glove. 1 collected off clean bailer.	N/A
Sediment Samples	35					
Water	56	8	1 pair of duplicate samples per 7 primary samples	0 No equipment used during sampling		

RPDs for soil (**Table L-1**) and for water (**Table L-2**) were within the defined acceptable limits except for the following:

- Moisture between primary sample AD_SD04 and both the intra and interlaboratory duplicates QC107 and QC207 and between primary sample A_SS03 and interlaboratory duplicate QC108 with RPD values of 48, 43 and 71 respectively.
- PFHxS between primary samples and both inter and interlaboratory duplicates for five quality control pairs (A_SS03 and QC208, ID012_SD01 and QC209, A_SS20 and QC111 and QC211, A_SS50 and QC114) ranging from an RPD value of 31 to 74.
- PFOS between primary samples and both inter and interlaboratory duplicates for five quality control pairs (MC_SD08 and QC206, SD012_SD01 and QC109, A_SS20 and QC211, A_SS30 and QC112, A_SS52 and QC215) ranging from an RPD value of 38 to 64.
- PFPeS between primary sample ID012_SD01 and interlaboratory duplicate QC109 with an RPD value of 169.
- High RPD values ranging from 32 to 47 exist for several PFAS compounds for primary water sample PWS_AIRPORT_BORE and both inter and interlaboratory duplicates.

Majority of the high RPD non-conformances exist for soil and sediment samples which are likely due to the heterogeneity of the sample. The high RPD values for the airport bore sample are all below 50 and are not considered to affect the overall validity of the analytical data.

Rinsate Blanks

As per **Table L-3**, all results were below detection limits indicating cross contamination between samples is unlikely.

Trip Blanks

Trip blanks were not collected as part of this investigation to the low volatile nature of PFAS and the low likelihood of cross contamination.

Holding Time Exceedances

Holding time outliers for major cations was identified in 11 laboratory reports. Major cations were collected to provide an indicative assessment of aquifer properties across the island and are not a COPC, therefor this exceedances is not considered to have impacted the outcome of the investigation.

Temperature Exceedances

Due to the remote location of the site and the custom protocols getting the samples into Sydney, all laboratory reports indicate temperature exceedance (<6 ºC). The laboratory noted that attempts to cool the samples were present. This is not considered to have affected the laboratory results as the primary contaminants of concern, PFAS, are non-volatile and no volatile contaminants were detected in the primary samples during this round of sampling.

Laboratory Control Frequency

Laboratory duplicates and matrix spike frequency were not met in 20 of the laboratory reports. This is not anticipated to impact the conclusions drawn as the duplicate and triplicate results were relatively closely correlated with few exceedances of adopted criteria as discussed above.

Laboratory Quality Control Process

Laboratory quality control process non-conformances identified in quality assurance procedures and quality control samples for each environmental media sampled are summarised below.

- Surrogate recoveries were outside the laboratory recovery limits in one laboratory report.
- Matrix spike recovery was not determined for selected analytes in eight laboratory reports.

While some of the quality control results were reported to be outside adopted acceptance objectives, the majority of the quality control results indicated that the precision and accuracy of the data was within acceptable limits. The results were therefore considered to be representative of chemical concentrations in the environmental media sampled at the time of sampling, and to be suitable to be used for their intended purpose in providing an understanding of the contamination status of the environmental media assessed.

Data Suitability

While a small number of QC results were outside specified acceptance criteria, these were not considered to significantly impact on the quality or representativeness of the data, and majority of results indicated that the precision and accuracy of the data was within acceptable limits. The results are therefore considered to be representative of chemical concentrations in the environmental media sampled at the time of sampling, and to be suitable to be used for their intended purpose in forming conclusions relating to the contamination status of soil, sediment, groundwater and surface water at and surrounding the site.

Data Validation Checklist

senversa

Job Number:	17776
Report Title:	Preliminary Site Investigation
Client:	DITCRD
Completed By:	Lucinda Trickey
Date:	
Verified By:	
Date:	

SAMPLE DELIVERY GROUP (SDG):	**ES2002609**	**SAMPLE DELIVERY GROUP (SDG):**	**ES2002612**	**SAMPLE DELIVERY GROUP (SDG):**	**ES2002614**	**SAMPLE DELIVERY GROUP (SDG):**	**ES2002615**
Laboratory:	ALS Environmental	**Laboratory:**	ALS Environmental	**Laboratory:**	ALS Environmental	**Laboratory:**	ALS Environmental
Sample Dates:	16 Januaru 2020	**Sample Dates:**	16 Januaru 2020	**Sample Dates:**	16 Januaru 2020	**Sample Dates:**	16 Januaru 2020
Sample Media:	Water	**Sample Media:**	Water	**Sample Media:**	Water	**Sample Media:**	Water

Quality Assurance Process	**Objectives & Measure**	**Acceptance Criteria**	**Source of Information**	**Acceptance Criteria Met?**	**Notes/Details of Nonconformance**	**Acceptance Criteria Met?**	**Notes/Details of Nonconformance**	**Acceptance Criteria Met?**	**Notes/Details of Nonconformance**	**Acceptance Criteria Met?**	**Notes/Details of Nonconformance**
Standard Procedures	Standard field sampling procedures and forms used	No deviation from standard procedure and forms used.	Borelogs, field sheets, COCs, data tables	Yes		Yes		Yes		Yes	
Equipment Calibration	All equipment calibrated in accordance with manufacturers specifications	All equipment calibrated in accordance with manufacturers specifications.	Calibration Certificates / Records	Yes		Yes		Yes		Yes	
Testing Method Accreditation	NATA accredited methods used for all analyses determined	Primary and secondary laboratories to use NATA accredited methods for all analytes determined.	Laboratory Report	Yes		Yes		Yes		Yes	
Quality Control Sampling Frequency	Field QC sampling frequency in accordance with AS4482.1-2005	Field (Intra-laboratory) Duplicates - ≥ 1 in 20 primary samples. (note that PFAS NEMP recommends 1 in 10 for PFAS investigations)	QA/QC register (within field book)	No	No QC samples included in this laboratory batch. QC samples are included in report ES2002626.	No	No QC samples included in this laboratory batch. QC samples are included in report ES2002626.	No	No QC samples included in this laboratory batch. QC samples are included in report ES2002626.	No	No QC samples included in this laboratory batch. QC samples are included in report ES2002626.
		Secondary (inter-laboratory) duplicates - ≥ 1 in 20 primary samples. (note that PFAS NEMP recommends 1 in 10 for PFAS investigations)	QA/QC register (within field book)	No		No		No		No	
		Rinsate Blanks - ≥ 1 per day, per matrix per equipment.	QA/QC register (within field book)	No	No QC samples included in this laboratory batch. QC samples are included in report ES2002626.	No	No QC samples included in this laboratory batch. QC samples are included in report ES2002626.	No	No QC samples included in this laboratory batch. QC samples are included in report ES2002626.	No	No QC samples included in this laboratory batch. QC samples are included in report ES2002626.
		Trip Blanks - ≥ 1 per esky containing samples for volatiles.	QA/QC register (within field book)	No	No trip blanks were collected during this investigation.	No	No trip blanks were collected during this investigation.	No	No trip blanks were collected during this investigation.	No	No trip blanks were collected during this investigation.
	Laboratory QC analysis frequency in accordance with NEPC 2013	Laboratory Duplicates - at least 1 in 10 analyses or 1 per process batch.	Laboratory Reports	No	Expected laboratory frequency was not met.	No	Expected laboratory frequency was not met.	No	Expected laboratory frequency was not met.	No	Expected laboratory frequency was not met.
		Method Blanks - at least 1 per process batch.	Laboratory Reports	Yes		Yes		Yes		Yes	
		Surrogate Recoveries - all samples spiked where appropriate (e.g. chromatographic analysis of organics).	Laboratory Reports	Yes		Yes		Yes		Yes	
		Laboratory Control Samples - at least 1 per process batch.	Laboratory Reports	Yes		Yes		Yes		Yes	
		Matrix Spikes - at least 1 per matrix type per process batch.	Laboratory Reports	No	Expected laboratory frequency was not met.	No	Expected laboratory frequency was not met.	No	Expected laboratory frequency was not met.	No	Expected laboratory frequency was not met.
Sample Preservation, Handling and Holding Times	Samples appropriately preserved upon collection, stored and transported, and analysed within holding times	In accordance with laboratory specific method requirements. Unless specific method indicates otherwise, soil and water samples should be stored, transported and received by the laboratory at < 6°C.	Laboratory Reports	No	Samples received at temperatures exceeding 6 °C.	No	Samples received at temperatures exceeding 6 °C.	No	Samples received at temperatures exceeding 6 °C.	No	Samples received at temperatures exceeding 6 °C. Holding time outlier exists for Major Cations.
Data Management	No errors in data transcription	Entry of field data verified by peer.	10% check of electronically imported data (e.g. ESDAT). 100% check of manually entered data (e.g. field parameters, gauging data).	Yes		Yes		Yes		Yes	
Data Useability	Limits of reporting less than investigation levels	Limits of reporting less than relevant investigation levels.	Results Tables	Yes		Yes		Yes		Yes	

Data Validation Checklist

senversa

Job Number:	17776
Report Title:	Preliminary Site Investigation
Client:	DITCRD
Completed By:	Lucinda Trickey
Date:	
Verified By:	
Date:	

SAMPLE DELIVERY GROUP (SDG):	**ES2002616**	**SAMPLE DELIVERY GROUP (SDG):**	**ES2002617**	**SAMPLE DELIVERY GROUP (SDG):**	**ES2002618**	**SAMPLE DELIVERY GROUP (SDG):**	**ES2002619**
Laboratory:	ALS Environmental	**Laboratory:**	ALS Environmental	**Laboratory:**	ALS Environmental	**Laboratory:**	ALS Environmental
Sample Dates:	16-Jan-20	**Sample Dates:**	15-Jan-20	**Sample Dates:**	17-Jan-20	**Sample Dates:**	16-Jan-20
Sample Media:	Water	**Sample Media:**	Water	**Sample Media:**	Water	**Sample Media:**	Water

Quality Assurance Process	**Objectives & Measure**	**Acceptance Criteria**	**Source of Information**	**Acceptance Criteria Met?**	**Notes/Details of Nonconformance**	**Acceptance Criteria Met?**	**Notes/Details of Nonconformance**	**Acceptance Criteria Met?**	**Notes/Details of Nonconformance**	**Acceptance Criteria Met?**	**Notes/Details of Nonconformance**
Standard Procedures	Standard field sampling procedures and forms used	No deviation from standard procedure and forms used.	Borelogs, field sheets, COCs, data tables	Yes		Yes		Yes		Yes	
Equipment Calibration	All equipment calibrated in accordance with manufacturers specifications	All equipment calibrated in accordance with manufacturers specifications.	Calibration Certificates / Records	Yes		Yes		Yes		Yes	
Testing Method Accreditation	NATA accredited methods used for all analyses determined	Primary and secondary laboratories to use NATA accredited methods for all analytes determined.	Laboratory Report	Yes		Yes		Yes		Yes	
Quality Control Sampling Frequency	Field QC sampling frequency in accordance with AS4482.1-2005	Field (Intra-laboratory) Duplicates - ≥ 1 in 20 primary samples. (note that PFAS NEMP recommends 1 in 10 for PFAS investigations)	QA/QC register (within field book)	No	No QC samples included in this laboratory batch. QC samples are included in report ES2002626.	No	No QC samples included in this laboratory batch. QC samples are included in report ES2002626.	No	No QC samples included in this laboratory batch. QC samples are included in report ES2002626.	No	No QC samples included in this laboratory batch. QC samples are included in report ES2002626.
		Secondary (inter-laboratory) duplicates - ≥ 1 in 20 primary samples. (note that PFAS NEMP recommends 1 in 10 for PFAS investigations)	QA/QC register (within field book)	No		No		No		No	
		Rinsate Blanks - ≥ 1 per day, per matrix per equipment.	QA/QC register (within field book)	No	No QC samples included in this laboratory batch. QC samples are included in report ES2002626.	No	No QC samples included in this laboratory batch. QC samples are included in report ES2002626.	No	No QC samples included in this laboratory batch. QC samples are included in report ES2002626.	No	No QC samples included in this laboratory batch. QC samples are included in report ES2002626.
		Trip Blanks - ≥ 1 per esky containing samples for volatiles.	QA/QC register (within field book)	No	No trip blanks were collected during this investigation.	No	No trip blanks were collected during this investigation.	No	No trip blanks were collected during this investigation.	No	No trip blanks were collected during this investigation.
	Laboratory QC analysis frequency in accordance with NEPC 2013	Laboratory Duplicates - at least 1 in 10 analyses or 1 per process batch.	Laboratory Reports	No	Expected laboratory frequency was not met.	No	Expected laboratory frequency was not met.	No	Expected laboratory frequency was not met.	No	Expected laboratory frequency was not met.
		Method Blanks - at least 1 per process batch.	Laboratory Reports	Yes		Yes		Yes		Yes	
		Surrogate Recoveries - all samples spiked where appropriate (e.g. chromatographic analysis of organics).	Laboratory Reports	Yes		Yes		Yes		Yes	
		Laboratory Control Samples - at least 1 per process batch.	Laboratory Reports	Yes		Yes		Yes		Yes	
		Matrix Spikes - at least 1 per matrix type per process batch.	Laboratory Reports	No	Expected laboratory frequency was not met.	No	Expected laboratory frequency was not met.	No	Expected laboratory frequency was not met.	No	Expected laboratory frequency was not met.
Sample Preservation, Handling and Holding Times	Samples appropriately preserved upon collection, stored and transported, and analysed within holding times	In accordance with laboratory specific method requirements. Unless specific method indicates otherwise, soil and water samples should be stored, transported and received by the laboratory at < 6°C.	Laboratory Reports	No	Samples received at temperatures exceeding 6 °C. Holding time outlier exists for Major Cations.	No	Samples received at temperatures exceeding 6 °C. Holding time outlier exists for Major Cations.	No	Samples received at temperatures exceeding 6 °C. Holding time outlier exists for Major Cations.	No	Samples received at temperatures exceeding 6 °C. Holding time outlier exists for Major Cations.
Data Management	No errors in data transcription	Entry of field data verified by peer.	10% check of electronically imported data (e.g. ESDAT). 100% check of manually entered data (e.g. field parameters, gauging data).	Yes		Yes		Yes		Yes	
Data Useability	Limits of reporting less than investigation levels	Limits of reporting less than relevant investigation levels.	Results Tables	Yes		Yes		Yes		Yes	

Data Validation Checklist

Job Number:	17776
Report Title:	Preliminary Site Investigation
Client:	DITCRD
Completed By:	Lucinda Trickey
Date:	
Verified By:	
Date:	

SAMPLE DELIVERY GROUP (SDG):	**ES2002620**
Laboratory:	ALS Environmental
Sample Dates:	16-Jan-20
Sample Media:	Water

Quality Assurance Process	Objectives & Measure	Acceptance Criteria	Source of Information	Acceptance Criteria Met?	Notes/Details of Nonconformance
Standard Procedures	Standard field sampling procedures and forms used	No deviation from standard procedure and forms used.	Borelogs, field sheets, COCs, data tables	Yes	
Equipment Calibration	All equipment calibrated in accordance with manufacturers specifications	All equipment calibrated in accordance with manufacturers specifications.	Calibration Certificates / Records	Yes	
Testing Method Accreditation	NATA accredited methods used for all analyses determined	Primary and secondary laboratories to use NATA accredited methods for all analytes determined.	Laboratory Report	Yes	
Quality Control Sampling Frequency	Field QC sampling frequency in accordance with AS4482.1-2005	Field (Intra-laboratory) Duplicates - ≥ 1 in 20 primary samples. (note that PFAS NEMP recommends 1 in 10 for PFAS investigations)	QA/QC register (within field book)	No	No QC samples included in this laboratory batch. QC samples are included in report ES2002626.
		Secondary (inter-laboratory) duplicates - ≥ 1 in 20 primary samples. (note that PFAS NEMP recommends 1 in 10 for PFAS investigations)	QA/QC register (within field book)	No	
		Rinsate Blanks - ≥ 1 per day, per matrix per equipment.	QA/QC register (within field book)	Yes	QC300
		Trip Blanks - ≥ 1 per esky containing samples for volatiles.	QA/QC register (within field book)	No	No trip blanks were collected during this investigation.
	Laboratory QC analysis frequency in accordance with NEPC 2013	Laboratory Duplicates - at least 1 in 10 analyses or 1 per process batch.	Laboratory Reports	No	Expected laboratory frequency was not met.
		Method Blanks - at least 1 per process batch.	Laboratory Reports	Yes	
		Surrogate Recoveries - all samples spiked where appropriate (e.g. chromatographic analysis of organics).	Laboratory Reports	Yes	
		Laboratory Control Samples - at least 1 per process batch.	Laboratory Reports	Yes	
		Matrix Spikes - at least 1 per matrix type per process batch.	Laboratory Reports	No	Expected laboratory frequency was not met.
Sample Preservation, Handling and Holding Times	Samples appropriately preserved upon collection, stored and transported, and analysed within holding times	In accordance with laboratory specific method requirements. Unless specific method indicates otherwise, soil and water samples should be stored, transported and received by the laboratory at < 6°C.	Laboratory Reports	No	Samples received at temperatures exceeding 6 °C. Holding time outlier exists for Major Cations.
Data Management	No errors in data transcription	Entry of field data verified by peer.	10% check of electronically imported data (e.g. ESDAT). 100% check of manually entered data (e.g. field parameters, gauging data).	Yes	
Data Useability	Limits of reporting less than investigation levels	Limits of reporting less than relevant investigation levels.	Results Tables	Yes	

Data Validation Checklist

senversa

Job Number:	17776
Report Title:	Preliminary Site Investigation
Client:	DITCRD
Completed By:	Lucinda Trickey
Date:	
Verified By:	
Date:	

SAMPLE DELIVERY GROUP (SDG):	**ES2002622**	**SAMPLE DELIVERY GROUP (SDG):**	**ES2002626**	**SAMPLE DELIVERY GROUP (SDG):**	**ES2002803**	**SAMPLE DELIVERY GROUP (SDG):**	**ES2002806**
Laboratory:	ALS Environmental	**Laboratory:**	ALS Environmental	**Laboratory:**	ALS Environmental	**Laboratory:**	ALS Environmental
Sample Dates:	15-Jan-20	**Sample Dates:**	14 - 17 January 2020	**Sample Dates:**	18 - 23 January 2020	**Sample Dates:**	21 - 23 January 2020
Sample Media:	Water	**Sample Media:**	Water	**Sample Media:**	Soil and Water	**Sample Media:**	Soil

Quality Assurance Process	**Objectives & Measure**	**Acceptance Criteria**	**Source of Information**	**Acceptance Criteria Met?**	**Notes/Details of Nonconformance**	**Acceptance Criteria Met?**	**Notes/Details of Nonconformance**	**Acceptance Criteria Met?**	**Notes/Details of Nonconformance**	**Acceptance Criteria Met?**	**Notes/Details of Nonconformance**
Standard Procedures	Standard field sampling procedures and forms used	No deviation from standard procedure and forms used.	Borelogs, field sheets, COCs, data tables	Yes		Yes		Yes		Yes	
Equipment Calibration	All equipment calibrated in accordance with manufacturers specifications	All equipment calibrated in accordance with manufacturers specifications.	Calibration Certificates / Records	Yes		Yes		Yes		Yes	
Testing Method Accreditation	NATA accredited methods used for all analyses determined	Primary and secondary laboratories to use NATA accredited methods for all analytes determined.	Laboratory Report	Yes		Yes		Yes		Yes	
Quality Control Sampling Frequency	Field QC sampling frequency in accordance with AS4482.1-2005	Field (Intra-laboratory) Duplicates - ≥ 1 in 20 primary samples. (note that PFAS NEMP recommends 1 in 10 for PFAS investigations)	QA/QC register (within field book)	No	No QC samples included in this laboratory batch. QC samples are included in report ES2002626.	Yes		No	No QC samples included in this laboratory batch. QC samples are included in report ES2002626.	No	No QC samples included in this laboratory batch. QC samples are included in report ES2002626.
		Secondary (inter-laboratory) duplicates - ≥ 1 in 20 primary samples. (note that PFAS NEMP recommends 1 in 10 for PFAS investigations)	QA/QC register (within field book)	No		Yes		No		No	
		Rinsate Blanks - ≥ 1 per day, per matrix per equipment.	QA/QC register (within field book)	No	No QC samples included in this laboratory batch. QC samples are included in report ES2002626.	Yes	QC301	Yes	QC302 - QC305	No	No QC samples included in this laboratory batch. QC samples are included in report ES2002626.
		Trip Blanks - ≥ 1 per esky containing samples for volatiles.	QA/QC register (within field book)	No	No trip blanks were collected during this investigation.	No	No trip blanks were collected during this investigation.	No	No trip blanks were collected during this investigation.	No	No trip blanks were collected during this investigation.
	Laboratory QC analysis frequency in accordance with NEPC 2013	Laboratory Duplicates - at least 1 in 10 analyses or 1 per process batch.	Laboratory Reports	No	Expected laboratory frequency was not met.	No	Expected laboratory frequency was not met.	No	Expected laboratory frequency was not met.	Yes	
		Method Blanks - at least 1 per process batch.	Laboratory Reports	Yes		Yes		Yes		Yes	
		Surrogate Recoveries - all samples spiked where appropriate (e.g. chromatographic analysis of organics).	Laboratory Reports	Yes		Yes		Yes		Yes	
		Laboratory Control Samples - at least 1 per process batch.	Laboratory Reports	Yes		Yes		Yes		Yes	
		Matrix Spikes - at least 1 per matrix type per process batch.	Laboratory Reports	No	Expected laboratory frequency was not met.	No	Expected laboratory frequency was not met.	No	Expected laboratory frequency was not met.	Yes	
Sample Preservation, Handling and Holding Times	Samples appropriately preserved upon collection, stored and transported, and analysed within holding times	In accordance with laboratory specific method requirements. Unless specific method indicates otherwise, soil and water samples should be stored, transported and received by the laboratory at < 6°C.	Laboratory Reports	No	Samples received at temperatures exceeding 6 °C. Holding time outlier exists for Major Cations.	No	Samples received at temperatures exceeding 6 °C. Holding time outlier exists for Major Cations.	No	Samples received at temperatures exceeding 6 °C.	No	Samples received at temperatures exceeding 6 °C.
Data Management	No errors in data transcription	Entry of field data verified by peer.	10% check of electronically imported data (e.g. ESDAT). 100% check of manually entered data (e.g. field parameters, gauging data).	Yes		Yes		Yes		Yes	
Data Useability	Limits of reporting less than investigation levels	Limits of reporting less than relevant investigation levels.	Results Tables	Yes		Yes		Yes		Yes	

Data Validation Checklist

Job Number:	17776
Report Title:	Preliminary Site Investigation
Client:	DITCRD
Completed By:	Lucinda Trickey
Date:	
Verified By:	
Date:	

SAMPLE DELIVERY GROUP (SDG):	**ES2002808**	**SAMPLE DELIVERY GROUP (SDG):**	**ES2002810**	**SAMPLE DELIVERY GROUP (SDG):**	**ES2002812**	**SAMPLE DELIVERY GROUP (SDG):**	**ES2002813**
Laboratory:	ALS Environmental	**Laboratory:**	ALS Environmental	**Laboratory:**	ALS Environmental	**Laboratory:**	ALS Environmental
Sample Dates:	18 - 21 Jan 2020	**Sample Dates:**	20-Jan-20	**Sample Dates:**	20-Jan-20	**Sample Dates:**	23-Jan-20
Sample Media:	Soil and Water	**Sample Media:**	Soil	**Sample Media:**	Soil	**Sample Media:**	Water

Quality Assurance Process	**Objectives & Measure**	**Acceptance Criteria**	**Source of Information**	**Acceptance Criteria Met?**	**Notes/Details of Nonconformance**	**Acceptance Criteria Met?**	**Notes/Details of Nonconformance**	**Acceptance Criteria Met?**		**Acceptance Criteria Met?**	**Notes/Details of Nonconformance**
Standard Procedures	Standard field sampling procedures and forms used	No deviation from standard procedure and forms used.	Borelogs, field sheets, COCs, data tables	Yes		Yes		Yes		Yes	
Equipment Calibration	All equipment calibrated in accordance with manufacturers specifications	All equipment calibrated in accordance with manufacturers specifications.	Calibration Certificates / Records	Yes		Yes		Yes		Yes	
Testing Method Accreditation	NATA accredited methods used for all analyses determined	Primary and secondary laboratories to use NATA accredited methods for all analytes determined.	Laboratory Report	Yes		Yes		Yes		Yes	
Quality Control Sampling Frequency	Field QC sampling frequency in accordance with AS4482.1-2005	Field (Intra-laboratory) Duplicates - ≥ 1 in 20 primary samples. (note that PFAS NEMP recommends 1 in 10 for PFAS investigations)	QA/QC register (within field book)	No	No QC samples included in this laboratory batch. QC samples are included in report ES2002626.	No	No QC samples included in this laboratory batch. QC samples are included in report ES2002626.	No	No QC samples included in this laboratory batch. QC samples are included in report ES2002626.	No	No QC samples included in this laboratory batch. QC samples are included in report ES2002626.
		Secondary (inter-laboratory) duplicates - ≥ 1 in 20 primary samples. (note that PFAS NEMP recommends 1 in 10 for PFAS investigations)	QA/QC register (within field book)	No		No		No		No	
		Rinsate Blanks - ≥ 1 per day, per matrix per equipment.	QA/QC register (within field book)	No	No QC samples included in this laboratory batch. QC samples are included in report ES2002626.	No	No QC samples included in this laboratory batch. QC samples are included in report ES2002626.	No	No QC samples included in this laboratory batch. QC samples are included in report ES2002626.	No	No QC samples included in this laboratory batch. QC samples are included in report ES2002626.
		Trip Blanks - ≥ 1 per esky containing samples for volatiles.	QA/QC register (within field book)	No	No trip blanks were collected during this investigation.	No	No trip blanks were collected during this investigation.	No	No trip blanks were collected during this investigation.	No	No trip blanks were collected during this investigation.
	Laboratory QC analysis frequency in accordance with NEPC 2013	Laboratory Duplicates - at least 1 in 10 analyses or 1 per process batch.	Laboratory Reports	No	Expected laboratory frequency was not met.	No	Expected laboratory frequency was not met.	Yes		No	Expected laboratory frequency was not met.
		Method Blanks - at least 1 per process batch.	Laboratory Reports	Yes		Yes		Yes		Yes	
		Surrogate Recoveries - all samples spiked where appropriate (e.g. chromatographic analysis of organics).	Laboratory Reports	Yes		Yes		Yes		Yes	
		Laboratory Control Samples - at least 1 per process batch.	Laboratory Reports	Yes		Yes		Yes		Yes	
		Matrix Spikes - at least 1 per matrix type per process batch.	Laboratory Reports	No	Expected laboratory frequency was not met.	No	Expected laboratory frequency was not met.	Yes		No	Expected laboratory frequency was not met.
Sample Preservation, Handling and Holding Times	Samples appropriately preserved upon collection, stored and transported, and analysed within holding times	In accordance with laboratory specific method requirements. Unless specific method indicates otherwise, soil and water samples should be stored, transported and received by the laboratory at < 6°C.	Laboratory Reports	No	Samples received at temperatures exceeding 6 °C.	No	Samples received at temperatures exceeding 6 °C.	No	Samples received at temperatures exceeding 6 °C.	No	Samples received at temperatures exceeding 6 °C.
Data Management	No errors in data transcription	Entry of field data verified by peer.	10% check of electronically imported data (e.g. ESDAT). 100% check of manually entered data (e.g. field parameters, gauging data).	Yes		Yes		Yes		Yes	
Data Useability	Limits of reporting less than investigation levels	Limits of reporting less than relevant investigation levels.	Results Tables	Yes		Yes		Yes		Yes	

Data Validation Checklist

Job Number:	17776
Report Title:	Preliminary Site Investigation
Client:	DITCRD
Completed By:	Lucinda Trickey
Date:	
Verified By:	
Date:	

SAMPLE DELIVERY GROUP (SDG):	**ES2002814**	**SAMPLE DELIVERY GROUP (SDG):**	**ES2002817**	**SAMPLE DELIVERY GROUP (SDG):**	**ES2002819**	**SAMPLE DELIVERY GROUP (SDG):**	**ES2002821**
Laboratory:	ALS Environmental	**Laboratory:**	ALS Environmental	**Laboratory:**	ALS Environmental	**Laboratory:**	ALS Environmental
Sample Dates:	23-Jan-20	**Sample Dates:**	20-Jan-20	**Sample Dates:**	21-Jan-20	**Sample Dates:**	17-Jan-20
Sample Media:	Water	**Sample Media:**	Water	**Sample Media:**	Water	**Sample Media:**	Water

Quality Assurance Process	**Objectives & Measure**	**Acceptance Criteria**	**Source of Information**	**Acceptance Criteria Met?**	**Notes/Details of Nonconformance**	**Acceptance Criteria Met?**	**Notes/Details of Nonconformance**	**Acceptance Criteria Met?**	**Notes/Details of Nonconformance**	**Acceptance Criteria Met?**	**Notes/Details of Nonconformance**
Standard Procedures	Standard field sampling procedures and forms used	No deviation from standard procedure and forms used.	Borelogs, field sheets, COCs, data tables	Yes		Yes		Yes		Yes	
Equipment Calibration	All equipment calibrated in accordance with manufacturers specifications	All equipment calibrated in accordance with manufacturers specifications.	Calibration Certificates / Records	Yes		Yes		Yes		Yes	
Testing Method Accreditation	NATA accredited methods used for all analyses determined	Primary and secondary laboratories to use NATA accredited methods for all analytes determined.	Laboratory Report	Yes		Yes		Yes		Yes	
Quality Control Sampling Frequency	Field QC sampling frequency in accordance with AS4482.1-2005	Field (Intra-laboratory) Duplicates - ≥ 1 in 20 primary samples. (note that PFAS NEMP recommends 1 in 10 for PFAS investigations)	QA/QC register (within field book)	No	No QC samples included in this laboratory batch. QC samples are included in report ES2002626.	No	No QC samples included in this laboratory batch. QC samples are included in report ES2002626.	No	No QC samples included in this laboratory batch. QC samples are included in report ES2002626.	Yes	
		Secondary (inter-laboratory) duplicates - ≥ 1 in 20 primary samples. (note that PFAS NEMP recommends 1 in 10 for PFAS investigations)	QA/QC register (within field book)	No		No		No		Yes	
		Rinsate Blanks - ≥ 1 per day, per matrix per equipment.	QA/QC register (within field book)	No	No QC samples included in this laboratory batch. QC samples are included in report ES2002626.	No	No QC samples included in this laboratory batch. QC samples are included in report ES2002626.	No	No QC samples included in this laboratory batch. QC samples are included in report ES2002626.	Yes	
		Trip Blanks - ≥ 1 per esky containing samples for volatiles.	QA/QC register (within field book)	No	No trip blanks were collected during this investigation.	No	No trip blanks were collected during this investigation.	No	No trip blanks were collected during this investigation.	No	No trip blanks were collected during this investigation.
	Laboratory QC analysis frequency in accordance with NEPC 2013	Laboratory Duplicates - at least 1 in 10 analyses or 1 per process batch.	Laboratory Reports	No	Expected laboratory frequency was not met.	No	Expected laboratory frequency was not met.	No	Expected laboratory frequency was not met.	No	Expected laboratory frequency was not met.
		Method Blanks - at least 1 per process batch.	Laboratory Reports	Yes		Yes		Yes		Yes	
		Surrogate Recoveries - all samples spiked where appropriate (e.g. chromatographic analysis of organics).	Laboratory Reports	Yes		Yes		Yes		Yes	
		Laboratory Control Samples - at least 1 per process batch.	Laboratory Reports	Yes		Yes		Yes		Yes	
		Matrix Spikes - at least 1 per matrix type per process batch.	Laboratory Reports	No	Expected laboratory frequency was not met.	No	Expected laboratory frequency was not met.	No	Expected laboratory frequency was not met.	No	Expected laboratory frequency was not met.
Sample Preservation, Handling and Holding Times	Samples appropriately preserved upon collection, stored and transported, and analysed within holding times	In accordance with laboratory specific method requirements. Unless specific method indicates otherwise, soil and water samples should be stored, transported and received by the laboratory at < 6°C.	Laboratory Reports	No	Samples received at temperatures exceeding 6 °C.	No	Samples received at temperatures exceeding 6 °C.	No	Samples received at temperatures exceeding 6 °C.	No	Samples received at temperatures exceeding 6 °C. Holding time outlier exists for Major Cations.
Data Management	No errors in data transcription	Entry of field data verified by peer.	10% check of electronically imported data (e.g. ESDAT). 100% check of manually entered data (e.g. field parameters, gauging data).	Yes		Yes		Yes		Yes	
Data Useability	Limits of reporting less than investigation levels	Limits of reporting less than relevant investigation levels.	Results Tables	Yes		Yes		Yes		Yes	

Data Validation Checklist

Job Number:	17776
Report Title:	Preliminary Site Investigation
Client:	DITCRD
Completed By:	Lucinda Trickey
Date:	
Verified By:	
Date:	

SAMPLE DELIVERY GROUP (SDG):	**ES2002822**	**SAMPLE DELIVERY GROUP (SDG):**	**ES2002824**	**SAMPLE DELIVERY GROUP (SDG):**	**ES2002826**	**SAMPLE DELIVERY GROUP (SDG):**	**ES2002827**
Laboratory:	ALS Environmental	**Laboratory:**	ALS Environmental	**Laboratory:**	ALS Environmental	**Laboratory:**	ALS Environmental
Sample Dates:	18-Jan-20	**Sample Dates:**	20-Jan-20	**Sample Dates:**	20-Jan-20	**Sample Dates:**	20-Jan-20
Sample Media:	Water	**Sample Media:**	Soil	**Sample Media:**	Water	**Sample Media:**	Soil

Quality Assurance Process	Objectives & Measure	Acceptance Criteria	Source of Information	Acceptance Criteria Met?	Notes/Details of Nonconformance	Acceptance Criteria Met?	Notes/Details of Nonconformance	Acceptance Criteria Met?	Notes/Details of Nonconformance	Acceptance Criteria Met?	Notes/Details of Nonconformance
Standard Procedures	Standard field sampling procedures and forms used	No deviation from standard procedure and forms used.	Borelogs, field sheets, COCs, data tables	Yes		Yes		Yes		Yes	
Equipment Calibration	All equipment calibrated in accordance with manufacturers specifications	All equipment calibrated in accordance with manufacturers specifications.	Calibration Certificates / Records	Yes		Yes		Yes		Yes	
Testing Method Accreditation	NATA accredited methods used for all analyses determined	Primary and secondary laboratories to use NATA accredited methods for all analytes determined.	Laboratory Report	Yes		Yes		Yes		Yes	
Quality Control Sampling Frequency	Field QC sampling frequency in accordance with AS4482.1-2005	Field (Intra-laboratory) Duplicates - ≥ 1 in 20 primary samples. (note that PFAS NEMP recommends 1 in 10 for PFAS investigations)	QA/QC register (within field book)	Yes		No	No QC samples included in this laboratory batch. QC samples are included in report ES2002626.	No	No QC samples included in this laboratory batch. QC samples are included in report ES2002626.	No	No QC samples included in this laboratory batch. QC samples are included in report ES2002626.
		Secondary (inter-laboratory) duplicates - ≥ 1 in 20 primary samples. (note that PFAS NEMP recommends 1 in 10 for PFAS investigations)	QA/QC register (within field book)	Yes		No		No		No	
		Rinsate Blanks - ≥ 1 per day, per matrix per equipment.	QA/QC register (within field book)	Yes		No	No QC samples included in this laboratory batch. QC samples are included in report ES2002626.	No	No QC samples included in this laboratory batch. QC samples are included in report ES2002626.	No	No QC samples included in this laboratory batch. QC samples are included in report ES2002626.
		Trip Blanks - ≥ 1 per esky containing samples for volatiles.	QA/QC register (within field book)	No	No trip blanks were collected during this investigation.	No	No trip blanks were collected during this investigation.	No	No trip blanks were collected during this investigation.	No	No trip blanks were collected during this investigation.
	Laboratory QC analysis frequency in accordance with NEPC 2013	Laboratory Duplicates - at least 1 in 10 analyses or 1 per process batch.	Laboratory Reports	No	Expected laboratory frequency was not met.	Yes		Yes		Yes	
		Method Blanks - at least 1 per process batch.	Laboratory Reports	Yes		Yes		Yes		Yes	
		Surrogate Recoveries - all samples spiked where appropriate (e.g. chromatographic analysis of organics).	Laboratory Reports	Yes		Yes		Yes		Yes	
		Laboratory Control Samples - at least 1 per process batch.	Laboratory Reports	Yes		Yes		Yes		Yes	
		Matrix Spikes - at least 1 per matrix type per process batch.	Laboratory Reports	No	Expected laboratory frequency was not met.	Yes		Yes		Yes	
Sample Preservation, Handling and Holding Times	Samples appropriately preserved upon collection, stored and transported, and analysed within holding times	In accordance with laboratory specific method requirements. Unless specific method indicates otherwise, soil and water samples should be stored, transported and received by the laboratory at < 6°C.	Laboratory Reports	No	Samples received at temperatures exceeding 6 °C. Holding time outlier exists for Major Cations.	No	Samples received at temperatures exceeding 6 °C.	No	Samples received at temperatures exceeding 6 °C.	No	Samples received at temperatures exceeding 6 °C.
Data Management	No errors in data transcription	Entry of field data verified by peer.	10% check of electronically imported data (e.g. ESDAT). 100% check of manually entered data (e.g. field parameters, gauging data).	Yes		Yes		Yes		Yes	
Data Useability	Limits of reporting less than investigation levels	Limits of reporting less than relevant investigation levels.	Results Tables	Yes		Yes		Yes		Yes	

Data Validation Checklist

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Job Number:	17776
Report Title:	Preliminary Site Investigation
Client:	DITCRD
Completed By:	Lucinda Trickey
Date:	
Verified By:	
Date:	

SAMPLE DELIVERY GROUP (SDG):	**ES2002829**	**SAMPLE DELIVERY GROUP (SDG):**	**ES2002830**	**SAMPLE DELIVERY GROUP (SDG):**	**ES2002831**	**SAMPLE DELIVERY GROUP (SDG):**	**ES2002833**
Laboratory:	ALS Environmental	**Laboratory:**	ALS Environmental	**Laboratory:**	ALS Environmental	**Laboratory:**	ALS Environmental
Sample Dates:	21-Jan-20	**Sample Dates:**	21-Jan-20	**Sample Dates:**	22-Jan-20	**Sample Dates:**	24-Jan-20
Sample Media:	Soil	**Sample Media:**	Soil	**Sample Media:**	Water	**Sample Media:**	Ansulite

Quality Assurance Process	**Objectives & Measure**	**Acceptance Criteria**	**Source of Information**	**Acceptance Criteria Met?**	**Notes/Details of Nonconformance**	**Acceptance Criteria Met?**	**Notes/Details of Nonconformance**	**Acceptance Criteria Met?**	**Notes/Details of Nonconformance**	**Acceptance Criteria Met?**	**Notes/Details of Nonconformance**
Standard Procedures	Standard field sampling procedures and forms used	No deviation from standard procedure and forms used.	Borelogs, field sheets, COCs, data tables	Yes		Yes		Yes		Yes	
Equipment Calibration	All equipment calibrated in accordance with manufacturers specifications	All equipment calibrated in accordance with manufacturers specifications.	Calibration Certificates / Records	Yes		Yes		Yes		Yes	
Testing Method Accreditation	NATA accredited methods used for all analyses determined	Primary and secondary laboratories to use NATA accredited methods for all analytes determined.	Laboratory Report	Yes		Yes		Yes		Yes	
Quality Control Sampling Frequency	Field QC sampling frequency in accordance with AS4482.1-2005	Field (Intra-laboratory) Duplicates - ≥ 1 in 20 primary samples. (note that PFAS NEMP recommends 1 in 10 for PFAS investigations)	QA/QC register (within field book)	No	No QC samples included in this laboratory batch. QC samples are included in report ES2002626.	No	No QC samples included in this laboratory batch. QC samples are included in report ES2002626.	No	No QC samples included in this laboratory batch. QC samples are included in report ES2002626.	No	No QC samples included in this laboratory batch. QC samples are included in report ES2002626.
		Secondary (inter-laboratory) duplicates - ≥ 1 in 20 primary samples. (note that PFAS NEMP recommends 1 in 10 for PFAS investigations)	QA/QC register (within field book)	No		No		No		No	
		Rinsate Blanks - ≥ 1 per day, per matrix per equipment.	QA/QC register (within field book)	No	No QC samples included in this laboratory batch. QC samples are included in report ES2002626.	No	No QC samples included in this laboratory batch. QC samples are included in report ES2002626.	No	No QC samples included in this laboratory batch. QC samples are included in report ES2002626.	No	No QC samples included in this laboratory batch. QC samples are included in report ES2002626.
		Trip Blanks - ≥ 1 per esky containing samples for volatiles.	QA/QC register (within field book)	No	No trip blanks were collected during this investigation.	No	No trip blanks were collected during this investigation.	No	No trip blanks were collected during this investigation.	No	No trip blanks were collected during this investigation.
	Laboratory QC analysis frequency in accordance with NEPC 2013	Laboratory Duplicates - at least 1 in 10 analyses or 1 per process batch.	Laboratory Reports	Yes		Yes		Yes		Yes	
		Method Blanks - at least 1 per process batch.	Laboratory Reports	Yes		Yes		Yes		Yes	
		Surrogate Recoveries - all samples spiked where appropriate (e.g. chromatographic analysis of organics).	Laboratory Reports	Yes		Yes		Yes		Yes	
		Laboratory Control Samples - at least 1 per process batch.	Laboratory Reports	Yes		Yes		Yes		Yes	
		Matrix Spikes - at least 1 per matrix type per process batch.	Laboratory Reports	Yes		Yes		Yes		Yes	
Sample Preservation, Handling and Holding Times	Samples appropriately preserved upon collection, stored and transported, and analysed within holding times	In accordance with laboratory specific method requirements. Unless specific method indicates otherwise, soil and water samples should be stored, transported and received by the laboratory at < 6°C.	Laboratory Reports	No	Samples received at temperatures exceeding 6 °C.	No	Samples received at temperatures exceeding 6 °C.	No	Samples received at temperatures exceeding 6 °C. Holding time outlier exists for Major Cations.	No	Samples received at temperatures exceeding 6 °C. Holding time outlier exists for Major Cations.
Data Management	No errors in data transcription	Entry of field data verified by peer.	10% check of electronically imported data (e.g. ESDAT). 100% check of manually entered data (e.g. field parameters, gauging data).	Yes		Yes		Yes		Yes	
Data Useability	Limits of reporting less than investigation levels	Limits of reporting less than relevant investigation levels.	Results Tables	Yes		Yes		Yes		Yes	

Data Validation Checklist

Job Number:	17776
Report Title:	Preliminary Site Investigation
Client:	DITCRD
Completed By:	Lucinda Trickey
Date:	
Verified By:	
Date:	

SAMPLE DELIVERY GROUP (SDG):	**699263**	**SAMPLE DELIVERY GROUP (SDG):**	**699266**	**SAMPLE DELIVERY GROUP (SDG):**	**699303**	**SAMPLE DELIVERY GROUP (SDG):**	**EM2002483**
Laboratory:	Eurofins	**Laboratory:**	Eurofins	**Laboratory:**	Eurofins	**Laboratory:**	ALS Environmental
Sample Dates:	16-Jan-20	**Sample Dates:**	14-Jan-20	**Sample Dates:**	18 - 23 Jan 2020	**Sample Dates:**	13-Feb-20
Sample Media:	Water	**Sample Media:**	Water	**Sample Media:**	Soil and Water	**Sample Media:**	Water

				Secondary Laboratory		Secondary Laboratory		Secondary Laboratory			
Quality Assurance Process	**Objectives & Measure**	**Acceptance Criteria**	**Source of Information**	**Acceptance Criteria Met?**	**Notes/Details of Nonconformance**	**Acceptance Criteria Met?**	**Notes/Details of Nonconformance**	**Acceptance Criteria Met?**	**Notes/Details of Nonconformance**	**Acceptance Criteria Met?**	**Notes/Details of Nonconformance**
Standard Procedures	Standard field sampling procedures and forms used	No deviation from standard procedure and forms used.	Borelogs, field sheets, COCs, data tables	Yes		Yes		Yes		Yes	
Equipment Calibration	All equipment calibrated in accordance with manufacturers specifications	All equipment calibrated in accordance with manufacturers specifications.	Calibration Certificates / Records	Yes		Yes		Yes		Yes	
Testing Method Accreditation	NATA accredited methods used for all analyses determined	Primary and secondary laboratories to use NATA accredited methods for all analytes determined.	Laboratory Report	Yes		Yes		Yes		Yes	
Quality Control Sampling Frequency	Field QC sampling frequency in accordance with AS4482.1-2005	Field (Intra-laboratory) Duplicates - ≥ 1 in 20 primary samples. (note that PFAS NEMP recommends 1 in 10 for PFAS investigations)	QA/QC register (within field book)	N/A		N/A		N/A		Yes	
		Secondary (inter-laboratory) duplicates - ≥ 1 in 20 primary samples. (note that PFAS NEMP recommends 1 in 10 for PFAS investigations)	QA/QC register (within field book)	Yes		Yes		Yes		Yes	
		Rinsate Blanks - ≥ 1 per day, per matrix per equipment.	QA/QC register (within field book)	No	Field blanks analysed in primary laboratory	No	Field blanks analysed in primary laboratory	No	Field blanks analysed in primary laboratory	No	Field blanks analysed in primary laboratory
		Trip Blanks - ≥ 1 per esky containing samples for volatiles.	QA/QC register (within field book)	No	No trip blanks were collected during this investigation.	No	No trip blanks were collected during this investigation.	No	No trip blanks were collected during this investigation.	No	No trip blanks were collected during this investigation.
	Laboratory QC analysis frequency in accordance with NEPC 2013	Laboratory Duplicates - at least 1 in 10 analyses or 1 per process batch.	Laboratory Reports	Yes		Yes		Yes		Yes	
		Method Blanks - at least 1 per process batch.	Laboratory Reports	Yes		Yes		Yes		Yes	
		Surrogate Recoveries - all samples spiked where appropriate (e.g. chromatographic analysis of organics).	Laboratory Reports	Yes		Yes		Yes		Yes	
		Laboratory Control Samples - at least 1 per process batch.	Laboratory Reports	Yes		Yes		Yes		Yes	
		Matrix Spikes - at least 1 per matrix type per process batch.	Laboratory Reports	Yes		Yes		Yes		Yes	
Sample Preservation, Handling and Holding Times	Samples appropriately preserved upon collection, stored and transported, and analysed within holding times	In accordance with laboratory specific method requirements. Unless specific method indicates otherwise, soil and water samples should be stored, transported and received by the laboratory at < 6°C.	Laboratory Reports	No	Samples received at temperatures exceeding 6 °C.	No	Samples received at temperatures exceeding 6 °C.	No	Samples received at temperatures exceeding 6 °C.	Yes	
Data Management	No errors in data transcription	Entry of field data verified by peer.	10% check of electronically imported data (e.g. ESDAT). 100% check of manually entered data (e.g. field parameters, gauging data).	Yes		Yes		Yes		Yes	
Data Useability	Limits of reporting less than investigation levels	Limits of reporting less than relevant investigation levels.	Results Tables	Yes		Yes		Yes		Yes	

Data Validation Checklist

Job Number:	17776
Report Title:	Preliminary Site Investigation
Client:	DITCRD
Completed By:	Lucinda Trickey
Date:	
Verified By:	
Date:	

SAMPLE DELIVERY GROUP (SDG):	**702421 - W**	**SAMPLE DELIVERY GROUP (SDG):**	**ES2005692**	**SAMPLE DELIVERY GROUP (SDG):**	
Laboratory:	Eurofins	**Laboratory:**	ALS Environmental	**Laboratory:**	Eurofins
Sample Dates:	13-Feb-20	**Sample Dates:**	19 - 23 January 2020	**Sample Dates:**	20 - 22 January 020
Sample Media:	Water	**Sample Media:**	Soil	**Sample Media:**	Soil

						Primary Leach Analysis		Secondary Leach Analysis	
Quality Assurance Process	**Objectives & Measure**	**Acceptance Criteria**	**Source of Information**	**Acceptance Criteria Met?**	**Notes/Details of Nonconformance**	**Acceptance Criteria Met?**	**Notes/Details of Nonconformance**	**Acceptance Criteria Met?**	**Notes/Details of Nonconformance**
Standard Procedures	Standard field sampling procedures and forms used	No deviation from standard procedure and forms used.	Borelogs, field sheets, COCs, data tables	Yes		Yes		Yes	
Equipment Calibration	All equipment calibrated in accordance with manufacturers specifications	All equipment calibrated in accordance with manufacturers specifications.	Calibration Certificates / Records	Yes		Yes		Yes	
Testing Method Accreditation	NATA accredited methods used for all analyses determined	Primary and secondary laboratories to use NATA accredited methods for all analytes determined.	Laboratory Report	Yes		Yes		Yes	
Quality Control Sampling Frequency	Field QC sampling frequency in accordance with AS4482.1-2005	Field (Intra-laboratory) Duplicates - ≥ 1 in 20 primary samples. (note that PFAS NEMP recommends 1 in 10 for PFAS investigations)	QA/QC register (within field book)	Yes		Yes		Yes	
		Secondary (inter-laboratory) duplicates - ≥ 1 in 20 primary samples. (note that PFAS NEMP recommends 1 in 10 for PFAS investigations)	QA/QC register (within field book)	Yes		Yes		Yes	
		Rinsate Blanks - ≥ 1 per day, per matrix per equipment.	QA/QC register (within field book)	No	Field blanks analysed in primary laboratory	No	Field blanks analysed in primary laboratory	No	Field blanks analysed in primary laboratory
		Trip Blanks - ≥ 1 per esky containing samples for volatiles.	QA/QC register (within field book)	No	No trip blanks were collected during this investigation.	No	No trip blanks were collected during this investigation.	No	No trip blanks were collected during this investigation.
	Laboratory QC analysis frequency in accordance with NEPC 2013	Laboratory Duplicates - at least 1 in 10 analyses or 1 per process batch.	Laboratory Reports	Yes		Yes		Yes	
		Method Blanks - at least 1 per process batch.	Laboratory Reports	Yes		Yes		Yes	
		Surrogate Recoveries - all samples spiked where appropriate (e.g. chromatographic analysis of organics).	Laboratory Reports	Yes		Yes		Yes	
		Laboratory Control Samples - at least 1 per process batch.	Laboratory Reports	Yes		Yes		Yes	
		Matrix Spikes - at least 1 per matrix type per process batch.	Laboratory Reports	Yes		Yes		Yes	
Sample Preservation, Handling and Holding Times	Samples appropriately preserved upon collection, stored and transported, and analysed within holding times	In accordance with laboratory specific method requirements. Unless specific method indicates otherwise, soil and water samples should be stored, transported and received by the laboratory at < 6°C.	Laboratory Reports	Yes		Yes		Yes	
Data Management	No errors in data transcription	Entry of field data verified by peer.	10% check of electronically imported data (e.g. ESDAT). 100% check of manually entered data (e.g. field parameters, gauging data).	Yes		Yes		Yes	
Data Useability	Limits of reporting less than investigation levels	Limits of reporting less than relevant investigation levels.	Results Tables	Yes		Yes		Yes	

Data Validation Checklist

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Job Number:	17776
Report Title:	Preliminary Site Investigation
Client:	DITCRD
Completed By:	Lucinda Trickey
Date:	
Verified By:	
Date:	

SAMPLE DELIVERY GROUP (SDG):	**ES2002609**	**SAMPLE DELIVERY GROUP (SDG):**	**ES2002612**	**SAMPLE DELIVERY GROUP (SDG):**	**ES2002614**	**SAMPLE DELIVERY GROUP (SDG):**	**ES2002615**
Laboratory:	ALS Environmental	**Laboratory:**	ALS Environmental	**Laboratory:**	ALS Environmental	**Laboratory:**	ALS Environmental
Sample Dates:	16 Januaru 2020	**Sample Dates:**	16 Januaru 2020	**Sample Dates:**	16 Januaru 2020	**Sample Dates:**	16 Januaru 2020
Sample Media:	Water	**Sample Media:**	Water	**Sample Media:**	Water	**Sample Media:**	Water

Quality Control Process	**Objectives & Measure**	**Acceptance Criteria**	**How? (i.e. ESDAT output, review lab reports, review data**								
Field (Intra-laboratory) Duplicate Sampling and Analysis	Field Duplicate samples used assess the variability in analyte concentration between samples collected from the sample location and the reproducibility of the laboratory analysis. Where required, resubmission of previously analysed samples for chemicals within their holding times may be undertaken to further assess precision level of precision.	Analysed for same chemicals as primary sample. RPD <30% of mean conc. where both conc. >20 x LOR RPD <50% of mean conc. where both conc. 10-20 x LOR RPD No limit where both conc. < 10 x LOR	ESDAT generated summary of relative percent difference (RPD) results for field duplicate samples.	N/A		N/A		N/A		N/A	
Secondary Inter-laboratory) Duplicate Sampling and Analysis	Results are accurate and free from laboratory error. Secondary duplicate samples sent to a secondary laboratory to assess the accuracy of the analyte concentrations reported by the primary laboratory.	Analysed for same chemicals as primary sample. RPD <30% of mean conc. where both conc. >20 x LOR. RPD <50% of mean conc. where both conc. 10-20 x LOR. RPD no limit where both conc. < 10 x LOR.	ESDAT generated summary of relative percent difference (RPD) results for field duplicate samples.	N/A		N/A		N/A		N/A	
Field Rinsate Blank Preparation & Analysis	Cross contamination of samples does not occur between sampling locations due to carry-over from sampling equipment.	Analyte concentrations below LORs.	ESDAT generated summary of field blank analytical results.	N/A		N/A		N/A		N/A	
Trip Blank Sampling and Analysis	Cross contamination between samples does not occur in transit or as an artefact of the sampling handling procedure.	Analyte concentrations below LORs.	ESDAT generated summary of field blank analytical results.	N/A		N/A		N/A		N/A	
Laboratory Duplicates	Laboratory duplicates are used to test the precision of the laboratory measurements.	As specified by laboratory.	Laboratory reports	Yes		Yes		Yes		Yes	
Laboratory Control Samples	Laboratory control samples (LCS) are used to assess overall method performance. In general these samples are similar in composition to environmental samples, and contain known amounts of the analytes of interest.	Dynamic recovery limits as specified by laboratory.	Laboratory reports	Yes		Yes		Yes		Yes	
Certified Reference Material	CRM samples are used to monitor the accuracy of analyses performed by the laboratory.	As specified by laboratory (generally dynamic recovery limits). Usually not performed and assessed based on LCS results.	Laboratory reports	Yes		Yes		Yes		Yes	
Surrogate Recovery	Surrogates are organic compounds that are similar in chemical composition to analytes of interest and are spiked into environmental samples prior to sample preparation and analysis. Surrogate recoveries are used to evaluate matrix interference on a sample-specific basis.	Dynamic recovery limits as specified by laboratory.	Laboratory reports	Yes		Yes		Yes		Yes	
Matrix Spike Recovery	A matrix spike is an aliquot of a sample spiked with a known concentration of target analyte(s). Spiking occurs prior to sample preparation and analysis, and the results are used to assess the bias of a method in a given sample matrix.	Recovery 70 - 130% or dynamic limits if specified by laboratory.	Laboratory reports	Yes		Yes		Yes		Yes	
Laboratory Method Blanks	Method blanks are prepared to represent the sample matrix as closely as possible and prepared/extracted/digested and analysed exactly like field samples. These blanks are used by the laboratory to assess contamination introduced during sample preparation activities.	Analyte concentrations below LORs.	Laboratory reports	Yes		Yes		Yes		Yes	
Potentially Anomalous Data	No discrepancies between field, laboratory and/or expected results are identified	Analytical results are internally consistent, consistent with field measurements, and consistent with expected and/or historical results based on CSM	Multiple sources								

Data Validation Checklist

Job Number:	17776
Report Title:	Preliminary Site Investigation
Client:	DITCRD
Completed By:	Lucinda Trickey
Date:	
Verified By:	
Date:	

SAMPLE DELIVERY GROUP (SDG):	**ES2002616**	**SAMPLE DELIVERY GROUP (SDG):**	**ES2002617**	**SAMPLE DELIVERY GROUP (SDG):**	**ES2002618**	**SAMPLE DELIVERY GROUP (SDG):**	**ES2002619**
Laboratory:	ALS Environmental	**Laboratory:**	ALS Environmental	**Laboratory:**	ALS Environmental	**Laboratory:**	ALS Environmental
Sample Dates:	16-Jan-20	**Sample Dates:**	15-Jan-20	**Sample Dates:**	17-Jan-20	**Sample Dates:**	16-Jan-20
Sample Media:	Water	**Sample Media:**	Water	**Sample Media:**	Water	**Sample Media:**	Water

Quality Control Process	**Objectives & Measure**	**Acceptance Criteria**	**How? (i.e. ESDAT output, review lab reports, review data**	ES2002616		ES2002617		ES2002618		ES2002619	
Field (Intra-laboratory) Duplicate Sampling and Analysis	Field Duplicate samples used assess the variability in analyte concentration between samples collected from the sample location and the reproducibility of the laboratory analysis. Where required, resubmission of previously analysed samples for chemicals within their holding times may be undertaken to further assess precision level of precision.	Analysed for same chemicals as primary sample. RPD <30% of mean conc. where both conc. >20 x LOR RPD <50% of mean conc. where both conc. 10-20 x LOR RPD No limit where both conc. < 10 x LOR	ESDAT generated summary of relative percent difference (RPD) results for field duplicate samples.	N/A		N/A		N/A		N/A	
Secondary Inter-laboratory) Duplicate Sampling and Analysis	Results are accurate and free from laboratory error. Secondary duplicate samples sent to a secondary laboratory to assess the accuracy of the analyte concentrations reported by the primary laboratory.	Analysed for same chemicals as primary sample. RPD <30% of mean conc. where both conc. >20 x LOR. RPD <50% of mean conc. where both conc. 10-20 x LOR. RPD no limit where both conc. < 10 x LOR.	ESDAT generated summary of relative percent difference (RPD) results for field duplicate samples.	N/A		N/A		N/A		N/A	
Field Rinsate Blank Preparation & Analysis	Cross contamination of samples does not occur between sampling locations due to carry-over from sampling equipment.	Analyte concentrations below LORs.	ESDAT generated summary of field blank analytical results.	N/A		N/A		N/A		N/A	
Trip Blank Sampling and Analysis	Cross contamination between samples does not occur in transit or as an artefact of the sampling handling procedure.	Analyte concentrations below LORs.	ESDAT generated summary of field blank analytical results.	N/A		N/A		N/A		N/A	
Laboratory Duplicates	Laboratory duplicates are used to test the precision of the laboratory measurements.	As specified by laboratory.	Laboratory reports	Yes		Yes		Yes		Yes	
Laboratory Control Samples	Laboratory control samples (LCS) are used to assess overall method performance. In general these samples are similar in composition to environmental samples, and contain known amounts of the analytes of interest.	Dynamic recovery limits as specified by laboratory.	Laboratory reports	Yes		Yes		Yes		Yes	
Certified Reference Material	CRM samples are used to monitor the accuracy of analyses performed by the laboratory.	As specified by laboratory (generally dynamic recovery limits). Usually not performed and assessed based on LCS results.	Laboratory reports	Yes		Yes		Yes		Yes	
Surrogate Recovery	Surrogates are organic compounds that are similar in chemical composition to analytes of interest and are spiked into environmental samples prior to sample preparation and analysis. Surrogate recoveries are used to evaluate matrix interference on a sample-specific basis.	Dynamic recovery limits as specified by laboratory.	Laboratory reports	Yes		Yes		Yes		Yes	
Matrix Spike Recovery	A matrix spike is an aliquot of a sample spiked with a known concentration of target analyte(s). Spiking occurs prior to sample preparation and analysis, and the results are used to assess the bias of a method in a given sample matrix.	Recovery 70 - 130% or dynamic limits if specified by laboratory.	Laboratory reports	Yes		Yes		Yes		Yes	
Laboratory Method Blanks	Method blanks are prepared to represent the sample matrix as closely as possible and prepared/extracted/digested and analysed exactly like field samples. These blanks are used by the laboratory to assess contamination introduced during sample preparation activities.	Analyte concentrations below LORs.	Laboratory reports	Yes		Yes		Yes		Yes	
Potentially Anomalous Data	No discrepancies between field, laboratory and/or expected results are identified	Analytical results are internally consistent, consistent with field measurements, and consistent with expected and/or historical results based on CSM	Multiple sources								

Data Validation Checklist

senversa

Job Number:	17776
Report Title:	Preliminary Site Investigation
Client:	DITCRD
Completed By:	Lucinda Trickey
Date:	
Verified By:	
Date:	

SAMPLE DELIVERY GROUP (SDG):	**ES2002620**
Laboratory:	ALS Environmental
Sample Dates:	16-Jan-20
Sample Media:	Water

Quality Control Process	**Objectives & Measure**	**Acceptance Criteria**	**How? (i.e. ESDAT output, review lab reports, review data**		
Field (Intra-laboratory) Duplicate Sampling and Analysis	Field Duplicate samples used assess the variability in analyte concentration between samples collected from the sample location and the reproducibility of the laboratory analysis. Where required, resubmission of previously analysed samples for chemicals within their holding times may be undertaken to further assess precision level of precision.	Analysed for same chemicals as primary sample. RPD <30% of mean conc. where both conc. >20 x LOR RPD <50% of mean conc. where both conc. 10-20 x LOR RPD No limit where both conc. < 10 x LOR	ESDAT generated summary of relative percent difference (RPD) results for field duplicate samples.	No	High RPDs exist. Refer to attached table.
Secondary Inter-laborator) Duplicate Sampling and Analysis	Results are accurate and free from laboratory error. Secondary duplicate samples sent to a secondary laboratory to assess the accuracy of the analyte concentrations reported by the primary laboratory.	Analysed for same chemicals as primary sample. RPD <30% of mean conc. where both conc. >20 x LOR. RPD <50% of mean conc. where both conc. 10-20 x LOR. RPD no limit where both conc. < 10 x LOR.	ESDAT generated summary of relative percent difference (RPD) results for field duplicate samples.	N/A	
Field Rinsate Blank Preparation & Analysis	Cross contamination of samples does not occur between sampling locations due to carry-over from sampling equipment.	Analyte concentrations below LORs.	ESDAT generated summary of field blank analytical results.	Yes	
Trip Blank Sampling and Analysis	Cross contamination between samples does not occur in transit or as an artefact of the sampling handling procedure.	Analyte concentrations below LORs.	ESDAT generated summary of field blank analytical results.	N/A	
Laboratory Duplicates	Laboratory duplicates are used to test the precision of the laboratory measurements.	As specified by laboratory.	Laboratory reports	Yes	
Laboratory Control Samples	Laboratory control samples (LCS) are used to assess overall method performance. In general these samples are similar in composition to environmental samples, and contain known amounts of the analytes of interest.	Dynamic recovery limits as specified by laboratory.	Laboratory reports	Yes	
Certified Reference Material	CRM samples are used to monitor the accuracy of analyses performed by the laboratory.	As specified by laboratory (generally dynamic recovery limits). Usually not performed and assessed based on LCS results.	Laboratory reports	Yes	
Surrogate Recovery	Surrogates are organic compounds that are similar in chemical composition to analytes of interest and are spiked into environmental samples prior to sample preparation and analysis. Surrogate recoveries are used to evaluate matrix interference on a sample-specific basis.	Dynamic recovery limits as specified by laboratory.	Laboratory reports	Yes	
Matrix Spike Recovery	A matrix spike is an aliquot of a sample spiked with a known concentration of target analyte(s). Spiking occurs prior to sample preparation and analysis, and the results are used to assess the bias of a method in a given sample matrix.	Recovery 70 - 130% or dynamic limits if specified by laboratory.	Laboratory reports	Yes	
Laboratory Method Blanks	Method blanks are prepared to represent the sample matrix as closely as possible and prepared/extracted/digested and analysed exactly like field samples. These blanks are used by the laboratory to assess contamination introduced during sample preparation activities.	Analyte concentrations below LORs.	Laboratory reports	Yes	
Potentially Anomalous Data	No discrepancies between field, laboratory and/or expected results are identified	Analytical results are internally consistent, consistent with field measurements, and consistent with expected and/or historical results based on CSM	Multiple sources		

Data Validation Checklist

Job Number:	17776
Report Title:	Preliminary Site Investigation
Client:	DITCRD
Completed By:	Lucinda Trickey
Date:	
Verified By:	
Date:	

				SAMPLE DELIVERY GROUP (SDG):	**ES2002622**	**SAMPLE DELIVERY GROUP (SDG):**	**ES2002626**	**SAMPLE DELIVERY GROUP (SDG):**	**ES2002803**	**SAMPLE DELIVERY GROUP (SDG):**	**ES2002806**
				Laboratory:	ALS Environmental	**Laboratory:**	ALS Environmental	**Laboratory:**	ALS Environmental	**Laboratory:**	ALS Environmental
				Sample Dates:	15-Jan-20	**Sample Dates:**	14 - 17 January 2020	**Sample Dates:**	18 - 23 January 2020	**Sample Dates:**	21 - 23 January 2020
				Sample Media:	Water	**Sample Media:**	Water	**Sample Media:**	Soil and Water	**Sample Media:**	Soil
Quality Control Process	**Objectives & Measure**	**Acceptance Criteria**	**How? (i.e. ESDAT output, review lab reports, review data**								
Field (Intra-laboratory) Duplicate Sampling and Analysis	Field Duplicate samples used assess the variability in analyte concentration between samples collected from the sample location and the reproducibility of the laboratory analysis. Where required, resubmission of previously analysed samples for chemicals within their holding times may be undertaken to further assess precision level of precision.	Analysed for same chemicals as primary sample. RPD <30% of mean conc. where both conc. >20 x LOR RPD <50% of mean conc. where both conc. 10-20 x LOR RPD No limit where both conc. < 10 x LOR	ESDAT generated summary of relative percent difference (RPD) results for field duplicate samples.	N/A		No	High RPDs exist. Refer to attached table.	No	High RPDs exist. Refer to attached table.	N/A	
Secondary Inter-laboratory) Duplicate Sampling and Analysis	Results are accurate and free from laboratory error. Secondary duplicate samples sent to a secondary laboratory to assess the accuracy of the analyte concentrations reported by the primary laboratory.	Analysed for same chemicals as primary sample. RPD <30% of mean conc. where both conc. >20 x LOR. RPD <50% of mean conc. where both conc. 10-20 x LOR. RPD no limit where both conc. < 10 x LOR.	ESDAT generated summary of relative percent difference (RPD) results for field duplicate samples.	N/A		N/A		N/A		N/A	
Field Rinsate Blank Preparation & Analysis	Cross contamination of samples does not occur between sampling locations due to carry-over from sampling equipment.	Analyte concentrations below LORs.	ESDAT generated summary of field blank analytical results.	N/A		Yes		Yes		N/A	
Trip Blank Sampling and Analysis	Cross contamination between samples does not occur in transit or as an artefact of the sampling handling procedure.	Analyte concentrations below LORs.	ESDAT generated summary of field blank analytical results.	N/A		N/A		N/A		N/A	
Laboratory Duplicates	Laboratory duplicates are used to test the precision of the laboratory measurements.	As specified by laboratory.	Laboratory reports	Yes		Yes		Yes		Yes	
Laboratory Control Samples	Laboratory control samples (LCS) are used to assess overall method performance. In general these samples are similar in composition to environmental samples, and contain known amounts of the analytes of interest.	Dynamic recovery limits as specified by laboratory.	Laboratory reports	Yes		Yes		Yes		Yes	
Certified Reference Material	CRM samples are used to monitor the accuracy of analyses performed by the laboratory.	As specified by laboratory (generally dynamic recovery limits). Usually not performed and assessed based on LCS results.	Laboratory reports	Yes		Yes		Yes		Yes	
Surrogate Recovery	Surrogates are organic compounds that are similar in chemical composition to analytes of interest and are spiked into environmental samples prior to sample preparation and analysis. Surrogate recoveries are used to evaluate matrix interference on a sample-specific basis.	Dynamic recovery limits as specified by laboratory.	Laboratory reports	Yes		Yes		Yes		No	Recovery was less than the lower data quality objective.
Matrix Spike Recovery	A matrix spike is an aliquot of a sample spiked with a known concentration of target analyte(s). Spiking occurs prior to sample preparation and analysis, and the results are used to assess the bias of a method in a given sample matrix.	Recovery 70 - 130% or dynamic limits if specified by laboratory.	Laboratory reports	No	Matrix Spike Recovery less than lower data quality objective for sulfate.	Yes		Yes		No	Matrix spike recovery was not determined as the background level was greater than or equal to 4x the spike level.
Laboratory Method Blanks	Method blanks are prepared to represent the sample matrix as closely as possible and prepared/extracted/digested and analysed exactly like field samples. These blanks are used by the laboratory to assess contamination introduced during sample preparation activities.	Analyte concentrations below LORs.	Laboratory reports	Yes		Yes		Yes		Yes	
Potentially Anomalous Data	No discrepancies between field, laboratory and/or expected results are identified	Analytical results are internally consistent, consistent with field measurements, and consistent with expected and/or historical results based on CSM	Multiple sources								

Data Validation Checklist

Job Number:	17776
Report Title:	Preliminary Site Investigation
Client:	DITCRD
Completed By:	Lucinda Trickey
Date:	
Verified By:	
Date:	

SAMPLE DELIVERY GROUP (SDG):	**ES2002808**	**SAMPLE DELIVERY GROUP (SDG):**	**ES2002810**	**SAMPLE DELIVERY GROUP (SDG):**	**ES2002812**	**SAMPLE DELIVERY GROUP (SDG):**	**ES2002813**
Laboratory:	ALS Environmental	**Laboratory:**	ALS Environmental	**Laboratory:**	ALS Environmental	**Laboratory:**	ALS Environmental
Sample Dates:	18 - 21 Jan 2020	**Sample Dates:**	20-Jan-20	**Sample Dates:**	20-Jan-20	**Sample Dates:**	23-Jan-20
Sample Media:	Soil and Water	**Sample Media:**	Soil	**Sample Media:**	Soil	**Sample Media:**	Water

Quality Control Process	**Objectives & Measure**	**Acceptance Criteria**	**How? (i.e. ESDAT output, review lab reports, review data**	ES2002808		ES2002810		ES2002812		ES2002813	
Field (Intra-laboratory) Duplicate Sampling and Analysis	Field Duplicate samples used assess the variability in analyte concentration between samples collected from the sample location and the reproducibility of the laboratory analysis. Where required, resubmission of previously analysed samples for chemicals within their holding times may be undertaken to further assess precision level of precision.	Analysed for same chemicals as primary sample. RPD <30% of mean conc. where both conc. >20 x LOR RPD <50% of mean conc. where both conc. 10-20 x LOR RPD No limit where both conc. < 10 x LOR	ESDAT generated summary of relative percent difference (RPD) results for field duplicate samples.	N/A		N/A		N/A		N/A	
Secondary Inter-laboratory) Duplicate Sampling and Analysis	Results are accurate and free from laboratory error. Secondary duplicate samples sent to a secondary laboratory to assess the accuracy of the analyte concentrations reported by the primary laboratory.	Analysed for same chemicals as primary sample. RPD <30% of mean conc. where both conc. >20 x LOR. RPD <50% of mean conc. where both conc. 10-20 x LOR. RPD no limit where both conc. < 10 x LOR.	ESDAT generated summary of relative percent difference (RPD) results for field duplicate samples.	N/A		N/A		N/A		N/A	
Field Rinsate Blank Preparation & Analysis	Cross contamination of samples does not occur between sampling locations due to carry-over from sampling equipment.	Analyte concentrations below LORs.	ESDAT generated summary of field blank analytical results.	N/A		N/A		N/A		N/A	
Trip Blank Sampling and Analysis	Cross contamination between samples does not occur in transit or as an artefact of the sampling handling procedure.	Analyte concentrations below LORs.	ESDAT generated summary of field blank analytical results.	N/A		N/A		N/A		N/A	
Laboratory Duplicates	Laboratory duplicates are used to test the precision of the laboratory measurements.	As specified by laboratory.	Laboratory reports	Yes		Yes		Yes		Yes	
Laboratory Control Samples	Laboratory control samples (LCS) are used to assess overall method performance. In general these samples are similar in composition to environmental samples, and contain known amounts of the analytes of interest.	Dynamic recovery limits as specified by laboratory.	Laboratory reports	Yes		Yes		Yes		Yes	
Certified Reference Material	CRM samples are used to monitor the accuracy of analyses performed by the laboratory.	As specified by laboratory (generally dynamic recovery limits). Usually not performed and assessed based on LCS results.	Laboratory reports	Yes		Yes		Yes		Yes	
Surrogate Recovery	Surrogates are organic compounds that are similar in chemical composition to analytes of interest and are spiked into environmental samples prior to sample preparation and analysis. Surrogate recoveries are used to evaluate matrix interference on a sample-specific basis.	Dynamic recovery limits as specified by laboratory.	Laboratory reports	Yes		Yes		Yes		Yes	
Matrix Spike Recovery	A matrix spike is an aliquot of a sample spiked with a known concentration of target analyte(s). Spiking occurs prior to sample preparation and analysis, and the results are used to assess the bias of a method in a given sample matrix.	Recovery 70 - 130% or dynamic limits if specified by laboratory.	Laboratory reports	No	Matrix spike recovery was not determined as the background level was greater than or equal to 4x the spike level.	No	Matrix spike recovery was not determined as the background level was greater than or equal to 4x the spike level.	Yes		Yes	
Laboratory Method Blanks	Method blanks are prepared to represent the sample matrix as closely as possible and prepared/extracted/digested and analysed exactly like field samples. These blanks are used by the laboratory to assess contamination introduced during sample preparation activities.	Analyte concentrations below LORs.	Laboratory reports	Yes		Yes		Yes		Yes	
Potentially Anomalous Data	No discrepancies between field, laboratory and/or expected results are identified	Analytical results are internally consistent, consistent with field measurements, and consistent with expected and/or historical results based on CSM	Multiple sources								

Data Validation Checklist

Job Number:	17776
Report Title:	Preliminary Site Investigation
Client:	DITCRD
Completed By:	Lucinda Trickey
Date:	
Verified By:	
Date:	

SAMPLE DELIVERY GROUP (SDG):	**ES2002814**	**SAMPLE DELIVERY GROUP (SDG):**	**ES2002817**	**SAMPLE DELIVERY GROUP (SDG):**	**ES2002819**	**SAMPLE DELIVERY GROUP (SDG):**	**ES2002821**
Laboratory:	ALS Environmental	**Laboratory:**	ALS Environmental	**Laboratory:**	ALS Environmental	**Laboratory:**	ALS Environmental
Sample Dates:	23-Jan-20	**Sample Dates:**	20-Jan-20	**Sample Dates:**	21-Jan-20	**Sample Dates:**	17-Jan-20
Sample Media:	Water	**Sample Media:**	Water	**Sample Media:**	Water	**Sample Media:**	Water

Quality Control Process	**Objectives & Measure**	**Acceptance Criteria**	**How? (i.e. ESDAT output, review lab reports, review data**	ES2002814		ES2002817		ES2002819		ES2002821	
Field (Intra-laboratory) Duplicate Sampling and Analysis	Field Duplicate samples used assess the variability in analyte concentration between samples collected from the sample location and the reproducibility of the laboratory analysis. Where required, resubmission of previously analysed samples for chemicals within their holding times may be undertaken to further assess precision level of precision.	Analysed for same chemicals as primary sample. RPD <30% of mean conc. where both conc. >20 x LOR RPD <50% of mean conc. where both conc. 10-20 x LOR RPD No limit where both conc. < 10 x LOR	ESDAT generated summary of relative percent difference (RPD) results for field duplicate samples.	N/A		N/A		N/A		N/A	
Secondary Inter-laboratory) Duplicate Sampling and Analysis	Results are accurate and free from laboratory error. Secondary duplicate samples sent to a secondary laboratory to assess the accuracy of the analyte concentrations reported by the primary laboratory.	Analysed for same chemicals as primary sample. RPD <30% of mean conc. where both conc. >20 x LOR. RPD <50% of mean conc. where both conc. 10-20 x LOR. RPD no limit where both conc. < 10 x LOR.	ESDAT generated summary of relative percent difference (RPD) results for field duplicate samples.	N/A		N/A		N/A		N/A	
Field Rinsate Blank Preparation & Analysis	Cross contamination of samples does not occur between sampling locations due to carry-over from sampling equipment.	Analyte concentrations below LORs.	ESDAT generated summary of field blank analytical results.	N/A		N/A		N/A		N/A	
Trip Blank Sampling and Analysis	Cross contamination between samples does not occur in transit or as an artefact of the sampling handling procedure.	Analyte concentrations below LORs.	ESDAT generated summary of field blank analytical results.	N/A		N/A		N/A		N/A	
Laboratory Duplicates	Laboratory duplicates are used to test the precision of the laboratory measurements.	As specified by laboratory.	Laboratory reports	Yes		Yes		Yes		Yes	
Laboratory Control Samples	Laboratory control samples (LCS) are used to assess overall method performance. In general these samples are similar in composition to environmental samples, and contain known amounts of the analytes of interest.	Dynamic recovery limits as specified by laboratory.	Laboratory reports	Yes		Yes		Yes		Yes	
Certified Reference Material	CRM samples are used to monitor the accuracy of analyses performed by the laboratory.	As specified by laboratory (generally dynamic recovery limits). Usually not performed and assessed based on LCS results.	Laboratory reports	Yes		Yes		Yes		Yes	
Surrogate Recovery	Surrogates are organic compounds that are similar in chemical composition to analytes of interest and are spiked into environmental samples prior to sample preparation and analysis. Surrogate recoveries are used to evaluate matrix interference on a sample-specific basis.	Dynamic recovery limits as specified by laboratory.	Laboratory reports	Yes		Yes		Yes		Yes	
Matrix Spike Recovery	A matrix spike is an aliquot of a sample spiked with a known concentration of target analyte(s). Spiking occurs prior to sample preparation and analysis, and the results are used to assess the bias of a method in a given sample matrix.	Recovery 70 - 130% or dynamic limits if specified by laboratory.	Laboratory reports	Yes		Yes		Yes		Yes	
Laboratory Method Blanks	Method blanks are prepared to represent the sample matrix as closely as possible and prepared/extracted/digested and analysed exactly like field samples. These blanks are used by the laboratory to assess contamination introduced during sample preparation activities.	Analyte concentrations below LORs.	Laboratory reports	Yes		Yes		Yes		Yes	
Potentially Anomalous Data	No discrepancies between field, laboratory and/or expected results are identified	Analytical results are internally consistent, consistent with field measurements, and consistent with expected and/or historical results based on CSM	Multiple sources								

Data Validation Checklist

Job Number:	17776
Report Title:	Preliminary Site Investigation
Client:	DITCRD
Completed By:	Lucinda Trickey
Date:	
Verified By:	
Date:	

SAMPLE DELIVERY GROUP (SDG):	**ES2002822**	**SAMPLE DELIVERY GROUP (SDG):**	**ES2002824**	**SAMPLE DELIVERY GROUP (SDG):**	**ES2002826**	**SAMPLE DELIVERY GROUP (SDG):**	**ES2002827**
Laboratory:	ALS Environmental	**Laboratory:**	ALS Environmental	**Laboratory:**	ALS Environmental	**Laboratory:**	ALS Environmental
Sample Dates:	18-Jan-20	**Sample Dates:**	20-Jan-20	**Sample Dates:**	20-Jan-20	**Sample Dates:**	20-Jan-20
Sample Media:	Water	**Sample Media:**	Soil	**Sample Media:**	Water	**Sample Media:**	Soil

Quality Control Process	**Objectives & Measure**	**Acceptance Criteria**	**How? (i.e. ESDAT output, review lab reports, review data**	ES2002822		ES2002824		ES2002826		ES2002827	
Field (Intra-laboratory) Duplicate Sampling and Analysis	Field Duplicate samples used assess the variability in analyte concentration between samples collected from the sample location and the reproducibility of the laboratory analysis. Where required, resubmission of previously analysed samples for chemicals within their holding times may be undertaken to further assess precision level of precision.	Analysed for same chemicals as primary sample. RPD <30% of mean conc. where both conc. >20 x LOR RPD <50% of mean conc. where both conc. 10-20 x LOR RPD No limit where both conc. < 10 x LOR	ESDAT generated summary of relative percent difference (RPD) results for field duplicate samples.	N/A		N/A		N/A		N/A	
Secondary Inter-laboratory) Duplicate Sampling and Analysis	Results are accurate and free from laboratory error. Secondary duplicate samples sent to a secondary laboratory to assess the accuracy of the analyte concentrations reported by the primary laboratory.	Analysed for same chemicals as primary sample. RPD <30% of mean conc. where both conc. >20 x LOR. RPD <50% of mean conc. where both conc. 10-20 x LOR. RPD no limit where both conc. < 10 x LOR.	ESDAT generated summary of relative percent difference (RPD) results for field duplicate samples.	N/A		N/A		N/A		N/A	
Field Rinsate Blank Preparation & Analysis	Cross contamination of samples does not occur between sampling locations due to carry-over from sampling equipment.	Analyte concentrations below LORs.	ESDAT generated summary of field blank analytical results.	N/A		N/A		N/A		N/A	
Trip Blank Sampling and Analysis	Cross contamination between samples does not occur in transit or as an artefact of the sampling handling procedure.	Analyte concentrations below LORs.	ESDAT generated summary of field blank analytical results.	N/A		N/A		N/A		N/A	
Laboratory Duplicates	Laboratory duplicates are used to test the precision of the laboratory measurements.	As specified by laboratory.	Laboratory reports	Yes		Yes		Yes		Yes	
Laboratory Control Samples	Laboratory control samples (LCS) are used to assess overall method performance. In general these samples are similar in composition to environmental samples, and contain known amounts of the analytes of interest.	Dynamic recovery limits as specified by laboratory.	Laboratory reports	Yes		Yes		Yes		Yes	
Certified Reference Material	CRM samples are used to monitor the accuracy of analyses performed by the laboratory.	As specified by laboratory (generally dynamic recovery limits). Usually not performed and assessed based on LCS results.	Laboratory reports	Yes		Yes		Yes		Yes	
Surrogate Recovery	Surrogates are organic compounds that are similar in chemical composition to analytes of interest and are spiked into environmental samples prior to sample preparation and analysis. Surrogate recoveries are used to evaluate matrix interference on a sample-specific basis.	Dynamic recovery limits as specified by laboratory.	Laboratory reports	Yes		Yes		Yes		Yes	
Matrix Spike Recovery	A matrix spike is an aliquot of a sample spiked with a known concentration of target analyte(s). Spiking occurs prior to sample preparation and analysis, and the results are used to assess the bias of a method in a given sample matrix.	Recovery 70 - 130% or dynamic limits if specified by laboratory.	Laboratory reports	Yes		Yes		No	Matrix spike recovery was not determined as the background level was greater than or equal to 4x the spike level.	No	Matrix spike recovery was not determined as the background level was greater than or equal to 4x the spike level.
Laboratory Method Blanks	Method blanks are prepared to represent the sample matrix as closely as possible and prepared/extracted/digested and analysed exactly like field samples. These blanks are used by the laboratory to assess contamination introduced during sample preparation activities.	Analyte concentrations below LORs.	Laboratory reports	Yes		Yes		Yes		Yes	
Potentially Anomalous Data	No discrepancies between field, laboratory and/or expected results are identified	Analytical results are internally consistent, consistent with field measurements, and consistent with expected and/or historical results based on CSM	Multiple sources								

Data Validation Checklist

Job Number:	17776
Report Title:	Preliminary Site Investigation
Client:	DITCRD
Completed By:	Lucinda Trickey
Date:	
Verified By:	
Date:	

				SAMPLE DELIVERY GROUP (SDG):	**ES2002829**	**SAMPLE DELIVERY GROUP (SDG):**	**ES2002830**	**SAMPLE DELIVERY GROUP (SDG):**	**ES2002831**	**SAMPLE DELIVERY GROUP (SDG):**	**ES2002833**
				Laboratory:	ALS Environmental	**Laboratory:**	ALS Environmental	**Laboratory:**	ALS Environmental	**Laboratory:**	ALS Environmental
				Sample Dates:	21-Jan-20	**Sample Dates:**	21-Jan-20	**Sample Dates:**	22-Jan-20	**Sample Dates:**	24-Jan-20
				Sample Media:	Soil	**Sample Media:**	Soil	**Sample Media:**	Water	**Sample Media:**	Ansulite
Quality Control Process	**Objectives & Measure**	**Acceptance Criteria**	**How? (i.e. ESDAT output, review lab reports, review data**								
Field (Intra-laboratory) Duplicate Sampling and Analysis	Field Duplicate samples used assess the variability in analyte concentration between samples collected from the sample location and the reproducibility of the laboratory analysis. Where required, resubmission of previously analysed samples for chemicals within their holding times may be undertaken to further assess precision level of precision.	Analysed for same chemicals as primary sample. RPD <30% of mean conc. where both conc. >20 x LOR RPD <50% of mean conc. where both conc. 10-20 x LOR RPD No limit where both conc. < 10 x LOR	ESDAT generated summary of relative percent difference (RPD) results for field duplicate samples.	N/A		N/A		N/A		N/A	
Secondary Inter-laboratory) Duplicate Sampling and Analysis	Results are accurate and free from laboratory error. Secondary duplicate samples sent to a secondary laboratory to assess the accuracy of the analyte concentrations reported by the primary laboratory.	Analysed for same chemicals as primary sample. RPD <30% of mean conc. where both conc. >20 x LOR. RPD <50% of mean conc. where both conc. 10-20 x LOR. RPD no limit where both conc. < 10 x LOR.	ESDAT generated summary of relative percent difference (RPD) results for field duplicate samples.	N/A		N/A		N/A		N/A	
Field Rinsate Blank Preparation & Analysis	Cross contamination of samples does not occur between sampling locations due to carry-over from sampling equipment.	Analyte concentrations below LORs.	ESDAT generated summary of field blank analytical results.	N/A		N/A		N/A		N/A	
Trip Blank Sampling and Analysis	Cross contamination between samples does not occur in transit or as an artefact of the sampling handling procedure.	Analyte concentrations below LORs.	ESDAT generated summary of field blank analytical results.	N/A		N/A		N/A		N/A	
Laboratory Duplicates	Laboratory duplicates are used to test the precision of the laboratory measurements.	As specified by laboratory.	Laboratory reports	Yes		Yes		Yes		Yes	
Laboratory Control Samples	Laboratory control samples (LCS) are used to assess overall method performance. In general these samples are similar in composition to environmental samples, and contain known amounts of the analytes of interest.	Dynamic recovery limits as specified by laboratory.	Laboratory reports	Yes		Yes		Yes		Yes	
Certified Reference Material	CRM samples are used to monitor the accuracy of analyses performed by the laboratory.	As specified by laboratory (generally dynamic recovery limits). Usually not performed and assessed based on LCS results.	Laboratory reports	Yes		Yes		Yes		Yes	
Surrogate Recovery	Surrogates are organic compounds that are similar in chemical composition to analytes of interest and are spiked into environmental samples prior to sample preparation and analysis. Surrogate recoveries are used to evaluate matrix interference on a sample-specific basis.	Dynamic recovery limits as specified by laboratory.	Laboratory reports	Yes		Yes		Yes		Yes	
Matrix Spike Recovery	A matrix spike is an aliquot of a sample spiked with a known concentration of target analyte(s). Spiking occurs prior to sample preparation and analysis, and the results are used to assess the bias of a method in a given sample matrix.	Recovery 70 - 130% or dynamic limits if specified by laboratory.	Laboratory reports	Yes		No	Matrix spike recovery was not determined as the background level was greater than or equal to 4x the spike level.	No	Matrix spike recovery was not determined as the background level was greater than or equal to 4x the spike level.	Yes	
Laboratory Method Blanks	Method blanks are prepared to represent the sample matrix as closely as possible and prepared/extracted/digested and analysed exactly like field samples. These blanks are used by the laboratory to assess contamination introduced during sample preparation activities.	Analyte concentrations below LORs.	Laboratory reports	Yes		Yes		Yes		Yes	
Potentially Anomalous Data	No discrepancies between field, laboratory and/or expected results are identified	Analytical results are internally consistent, consistent with field measurements, and consistent with expected and/or historical results based on CSM	Multiple sources								

Data Validation Checklist

senversa

Job Number:	17776
Report Title:	Preliminary Site Investigation
Client:	DITCRD
Completed By:	Lucinda Trickey
Date:	
Verified By:	
Date:	

				SAMPLE DELIVERY GROUP (SDG):	**699263**	**SAMPLE DELIVERY GROUP (SDG):**	**699266**	**SAMPLE DELIVERY GROUP (SDG):**	**699303**	**SAMPLE DELIVERY GROUP (SDG):**	**EM2002483**
				Laboratory:	Eurofins	**Laboratory:**	Eurofins	**Laboratory:**	Eurofins	**Laboratory:**	ALS Environmental
				Sample Dates:	16-Jan-20	**Sample Dates:**	14-Jan-20	**Sample Dates:**	18 - 23 Jan 2020	**Sample Dates:**	13-Feb-20
				Sample Media:	Water	**Sample Media:**	Water	**Sample Media:**	Soil and Water	**Sample Media:**	Water
Quality Control Process	**Objectives & Measure**	**Acceptance Criteria**	**How? (i.e. ESDAT output, review lab reports, review data**								
Field (Intra-laboratory) Duplicate Sampling and Analysis	Field Duplicate samples used assess the variability in analyte concentration between samples collected from the sample location and the reproducibility of the laboratory analysis. Where required, resubmission of previously analysed samples for chemicals within their holding times may be undertaken to further assess precision level of precision.	Analysed for same chemicals as primary sample. RPD <30% of mean conc. where both conc. >20 x LOR RPD <50% of mean conc. where both conc. 10-20 x LOR RPD No limit where both conc. < 10 x LOR	ESDAT generated summary of relative percent difference (RPD) results for field duplicate samples.	N/A		N/A		N/A		Yes	
Secondary Inter-laborator) Duplicate Sampling and Analysis	Results are accurate and free from laboratory error. Secondary duplicate samples sent to a secondary laboratory to assess the accuracy of the analyte concentrations reported by the primary laboratory.	Analysed for same chemicals as primary sample. RPD <30% of mean conc. where both conc. >20 x LOR. RPD <50% of mean conc. where both conc. 10-20 x LOR. RPD no limit where both conc. < 10 x LOR.	ESDAT generated summary of relative percent difference (RPD) results for field duplicate samples.	No	High RPDs exist. Refer to attached table.	No	High RPDs exist. Refer to attached table.	No	High RPDs exist. Refer to attached table.	N/A	
Field Rinsate Blank Preparation & Analysis	Cross contamination of samples does not occur between sampling locations due to carry-over from sampling equipment.	Analyte concentrations below LORs.	ESDAT generated summary of field blank analytical results.	N/A		N/A		N/A		N/A	
Trip Blank Sampling and Analysis	Cross contamination between samples does not occur in transit or as an artefact of the sampling handling procedure.	Analyte concentrations below LORs.	ESDAT generated summary of field blank analytical results.	N/A		N/A		N/A		N/A	
Laboratory Duplicates	Laboratory duplicates are used to test the precision of the laboratory measurements.	As specified by laboratory.	Laboratory reports	Yes		Yes		Yes		Yes	
Laboratory Control Samples	Laboratory control samples (LCS) are used to assess overall method performance. In general these samples are similar in composition to environmental samples, and contain known amounts of the analytes of interest.	Dynamic recovery limits as specified by laboratory.	Laboratory reports	Yes		Yes		Yes		Yes	
Certified Reference Material	CRM samples are used to monitor the accuracy of analyses performed by the laboratory.	As specified by laboratory (generally dynamic recovery limits). Usually not performed and assessed based on LCS results.	Laboratory reports	Yes		Yes		Yes		Yes	
Surrogate Recovery	Surrogates are organic compounds that are similar in chemical composition to analytes of interest and are spiked into environmental samples prior to sample preparation and analysis. Surrogate recoveries are used to evaluate matrix interference on a sample-specific basis.	Dynamic recovery limits as specified by laboratory.	Laboratory reports	Yes		Yes		Yes		Yes	
Matrix Spike Recovery	A matrix spike is an aliquot of a sample spiked with a known concentration of target analyte(s). Spiking occurs prior to sample preparation and analysis, and the results are used to assess the bias of a method in a given sample matrix.	Recovery 70 - 130% or dynamic limits if specified by laboratory.	Laboratory reports	Yes		Yes		Yes		Yes	
Laboratory Method Blanks	Method blanks are prepared to represent the sample matrix as closely as possible and prepared/extracted/digested and analysed exactly like field samples. These blanks are used by the laboratory to assess contamination introduced during sample preparation activities.	Analyte concentrations below LORs.	Laboratory reports	Yes		Yes		Yes		Yes	
Potentially Anomalous Data	No discrepancies between field, laboratory and/or expected results are identified	Analytical results are internally consistent, consistent with field measurements, and consistent with expected and/or historical results based on CSM	Multiple sources								

Data Validation Checklist

senversa

Job Number:	17776
Report Title:	Preliminary Site Investigation
Client:	DITCRD
Completed By:	Lucinda Trickey
Date:	
Verified By:	
Date:	

Quality Control Process	Objectives & Measure	Acceptance Criteria	How? (i.e. ESDAT output, review lab reports, review data	SAMPLE DELIVERY GROUP (SDG):	702421 - W	SAMPLE DELIVERY GROUP (SDG):	ES2005692	SAMPLE DELIVERY GROUP (SDG):	
				Laboratory:	Eurofins	**Laboratory:**	ALS Environmental	**Laboratory:**	Eurofins
				Sample Dates:	13-Feb-20	**Sample Dates:**	19 - 23 January 2020	**Sample Dates:**	20 - 22 January 020
				Sample Media:	Water	**Sample Media:**	Soil	**Sample Media:**	Soil
Field (Intra-laboratory) Duplicate Sampling and Analysis	Field Duplicate samples used assess the variability in analyte concentration between samples collected from the sample location and the reproducibility of the laboratory analysis. Where required, resubmission of previously analysed samples for chemicals within their holding times may be undertaken to further assess precision level of precision.	Analysed for same chemicals as primary sample. RPD <30% of mean conc. where both conc. >20 x LOR RPD <50% of mean conc. where both conc. 10-20 x LOR RPD No limit where both conc. < 10 x LOR	ESDAT generated summary of relative percent difference (RPD) results for field duplicate samples.	N/A		Yes		N/A	
Secondary Inter-laboratory) Duplicate Sampling and Analysis	Results are accurate and free from laboratory error. Secondary duplicate samples sent to a secondary laboratory to assess the accuracy of the analyte concentrations reported by the primary laboratory.	Analysed for same chemicals as primary sample. RPD <30% of mean conc. where both conc. >20 x LOR. RPD <50% of mean conc. where both conc. 10-20 x LOR. RPD no limit where both conc. < 10 x LOR.	ESDAT generated summary of relative percent difference (RPD) results for field duplicate samples.	Yes		N/A		Yes	
Field Rinsate Blank Preparation & Analysis	Cross contamination of samples does not occur between sampling locations due to carry-over from sampling equipment.	Analyte concentrations below LORs.	ESDAT generated summary of field blank analytical results.	N/A		N/A		N/A	
Trip Blank Sampling and Analysis	Cross contamination between samples does not occur in transit or as an artefact of the sampling handling procedure.	Analyte concentrations below LORs.	ESDAT generated summary of field blank analytical results.	N/A		N/A		N/A	
Laboratory Duplicates	Laboratory duplicates are used to test the precision of the laboratory measurements.	As specified by laboratory.	Laboratory reports	Yes		Yes		Yes	
Laboratory Control Samples	Laboratory control samples (LCS) are used to assess overall method performance. In general these samples are similar in composition to environmental samples, and contain known amounts of the analytes of interest.	Dynamic recovery limits as specified by laboratory.	Laboratory reports	Yes		Yes		Yes	
Certified Reference Material	CRM samples are used to monitor the accuracy of analyses performed by the laboratory.	As specified by laboratory (generally dynamic recovery limits). Usually not performed and assessed based on LCS results.	Laboratory reports	Yes		Yes		Yes	
Surrogate Recovery	Surrogates are organic compounds that are similar in chemical composition to analytes of interest and are spiked into environmental samples prior to sample preparation and analysis. Surrogate recoveries are used to evaluate matrix interference on a sample-specific basis.	Dynamic recovery limits as specified by laboratory.	Laboratory reports	Yes		Yes		Yes	
Matrix Spike Recovery	A matrix spike is an aliquot of a sample spiked with a known concentration of target analyte(s). Spiking occurs prior to sample preparation and analysis, and the results are used to assess the bias of a method in a given sample matrix.	Recovery 70 - 130% or dynamic limits if specified by laboratory.	Laboratory reports	Yes		No	Matrix spike was not determined due to the background level being greater than or equal to 4x the spike level in sample A_SS19.	Yes	
Laboratory Method Blanks	Method blanks are prepared to represent the sample matrix as closely as possible and prepared/extracted/digested and analysed exactly like field samples. These blanks are used by the laboratory to assess contamination introduced during sample preparation activities.	Analyte concentrations below LORs.	Laboratory reports	Yes		Yes		Yes	
Potentially Anomalous Data	No discrepancies between field, laboratory and/or expected results are identified	Analytical results are internally consistent, consistent with field measurements, and consistent with expected and/or historical results based on CSM	Multiple sources						

Table L-1: RPD Analytical Results - Soil
Preliminary Site Investigation
Norfolk Island
DITCRD

		Location Code	AD_SD04	AD_SD04		AD_SD04	AD_SD04		CHAP_SS01	CHAP_SS01		CHAP_SS01	CHAP_SS01		MC_SD08	MC_SD08		MC_SD08	MC_SD08		MC_SD08	MC_SD08	
		Field ID	AD_SD04	QC107		AD_SD04	QC207		CHAP_SS01	QC105		CHAP_SS01	QC205		MC_SD08	QC106		MC_SD08	QC206		MC_SD08	QC206	
		Date	20/01/2020	20/01/2020		20/01/2020	20/01/2020		20/01/2020	20/01/2020		20/01/2020	20/01/2020		20/01/2020	20/01/2020		20/01/2020	20/01/2020		20/01/2020	20/01/2020	
		Sample Type	Normal	Field_D		Normal	Interlab_D		Normal	Field_D		Normal	Interlab_D		Normal	Field_D		Normal	Interlab_D		Normal	Interlab_D	
		Lab Report No.	ES2002812	ES2002803	RPD	ES2002812	699303	RPD	ES2002810	ES2002803	RPD	ES2002810	699303	RPD	ES2002810	ES2002803	RPD	ES2002810	699303	RPD	ES2002810	702872	RPD
	Unit	EQL																					
Physical Parameters																							
Leachate Fluid	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.0	-
Moisture Content	%	0.1	6.1	10.0	**48**	6.1	9.4	**43**	11.4	12.0	5	11.4	11	4	18.7	18.7	0	18.7	19	2	18.7	-	-
pH (Initial)	pH Units	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.0	-
pH of Leaching Fluid	pH Units	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.0	-
pH (Final)	pH Units	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.0	-
(n:2) Fluorotelomer Sulfonic Acids																							
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	µg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-
	mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	-	-
6:2 Fluorotelomer Sulfonate (6:2 FtS)	µg/L	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-
	mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.01	0	<0.0005	<0.0005	0	<0.0005	<0.01	0	<0.0005	<0.0005	0	<0.0005	<0.01	0	<0.0005	-	-
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	µg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-
	mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	-	-
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	µg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-
	mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	-	-
Perfluoroalkane Carboxylic Acids																							
Perfluorohexanoic acid (PFHxA)	µg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.05	-
	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0	0.0002	0.0002	0	0.0002	<0.005	0	0.0018	0.0016	12	0.0018	<0.005	0	0.0018	-	-
Perfluorododecanoic acid (PFDoDA)	µg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-
	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	-	-
Perfluorononanoic acid (PFNA)	µg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-
	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0	0.0005	0.0003	50	0.0005	<0.005	0	0.0005	-	-
Perfluoropentanoic acid (PFPeA)	µg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-
	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0	0.0004	0.0004	0	0.0004	<0.005	0	0.0004	-	-
Perfluorotetradecanoic acid (PFTeDA)	µg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-
	mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	-	-
Perfluoroheptanoic acid (PFHpA)	µg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.02	-
	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0	0.0004	0.0004	0	0.0004	<0.005	0	0.0004	-	-
Perfluorobutanoic acid (PFBA)	µg/L	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-
	mg/kg	0.001	<0.001	<0.001	0	<0.001	<0.005	0	0.001	<0.001	0	0.001	<0.005	0	0.001	<0.001	0	0.001	<0.005	0	0.001	-	-
Perfluorodecanoic acid (PFDA)	µg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-
	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0	0.0003	0.0002	40	0.0003	<0.005	0	0.0003	-	-
Perfluorotridecanoic acid (PFTrDA)	µg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-
	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	-	-
Perfluoroundecanoic acid (PFUnDA)	µg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-
	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	-	-
Perfluorooctanoic acid (PFOA)	µg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.03	-
	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0	0.0011	0.0009	20	0.0011	<0.005	0	0.0011	-	-
Perfluoroalkane Sulfonic Acids																							
Perfluorononanesulfonic acid (PFNS)	µg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-
	mg/kg	0.005	-	-	-	-	<0.005	-	-	-	-	-	<0.005	-	-	-	-	-	<0.005	-	-	-	-
Perfluorooctanesulfonic acid (PFOS)	µg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.3	-
	mg/kg	0.0002	0.0010	0.0008	22	0.0010	<0.005	0	0.0021	0.0020	5	0.0021	<0.005	0	0.172	0.174	1	0.172	0.13	28	0.172	-	-
Perfluoropentane sulfonic acid (PFPeS)	µg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.04	-
	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0	0.0015	0.0011	31	0.0015	<0.005	0	0.0015	-	-
Perfluorohexane sulfonic acid (PFHxS)	µg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.46	-
	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0	0.0003	0.0003	0	0.0003	<0.005	0	0.0219	0.0202	8	0.0219	0.014	**44**	0.0219	-	-
Perfluoroheptane sulfonic acid (PFHpS)	µg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.04	-
	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0	0.0024	0.0016	40	0.0024	<0.005	0	0.0024	-	-
Perfluorodecanesulfonic acid (PFDS)	µg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-
	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0	0.0009	0.0007	25	0.0009	<0.005	0	0.0009	-	-
Perfluorobutane sulfonic acid (PFBS)	µg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.04	-
	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0	0.0016	0.0013	21	0.0016	<0.005	0	0.0016	-	-
Perfluoropropanesulfonic acid (PFPrS)	µg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.02	-
	mg/kg	0.005	-	-	-	-	<0.005	-	-	-	-	-	<0.005	-	-	-	-	-	<0.005	-	-	-	-
Sum of PFHxS and PFOS	µg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.76	-
	mg/kg	0.0002	0.0010	0.0008	22	0.0010	<0.005	0	0.0024	0.0023	4	0.0024	<0.005	0	0.194	0.194	0	0.194	0.144	30	0.194	-	-
Perfluoroalkyl Sulfonamides																							
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	µg/L	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-
	mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	-	-
N-methylperfluorooctane sulfonamidoacetic acid (NMeFOSAA)	µg/L	0.02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-
	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.01	0	<0.0002	<0.0002	0	<0.0002	<0.01	0	<0.0002	<0.0002	0	<0.0002	<0.01	0	<0.0002	-	-
N-ethyl-perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	µg/L	0.02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-
	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.01	0	<0.0002	<0.0002	0	<0.0002	<0.01	0	<0.0002	<0.0002	0	<0.0002	<0.01	0	<0.0002	-	-
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	µg/L	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-
	mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	-	-
N-Methyl perfluorooctane sulfonamide (MeFOSA)	µg/L	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-
	mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	-	-
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	µg/L	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-
	mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	-	-
Perfluorooctane sulfonamide (FOSA)	µg/L	0.02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.05	-
	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0	0.0002	<0.0002	0	0.0002	<0.005	0	0.0002	-	-
PFAS																							
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	µg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.79	-
	mg/kg	0.005	-	-	-	-	<0.005	-	-	-	-	-	<0.005	-	-	-	-	-	0.144	-	-	-	-
Sum of US EPA PFAS (PFOS + PFOA)*	µg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.33	-
	mg/kg	0.005	-	-	-	-	<0.005	-	-	-	-	-	<0.005	-	-	-	-	-	0.13	-	-	-	-
Sum of PFAS	µg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
	mg/kg	0.0002	0.0010	0.0008	22	0.0010	<0.05	0	0.0036	0.0025	36	0.0036	<0.05	0	0.206	0.203	1	0.206	0.144	**35**	0.206	-	-

***RPDs have only been considered where a concentration is greater than 1 times the EQL.**
****Elevated RPDs are highlighted as per QAQC Profile settings (Acceptable RPDs for each EQL multiplier range are: 1000 (1 - 10 x EQL); 50 (10 - 20 x EQL); 30 (> 20 x EQL))**
*****Interlab Duplicates are matched on a per compound basis as methods vary between laboratories. Any methods in the row header relate to those used in the primary laboratory**

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		Location Code	MC_SD08	MC_SD08		A_SS03	A_SS03		A_SS03	A_SS03		ID012_SD01	ID012_SD01		ID012_SD01	ID012_SD01		A_SS20	A_SS20		A_SS20	A_SS20	
		Field ID	MC_SD08	QC106		A_SS03	QC108		A_SS03	QC208		ID012_SD01	QC109		ID012_SD01	QC209		A_SS20	QC111		A_SS20	QC211	
		Date	20/01/2020	20/01/2020		21/01/2020	20/01/2020		21/01/2020	21/01/2020		21/01/2020	21/01/2020		21/01/2020	21/01/2020		22/01/2020	22/01/2020		22/01/2020	22/01/2020	
		Sample Type	Normal	Field_D		Normal	Field_D		Normal	Interlab_D		Normal	Field_D		Normal	Interlab_D		Normal	Field_D		Normal	Interlab_D	
		Lab Report No.	ES2005692	ES2005692	RPD	ES2002806	ES2002803	RPD	ES2002806	699303	RPD	ES2002830	ES2002803	RPD	ES2002830	699303	RPD	ES2002806	ES2002803	RPD	ES2002806	699303	RPD
	Unit	EQL																					
Physical Parameters																							
Leachate Fluid	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Moisture Content	%	0.1	-	-	-	1.8	3.8	**71**	1.8	2.7	40	84.1	84.9	1	84.1	84	0	10.4	8.6	19	10.4	8.9	16
pH (Initial)	pH Units	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
pH of Leaching Fluid	pH Units	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
pH (Final)	pH Units	0.1	6.6	7.6	14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(n:2) Fluorotelomer Sulfonic Acids																							
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	µg/L	0.01	<0.05	<0.05	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	mg/kg	0.0005	-	-	-	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0
6:2 Fluorotelomer Sulfonate (6:2 FtS)	µg/L	0.05	<0.05	<0.05	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	mg/kg	0.0005	-	-	-	<0.0005	<0.0005	0	<0.0005	<0.01	0	<0.0005	<0.0005	0	<0.0005	<0.01	0	<0.0005	<0.0005	0	<0.0005	<0.01	0
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	µg/L	0.01	<0.05	<0.05	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	mg/kg	0.0005	-	-	-	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0	0.0016	0.0017	6	0.0016	<0.005	0
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	µg/L	0.01	<0.05	<0.05	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	mg/kg	0.0005	-	-	-	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0
Perfluoroalkane Carboxylic Acids																							
Perfluorohexanoic acid (PFHxA)	µg/L	0.01	0.06	0.06	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	mg/kg	0.0002	-	-	-	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0	0.0028	0.0032	13	0.0028	<0.005	0
Perfluorododecanoic acid (PFDoDA)	µg/L	0.01	<0.02	<0.02	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	mg/kg	0.0002	-	-	-	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0	0.0024	0.0023	4	0.0024	<0.005	0
Perfluorononanoic acid (PFNA)	µg/L	0.01	<0.02	<0.02	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	mg/kg	0.0002	-	-	-	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0	0.0016	0.0015	6	0.0016	<0.005	0
Perfluoropentanoic acid (PFPeA)	µg/L	0.01	<0.02	<0.02	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	mg/kg	0.0002	-	-	-	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	0.0003	40	<0.0002	0.0060	187	0.0033	0.0021	44	0.0033	<0.005	0
Perfluorotetradecanoic acid (PFTeDA)	µg/L	0.01	<0.05	<0.05	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	mg/kg	0.0005	-	-	-	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0006	<0.0006	0	<0.0006	<0.005	0	0.0015	<0.0005	100	0.0015	<0.005	0
Perfluoroheptanoic acid (PFHpA)	µg/L	0.01	<0.02	<0.02	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	mg/kg	0.0002	-	-	-	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	0.0003	40	<0.0002	<0.005	0	0.0013	0.0010	26	0.0013	<0.005	0
Perfluorobutanoic acid (PFBA)	µg/L	0.05	<0.1	<0.1	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	mg/kg	0.001	-	-	-	<0.001	<0.001	0	<0.001	<0.005	0	<0.001	0.002	67	<0.001	<0.005	0	0.004	0.002	67	0.004	<0.005	0
Perfluorodecanoic acid (PFDA)	µg/L	0.01	<0.02	<0.02	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	mg/kg	0.0002	-	-	-	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0	0.0026	0.0023	12	0.0026	<0.005	0
Perfluorotridecanoic acid (PFTrDA)	µg/L	0.01	<0.02	<0.02	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	mg/kg	0.0002	-	-	-	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0	0.0003	0.0004	29	0.0003	<0.005	0
Perfluoroundecanoic acid (PFUnDA)	µg/L	0.01	<0.02	<0.02	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	mg/kg	0.0002	-	-	-	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0	0.0067	0.0032	**71**	0.0067	<0.005	29
Perfluorooctanoic acid (PFOA)	µg/L	0.01	0.04	0.04	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	mg/kg	0.0002	-	-	-	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0	0.0029	0.0029	0	0.0029	<0.005	0
Perfluoroalkane Sulfonic Acids																							
Perfluorononanesulfonic acid (PFNS)	µg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	mg/kg	0.005	-	-	-	-	-	-	-	<0.005	-	-	-	-	-	<0.005	-	-	-	-	-	0.0086	-
Perfluorooctanesulfonic acid (PFOS)	µg/L	0.01	3.73	3.47	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	mg/kg	0.0002	-	-	-	0.0068	0.0068	0	0.0068	<0.005	**31**	0.0167	0.0195	15	0.0167	0.0083	**67**	0.0338	0.0548	**47**	0.0338	0.055	**48**
Perfluoropentane sulfonic acid (PFPeS)	µg/L	0.01	0.04	0.04	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	mg/kg	0.0002	-	-	-	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	0.0024	**169**	<0.0002	<0.005	0	0.0008	0.0006	29	0.0008	<0.005	0
Perfluorohexane sulfonic acid (PFHxS)	µg/L	0.01	0.54	0.50	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	mg/kg	0.0002	-	-	-	0.0004	0.0003	29	0.0004	<0.005	0	0.0041	0.0060	**38**	0.0041	<0.005	0	0.0097	0.0091	6	0.0097	<0.005	**64**
Perfluoroheptane sulfonic acid (PFHpS)	µg/L	0.01	0.06	0.06	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	mg/kg	0.0002	-	-	-	0.0003	0.0002	40	0.0003	<0.005	0	<0.0002	0.0016	156	<0.0002	<0.005	0	0.0006	0.0005	18	0.0006	<0.005	0
Perfluorodecanesulfonic acid (PFDS)	µg/L	0.01	<0.02	<0.02	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	mg/kg	0.0002	-	-	-	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0	0.0277	0.0210	28	0.0277	0.023	19
Perfluorobutane sulfonic acid (PFBS)	µg/L	0.01	0.06	0.05	18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	mg/kg	0.0002	-	-	-	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	0.0003	40	<0.0002	<0.005	0	0.0006	0.0007	15	0.0006	<0.005	0
Perfluoropropanesulfonic acid (PFPrS)	µg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	mg/kg	0.005	-	-	-	-	-	-	-	<0.005	-	-	-	-	-	<0.005	-	-	-	-	-	<0.005	-
Sum of PFHxS and PFOS	µg/L	0.01	4.27	3.97	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	mg/kg	0.0002	-	-	-	0.0072	0.0071	1	0.0072	<0.005	**36**	0.0208	0.0255	20	0.0208	0.0083	**86**	0.0435	0.0639	**38**	0.0435	0.055	23
Perfluoroalkyl Sulfonamides																							
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	µg/L	0.05	<0.05	<0.05	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	mg/kg	0.0005	-	-	-	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0006	<0.0006	0	<0.0006	0.0092	176	<0.0005	<0.0005	0	<0.0005	<0.005	0
N-methylperfluorooctane sulfonamidoacetic acid (NMeFOSAA)	µg/L	0.02	<0.02	<0.02	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	mg/kg	0.0002	-	-	-	<0.0002	<0.0002	0	<0.0002	<0.01	0	<0.0002	<0.0002	0	<0.0002	<0.01	0	<0.0002	<0.0002	0	<0.0002	<0.01	0
N-ethyl-perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	µg/L	0.02	<0.02	<0.02	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	mg/kg	0.0002	-	-	-	<0.0002	<0.0002	0	<0.0002	<0.01	0	<0.0002	<0.0002	0	<0.0002	<0.01	0	<0.0002	<0.0002	0	<0.0002	<0.01	0
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	µg/L	0.05	<0.05	<0.05	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	mg/kg	0.0005	-	-	-	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0006	<0.0006	0	<0.0006	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0
N-Methyl perfluorooctane sulfonamide (MeFOSA)	µg/L	0.05	<0.05	<0.05	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	mg/kg	0.0005	-	-	-	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0006	<0.0006	0	<0.0006	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	µg/L	0.05	<0.05	<0.05	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	mg/kg	0.0005	-	-	-	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0006	<0.0006	0	<0.0006	0.0057	162	<0.0005	<0.0005	0	<0.0005	<0.005	0
Perfluorooctane sulfonamide (FOSA)	µg/L	0.02	<0.02	<0.02	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	mg/kg	0.0002	-	-	-	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0	0.0025	0.0021	17	0.0025	<0.005	0
PFAS																							
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	µg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	mg/kg	0.005	-	-	-	-	-	-	-	<0.005	-	-	-	-	-	0.0083	-	-	-	-	-	0.055	-
Sum of US EPA PFAS (PFOS + PFOA)*	µg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	mg/kg	0.005	-	-	-	-	-	-	-	<0.005	-	-	-	-	-	0.0083	-	-	-	-	-	0.055	-
Sum of PFAS	µg/L	0.01	4.53	4.22	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	mg/kg	0.0002	-	-	-	0.0075	0.0073	3	0.0075	<0.05	0	0.0208	0.0324	**44**	0.0208	<0.05	0	0.107	0.111	4	0.107	0.0866	21

***RPDs have only been considered where a concentration is greater than 1 times the EQL.**
****Elevated RPDs are highlighted as per QAQC Profile settings (Acceptable RPDs for each EQL multiplier range are: 1000 (1 - 10 x EQL); 50 (10 - 20 x EQL); 30 (> 20 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 L-1: RPD Analytical Results - Soil
Preliminary Site Investigation
Norfolk Island
DITCRD

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		Location Code	A_SS30	A_SS30		A_SS30	A_SS30		A_SS30	A_SS30		A_SS30	A_SS30		A_SS40	A_SS40		A_SS40	A_SS40		A_SS50	A_SS50	
		Field ID	A_SS30	QC112		A_SS30	QC212		A_SS30	QC212		A_SS30	QC112		A_SS40	QC113		A_SS40	QC213		A_SS50	QC114	
		Date	22/01/2020	22/01/2020		22/01/2020	22/01/2020		22/01/2020	22/01/2020		22/01/2020	22/01/2020		22/01/2020	22/01/2020		22/01/2020	22/01/2020		22/01/2020	22/01/2020	
		Sample Type	Normal	Field_D		Normal	Interlab_D		Normal	Interlab_D		Normal	Field_D		Normal	Field_D		Normal	Interlab_D		Normal	Field_D	
		Lab Report No.	ES2002806	ES2002803	RPD	ES2002806	699303	RPD	ES2002806	702872	RPD	ES2005692	ES2005692	RPD	ES2002806	ES2002803	RPD	ES2002806	699303	RPD	ES2002806	ES2002803	RPD
	Unit	EQL																					
Physical Parameters																							
Leachate Fluid	-		-	-	-	-	-	-	-	1.0	-	-	-	-	-	-	-	-	-	-	-	-	-
Moisture Content	%	0.1	10.8	13.1	19	10.8	12	11	10.8	-	-	-	-	-	8.2	8.3	1	8.2	8.4	2	9.1	9.5	4
pH (Initial)	pH Units	0.1	-	-	-	-	-	-	-	5.0	-	-	-	-	-	-	-	-	-	-	-	-	-
pH of Leaching Fluid	pH Units	0.1	-	-	-	-	-	-	-	5.0	-	-	-	-	-	-	-	-	-	-	-	-	-
pH (Final)	pH Units	0.1	-	-	-	-	-	-	-	5.0	-	7.2	7.5	4	-	-	-	-	-	-	-	-	-
(n:2) Fluorotelomer Sulfonic Acids																							
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	µg/L	0.01	-	-	-	-	-	-	-	<0.01	-	<0.05	<0.05	0	-	-	-	-	-	-	-	-	-
	mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	-	-	-	-	-	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0
6:2 Fluorotelomer Sulfonate (6:2 FtS)	µg/L	0.05	-	-	-	-	-	-	-	<0.05	-	<0.05	<0.05	0	-	-	-	-	-	-	-	-	-
	mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.01	0	<0.0005	-	-	-	-	-	<0.0005	<0.0005	0	<0.0005	<0.01	0	<0.0005	<0.0005	0
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	µg/L	0.01	-	-	-	-	-	-	-	0.12	-	0.22	0.22	0	-	-	-	-	-	-	-	-	-
	mg/kg	0.0005	0.0117	0.0130	11	0.0117	0.012	3	0.0117	-	-	-	-	-	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	µg/L	0.01	-	-	-	-	-	-	-	<0.01	-	<0.05	<0.05	0	-	-	-	-	-	-	-	-	-
	mg/kg	0.0005	0.0006	0.0009	40	0.0006	<0.005	0	0.0006	-	-	-	-	-	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0
Perfluoroalkane Carboxylic Acids																							
Perfluorohexanoic acid (PFHxA)	µg/L	0.01	-	-	-	-	-	-	-	0.17	-	0.17	0.17	0	-	-	-	-	-	-	-	-	-
	mg/kg	0.0002	0.0048	0.0049	2	0.0048	<0.005	0	0.0048	-	-	-	-	-	0.0008	0.0006	29	0.0008	<0.005	0	0.0004	0.0004	0
Perfluorododecanoic acid (PFDoDA)	µg/L	0.01	-	-	-	-	-	-	-	<0.01	-	<0.02	<0.02	0	-	-	-	-	-	-	-	-	-
	mg/kg	0.0002	0.0056	0.0051	9	0.0056	<0.005	11	0.0056	-	-	-	-	-	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0
Perfluorononanoic acid (PFNA)	µg/L	0.01	-	-	-	-	-	-	-	0.35	-	0.69	0.70	1	-	-	-	-	-	-	-	-	-
	mg/kg	0.0002	0.0153	0.0179	16	0.0153	0.021	**31**	0.0153	-	-	-	-	-	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0
Perfluoropentanoic acid (PFPeA)	µg/L	0.01	-	-	-	-	-	-	-	0.24	-	0.24	0.27	12	-	-	-	-	-	-	-	-	-
	mg/kg	0.0002	0.0088	0.0058	**41**	0.0088	0.0053	**50**	0.0088	-	-	-	-	-	0.0010	0.0006	50	0.0010	<0.005	0	<0.0002	<0.0002	0
Perfluorotetradecanoic acid (PFTeDA)	µg/L	0.01	-	-	-	-	-	-	-	<0.01	-	<0.05	<0.05	0	-	-	-	-	-	-	-	-	-
	mg/kg	0.0005	0.0007	0.0006	15	0.0007	<0.005	0	0.0007	-	-	-	-	-	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0
Perfluoroheptanoic acid (PFHpA)	µg/L	0.01	-	-	-	-	-	-	-	0.13	-	0.12	0.13	8	-	-	-	-	-	-	-	-	-
	mg/kg	0.0002	0.0029	0.0030	3	0.0029	<0.005	0	0.0029	-	-	-	-	-	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0
Perfluorobutanoic acid (PFBA)	µg/L	0.05	-	-	-	-	-	-	-	0.21	-	<0.1	0.2	67	-	-	-	-	-	-	-	-	-
	mg/kg	0.001	0.010	0.006	50	0.010	<0.005	67	0.010	-	-	-	-	-	0.001	0.001	0	0.001	<0.005	0	<0.001	<0.001	0
Perfluorodecanoic acid (PFDA)	µg/L	0.01	-	-	-	-	-	-	-	0.06	-	0.12	0.17	34	-	-	-	-	-	-	-	-	-
	mg/kg	0.0002	0.0075	0.0070	7	0.0075	0.0099	28	0.0075	-	-	-	-	-	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0
Perfluorotridecanoic acid (PFTrDA)	µg/L	0.01	-	-	-	-	-	-	-	<0.01	-	<0.02	<0.02	0	-	-	-	-	-	-	-	-	-
	mg/kg	0.0002	0.0012	0.0014	15	0.0012	<0.005	0	0.0012	-	-	-	-	-	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0
Perfluoroundecanoic acid (PFUnDA)	µg/L	0.01	-	-	-	-	-	-	-	<0.01	-	<0.02	<0.02	0	-	-	-	-	-	-	-	-	-
	mg/kg	0.0002	0.0081	0.0044	**59**	0.0081	0.0053	**42**	0.0081	-	-	-	-	-	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0
Perfluorooctanoic acid (PFOA)	µg/L	0.01	-	-	-	-	-	-	-	0.65	-	0.88	0.99	12	-	-	-	-	-	-	-	-	-
	mg/kg	0.0002	0.0170	0.0198	15	0.0170	0.025	**38**	0.0170	-	-	-	-	-	0.0004	0.0004	0	0.0004	<0.005	0	0.0004	0.0004	0
Perfluoroalkane Sulfonic Acids																							
Perfluorononanesulfonic acid (PFNS)	µg/L	0.01	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	-
	mg/kg	0.005	-	-	-	-	<0.005	-	-	-	-	-	-	-	-	-	-	-	<0.005	-	-	-	-
Perfluorooctanesulfonic acid (PFOS)	µg/L	0.01	-	-	-	-	-	-	-	0.81	-	1.52	2.10	**32**	-	-	-	-	-	-	-	-	-
	mg/kg	0.0002	0.137	0.124	10	0.137	0.16	15	0.137	-	-	-	-	-	0.0313	0.0311	1	0.0313	0.028	11	0.0222	0.0102	**74**
Perfluoropentane sulfonic acid (PFPeS)	µg/L	0.01	-	-	-	-	-	-	-	0.02	-	<0.02	<0.02	0	-	-	-	-	-	-	-	-	-
	mg/kg	0.0002	0.0014	0.0010	33	0.0014	<0.005	0	0.0014	-	-	-	-	-	<0.0002	<0.0002	0	<0.0002	<0.005	0	0.0002	0.0002	0
Perfluorohexane sulfonic acid (PFHxS)	µg/L	0.01	-	-	-	-	-	-	-	0.26	-	0.33	0.31	6	-	-	-	-	-	-	-	-	-
	mg/kg	0.0002	0.0190	0.0214	12	0.0190	0.01	**62**	0.0190	-	-	-	-	-	0.0007	0.0006	15	0.0007	<0.005	0	0.0028	0.0038	30
Perfluoroheptane sulfonic acid (PFHpS)	µg/L	0.01	-	-	-	-	-	-	-	0.01	-	0.03	0.02	40	-	-	-	-	-	-	-	-	-
	mg/kg	0.0002	0.0015	0.0015	0	0.0015	<0.005	0	0.0015	-	-	-	-	-	<0.0002	<0.0002	0	<0.0002	<0.005	0	0.0005	0.0003	50
Perfluorodecanesulfonic acid (PFDS)	µg/L	0.01	-	-	-	-	-	-	-	<0.01	-	<0.02	<0.02	0	-	-	-	-	-	-	-	-	-
	mg/kg	0.0002	0.0103	0.0145	**34**	0.0103	0.014	30	0.0103	-	-	-	-	-	0.0015	0.0016	6	0.0015	<0.005	0	<0.0002	<0.0002	0
Perfluorobutane sulfonic acid (PFBS)	µg/L	0.01	-	-	-	-	-	-	-	0.02	-	<0.02	<0.02	0	-	-	-	-	-	-	-	-	-
	mg/kg	0.0002	0.0009	0.0011	20	0.0009	<0.005	0	0.0009	-	-	-	-	-	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	0.0003	40
Perfluoropropanesulfonic acid (PFPrS)	µg/L	0.01	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	-
	mg/kg	0.005	-	-	-	-	<0.005	-	-	-	-	-	-	-	-	-	-	-	<0.005	-	-	-	-
Sum of PFHxS and PFOS	µg/L	0.01	-	-	-	-	-	-	-	1.07	-	1.85	2.41	26	-	-	-	-	-	-	-	-	-
	mg/kg	0.0002	0.156	0.145	7	0.156	0.17	9	0.156	-	-	-	-	-	0.0320	0.0317	1	0.0320	0.028	13	0.0250	0.0140	**56**
Perfluoroalkyl Sulfonamides																							
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	µg/L	0.05	-	-	-	-	-	-	-	<0.05	-	<0.05	<0.05	0	-	-	-	-	-	-	-	-	-
	mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	-	-	-	-	-	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0
N-methylperfluorooctane sulfonamidoacetic acid (NMeFOSAA)	µg/L	0.02	-	-	-	-	-	-	-	<0.05	-	<0.02	<0.02	0	-	-	-	-	-	-	-	-	-
	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.01	0	<0.0002	-	-	-	-	-	<0.0002	<0.0002	0	<0.0002	<0.01	0	<0.0002	<0.0002	0
N-ethyl-perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	µg/L	0.02	-	-	-	-	-	-	-	<0.05	-	<0.02	<0.02	0	-	-	-	-	-	-	-	-	-
	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.01	0	<0.0002	-	-	-	-	-	<0.0002	<0.0002	0	<0.0002	<0.01	0	<0.0002	<0.0002	0
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	µg/L	0.05	-	-	-	-	-	-	-	<0.05	-	<0.05	<0.05	0	-	-	-	-	-	-	-	-	-
	mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	-	-	-	-	-	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0
N-Methyl perfluorooctane sulfonamide (MeFOSA)	µg/L	0.05	-	-	-	-	-	-	-	<0.05	-	<0.05	<0.05	0	-	-	-	-	-	-	-	-	-
	mg/kg	0.0005	0.0012	0.0014	15	0.0012	<0.005	0	0.0012	-	-	-	-	-	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	µg/L	0.05	-	-	-	-	-	-	-	<0.05	-	<0.05	<0.05	0	-	-	-	-	-	-	-	-	-
	mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	-	-	-	-	-	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0
Perfluorooctane sulfonamide (FOSA)	µg/L	0.02	-	-	-	-	-	-	-	<0.05	-	<0.02	<0.02	0	-	-	-	-	-	-	-	-	-
	mg/kg	0.0002	0.0075	0.0063	17	0.0075	0.0053	**34**	0.0075	-	-	-	-	-	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0
PFAS																							
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	µg/L	0.01	-	-	-	-	-	-	-	1.72	-	-	-	-	-	-	-	-	-	-	-	-	-
	mg/kg	0.005	-	-	-	-	0.195	-	-	-	-	-	-	-	-	-	-	-	0.028	-	-	-	-
Sum of US EPA PFAS (PFOS + PFOA)*	µg/L	0.01	-	-	-	-	-	-	-	1.46	-	-	-	-	-	-	-	-	-	-	-	-	-
	mg/kg	0.005	-	-	-	-	0.185	-	-	-	-	-	-	-	-	-	-	-	0.028	-	-	-	-
Sum of PFAS	µg/L	0.01	-	-	-	-	-	-	-	3.05	-	4.32	5.28	20	-	-	-	-	-	-	-	-	-
	mg/kg	0.0002	0.273	0.261	4	0.273	0.2678	2	0.273	-	-	-	-	-	0.0367	0.0359	2	0.0367	<0.05	0	0.0265	0.0156	**52**

***RPDs have only been considered where a concentration is greater than 1 times the EQL.**
****Elevated RPDs are highlighted as per QAQC Profile settings (Acceptable RPDs for each EQL multiplier range are: 1000 (1 - 10 x EQL); 50 (10 - 20 x EQL); 30 (> 20 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 L-1: RPD Analytical Results - Soil
Preliminary Site Investigation
Norfolk Island
DITCRD

senversa

		Location Code	A_SS50	A_SS50		A_SS52	A_SS52		A_SS52	A_SS52		A_SS60	A_SS60		A_SS60	A_SS60	
		Field ID	A_SS50	QC214		A_SS52	QC115		A_SS52	QC215		A_SS60	QC116		A_SS60	QC216	
		Date	22/01/2020	22/01/2020		22/01/2020	22/01/2020		22/01/2020	22/01/2020		23/01/2020	22/01/2020		23/01/2020	23/01/2020	
		Sample Type	Normal	Interlab_D		Normal	Field_D		Normal	Interlab_D		Normal	Field_D		Normal	Interlab_D	
		Lab Report No.	ES2002806	699303	RPD	ES2002806	ES2002803	RPD	ES2002806	699303	RPD	ES2002806	ES2002803	RPD	ES2002806	699303	RPD
	Unit	EQL															
Physical Parameters																	
Leachate Fluid	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Moisture Content	%	0.1	9.1	7.2	23	5.2	4.5	14	5.2	4.1	24	15.2	13.2	14	15.2	14	8
pH (Initial)	pH Units	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
pH of Leaching Fluid	pH Units	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
pH (Final)	pH Units	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(n:2) Fluorotelomer Sulfonic Acids																	
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	µg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	mg/kg	0.0005	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0
6:2 Fluorotelomer Sulfonate (6:2 FtS)	µg/L	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	mg/kg	0.0005	<0.0005	<0.01	0	<0.0005	<0.0005	0	<0.0005	<0.01	0	<0.0005	<0.0005	0	<0.0005	<0.01	0
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	µg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	mg/kg	0.0005	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	µg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	mg/kg	0.0005	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0
Perfluoroalkane Carboxylic Acids																	
Perfluorohexanoic acid (PFHxA)	µg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	mg/kg	0.0002	0.0004	<0.005	0	0.0010	0.0011	10	0.0010	<0.005	0	0.0007	0.0007	0	0.0007	<0.005	0
Perfluorododecanoic acid (PFDoDA)	µg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	mg/kg	0.0002	<0.0002	<0.005	0	<0.0005	0.0004	0	<0.0005	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluorononanoic acid (PFNA)	µg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	mg/kg	0.0002	<0.0002	<0.005	0	<0.0005	0.0005	0	<0.0005	<0.005	0	0.0002	0.0004	67	0.0002	<0.005	0
Perfluoropentanoic acid (PFPeA)	µg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	mg/kg	0.0002	<0.0002	<0.005	0	<0.0005	0.0003	0	<0.0005	<0.005	0	0.0009	0.0006	40	0.0009	<0.005	0
Perfluorotetradecanoic acid (PFTeDA)	µg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	mg/kg	0.0005	<0.0005	<0.005	0	<0.0012	<0.0005	0	<0.0012	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0
Perfluoroheptanoic acid (PFHpA)	µg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	mg/kg	0.0002	<0.0002	<0.005	0	<0.0005	0.0004	0	<0.0005	<0.005	0	0.0004	0.0004	0	0.0004	<0.005	0
Perfluorobutanoic acid (PFBA)	µg/L	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	mg/kg	0.001	<0.001	<0.005	0	<0.001	0.003	100	<0.001	<0.005	0	0.002	0.001	67	0.002	<0.005	0
Perfluorodecanoic acid (PFDA)	µg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	mg/kg	0.0002	<0.0002	<0.005	0	<0.0005	0.0005	0	<0.0005	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluorotridecanoic acid (PFTrDA)	µg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	mg/kg	0.0002	<0.0002	<0.005	0	<0.0005	<0.0002	0	<0.0005	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluoroundecanoic acid (PFUnDA)	µg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	mg/kg	0.0002	<0.0002	<0.005	0	<0.0005	0.0004	0	<0.0005	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluorooctanoic acid (PFOA)	µg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	mg/kg	0.0002	0.0004	<0.005	0	<0.0005	0.0004	0	<0.0005	<0.005	0	0.0005	0.0006	18	0.0005	<0.005	0
Perfluoroalkane Sulfonic Acids																	
Perfluorononanesulfonic acid (PFNS)	µg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	mg/kg	0.005	-	<0.005	-	-	-	-	-	<0.005	-	-	-	-	-	<0.005	-
Perfluorooctanesulfonic acid (PFOS)	µg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	mg/kg	0.0002	0.0222	0.018	21	0.0492	0.0515	5	0.0492	0.037	28	0.0274	0.0299	9	0.0274	0.031	12
Perfluoropentane sulfonic acid (PFPeS)	µg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	mg/kg	0.0002	0.0002	<0.005	0	<0.0005	0.0005	0	<0.0005	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluorohexane sulfonic acid (PFHxS)	µg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	mg/kg	0.0002	0.0028	<0.005	0	0.0029	0.0056	**64**	0.0029	<0.005	0	0.0008	0.0011	32	0.0008	<0.005	0
Perfluoroheptane sulfonic acid (PFHpS)	µg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	mg/kg	0.0002	0.0005	<0.005	0	<0.0005	0.0005	0	<0.0005	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluorodecanesulfonic acid (PFDS)	µg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	mg/kg	0.0002	<0.0002	<0.005	0	0.0078	0.0092	16	0.0078	<0.005	**44**	0.0004	0.0007	55	0.0004	<0.005	0
Perfluorobutane sulfonic acid (PFBS)	µg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	mg/kg	0.0002	<0.0002	<0.005	0	<0.0005	0.0004	0	<0.0005	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluoropropanesulfonic acid (PFPrS)	µg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	mg/kg	0.005	-	<0.005	-	-	-	-	-	<0.005	-	-	-	-	-	<0.005	-
Sum of PFHxS and PFOS	µg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	mg/kg	0.0002	0.0250	0.018	**33**	0.0521	0.0571	9	0.0521	0.037	**34**	0.0282	0.0310	9	0.0282	0.031	9
Perfluoroalkyl Sulfonamides																	
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	µg/L	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	mg/kg	0.0005	<0.0005	<0.005	0	<0.0012	<0.0005	0	<0.0012	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0
N-methylperfluorooctane sulfonamidoacetic acid (NMeFOSAA)	µg/L	0.02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	mg/kg	0.0002	<0.0002	<0.01	0	<0.0005	<0.0002	0	<0.0005	<0.01	0	<0.0002	<0.0002	0	<0.0002	<0.01	0
N-ethyl-perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	µg/L	0.02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	mg/kg	0.0002	<0.0002	<0.01	0	<0.0005	<0.0002	0	<0.0005	<0.01	0	<0.0002	<0.0002	0	<0.0002	<0.01	0
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	µg/L	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	mg/kg	0.0005	<0.0005	<0.005	0	<0.0012	<0.0005	0	<0.0012	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0
N-Methyl perfluorooctane sulfonamide (MeFOSA)	µg/L	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	mg/kg	0.0005	<0.0005	<0.005	0	<0.0012	<0.0005	0	<0.0012	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	µg/L	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	mg/kg	0.0005	<0.0005	<0.005	0	<0.0012	<0.0005	0	<0.0012	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0
Perfluorooctane sulfonamide (FOSA)	µg/L	0.02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	mg/kg	0.0002	<0.0002	<0.005	0	<0.0005	0.0004	0	<0.0005	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0
PFAS																	
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	µg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	mg/kg	0.005	-	0.018	-	-	-	-	-	0.037	-	-	-	-	-	0.031	-
Sum of US EPA PFAS (PFOS + PFOA)*	µg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	mg/kg	0.005	-	0.018	-	-	-	-	-	0.037	-	-	-	-	-	0.031	-
Sum of PFAS	µg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	mg/kg	0.0002	0.0265	<0.05	0	0.0609	0.0751	21	0.0609	<0.05	20	0.0333	0.0354	6	0.0333	<0.05	0

***RPDs have only been considered where a concentration is greater than 1 times the EQL.**
****Elevated RPDs are highlighted as per QAQC Profile settings (Acceptable RPDs for each EQL multiplier range are: 1000 (1 - 10 x EQL); 50 (10 - 20 x EQL); 30 (> 20 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 L-2: RPD Analytical Results - Water
Preliminary Site Investigation
Norfolk Island
DITCRD

		Location Code	PWS_AIRPORT_BORE	PWS_AIRPORT_BORE		PWS_AIRPORT_BORE	PWS_AIRPORT_BORE		PWS_HEAD_DAM	PWS_HEAD_DAM		PWS_HEAD_DAM	PWS_HEAD_DAM	
		Field ID	PWS_AIRPORT_BORE	QC101		PWS_AIRPORT_BORE	QC201		PWS_HEAD_DAM	QC100		PWS_HEAD_DAM	QC200	
		Date	14/01/2020	14/01/2020		14/01/2020	14/01/2020		14/01/2020	14/01/2020		14/01/2020	14/01/2020	
		Sample Type	Normal	Field_D		Normal	Interlab_D		Normal	Field_D		Normal	Interlab_D	
		Lab Report No.	ES2002626	ES2002626	RPD	ES2002626	699266	RPD	ES2002626	ES2002626	RPD	ES2002626	699266	RPD
	Unit	EQL												
Major Ions														
Calcium (filtered)	mg/L	1	8	-	-	8	-	-	8	-	-	8	-	-
Chloride	mg/L	1	104	-	-	104	-	-	191	-	-	191	-	-
Magnesium (filtered)	mg/L	1	9	-	-	9	-	-	12	-	-	12	-	-
Potassium (filtered)	mg/L	1	2	-	-	2	-	-	3	-	-	3	-	-
Sulfate (as SO4) (filtered)	mg/L	1	26	-	-	26	-	-	27	-	-	27	-	-
Sodium (filtered)	mg/L	1	73	-	-	73	-	-	102	-	-	102	-	-
Anions Total	meq/L	0.01	4.27	-	-	4.27	-	-	6.51	-	-	6.51	-	-
Cations Total	meq/L	0.01	4.37	-	-	4.37	-	-	5.90	-	-	5.90	-	-
Ionic Balance	%	0.01	1.07	-	-	1.07	-	-	4.91	-	-	4.91	-	-
Alkalinity														
Bicarbonate Alkalinity (as CaCO3)	mg/L	1	40	-	-	40	-	-	28	-	-	28	-	-
Carbonate Alkalinity (as CaCO3)	mg/L	1	<1	-	-	<1	-	-	<1	-	-	<1	-	-
Hydroxide Alkalinity (as CaCO3)	mg/L	1	<1	-	-	<1	-	-	<1	-	-	<1	-	-
Total Alkalinity (as CaCO3)	mg/L	1	40	-	-	40	-	-	28	-	-	28	-	-
(n:2) Fluorotelomer Sulfonic Acids														
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	µg/L	0.01	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0
6:2 Fluorotelomer Sulfonate (6:2 FtS)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	µg/L	0.01	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	µg/L	0.01	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0
Perfluoroalkane Carboxylic Acids														
Perfluorohexanoic acid (PFHxA)	µg/L	0.01	1.35	1.34	1	1.35	1.2	12	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorododecanoic acid (PFDoDA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorononanoic acid (PFNA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluoropentanoic acid (PFPeA)	µg/L	0.01	0.33	0.33	0	0.33	0.27	20	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorotetradecanoic acid (PFTeDA)	µg/L	0.01	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0
Perfluoroheptanoic acid (PFHpA)	µg/L	0.01	0.28	0.27	4	0.28	0.25	11	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorobutanoic acid (PFBA)	µg/L	0.05	0.2	0.2	0	0.2	0.15	29	<0.1	<0.1	0	<0.1	<0.05	0
Perfluorodecanoic acid (PFDA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorotridecanoic acid (PFTrDA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluoroundecanoic acid (PFUnDA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorooctanoic acid (PFOA)	µg/L	0.01	0.57	0.57	0	0.57	0.57	0	<0.01	<0.01	0	<0.01	<0.01	0
Perfluoroalkane Sulfonic Acids														
Perfluorononanesulfonic acid (PFNS)	µg/L	0.01	-	-	-	-	0.10	-	-	-	-	-	<0.01	-
Perfluorooctanesulfonic acid (PFOS)	µg/L	0.01	33.1	20.6	**47**	33.1	22	**40**	0.02	0.02	0	0.02	<0.01	67
Perfluoropentane sulfonic acid (PFPeS)	µg/L	0.01	1.62	1.47	10	1.62	1.2	30	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorohexane sulfonic acid (PFHxS)	µg/L	0.01	11.4	8.24	**32**	11.4	10	13	<0.02	<0.02	0	<0.02	<0.01	0
Perfluoroheptane sulfonic acid (PFHpS)	µg/L	0.01	0.92	0.89	3	0.92	0.62	**39**	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorodecanesulfonic acid (PFDS)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorobutane sulfonic acid (PFBS)	µg/L	0.01	1.27	1.23	3	1.27	1.1	14	<0.02	<0.02	0	<0.02	<0.01	0
Perfluoropropanesulfonic acid (PFPrS)	µg/L	0.01	-	-	-	-	0.50	-	-	-	-	-	<0.01	-
Sum of PFHxS and PFOS	µg/L	0.01	44.5	28.8	**43**	44.5	32	**33**	0.02	0.02	0	0.02	<0.01	67
Perfluoroalkyl Sulfonamides														
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0
N-methylperfluorooctane sulfonamidoacetic acid (NMeFOSAA)	µg/L	0.02	<0.02	<0.02	0	<0.02	<0.05	0	<0.02	<0.02	0	<0.02	<0.05	0
N-ethyl-perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	µg/L	0.02	<0.02	<0.02	0	<0.02	<0.05	0	<0.02	<0.02	0	<0.02	<0.05	0
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0
N-Methyl perfluorooctane sulfonamide (MeFOSA)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0
Perfluorooctane sulfonamide (FOSA)	µg/L	0.02	<0.02	<0.02	0	<0.02	<0.05	0	<0.02	<0.02	0	<0.02	<0.05	0
PFAS														
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	µg/L	0.01	-	-	-	-	32.57	-	-	-	-	-	<0.01	-
Sum of US EPA PFAS (PFOS + PFOA)*	µg/L	0.01	-	-	-	-	22.57	-	-	-	-	-	<0.01	-
Sum of PFAS	µg/L	0.01	51.0	35.1	**37**	51.0	37.96	29	0.02	0.02	0	0.02	<0.1	0

***RPDs have only been considered where a concentration is greater than 1 times the EQL.**
****Elevated RPDs are highlighted as per QAQC Profile settings (Acceptable RPDs for each EQL multiplier range are: 1000 (1 - 10 x EQL); 50 (10 - 20 x EQL); 30 (> 20 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 L-2: RPD Analytical Results - Water
Preliminary Site Investigation
Norfolk Island
DITCRD

senversa

	Unit	EQL												
Location Code			ID005_TANK	ID005_TANK		ID005_TANK	ID005_TANK		PWS_SCH_BORE	PWS_SCH_BORE		PWS_SCH_BORE	PWS_SCH_BORE	
Field ID			ID005_TANK	QC103		ID005_TANK	QC203		PWS_SCH_BORE	QC102		PWS_SCH_BORE	QC202	
Date			16/01/2020	16/01/2020		16/01/2020	16/01/2020		16/01/2020	16/01/2020		16/01/2020	16/01/2020	
Sample Type			Normal	Field_D		Normal	Interlab_D		Normal	Field_D		Normal	Interlab_D	
Lab Report No.			ES2002612	ES2002626	RPD	ES2002612	ES2002626	RPD	ES2002620	ES2002620	RPD	ES2002620	699263	RPD
Major Ions														
Calcium (filtered)	mg/L	1	-	-	-	-	-	-	4	-	-	4	-	-
Chloride	mg/L	1	-	-	-	-	-	-	57	-	-	57	-	-
Magnesium (filtered)	mg/L	1	-	-	-	-	-	-	5	-	-	5	-	-
Potassium (filtered)	mg/L	1	-	-	-	-	-	-	1	-	-	1	-	-
Sulfate (as SO4) (filtered)	mg/L	1	-	-	-	-	-	-	22	-	-	22	-	-
Sodium (filtered)	mg/L	1	-	-	-	-	-	-	50	-	-	50	-	-
Anions Total	meq/L	0.01	-	-	-	-	-	-	2.50	-	-	2.50	-	-
Cations Total	meq/L	0.01	-	-	-	-	-	-	2.81	-	-	2.81	-	-
Ionic Balance	%	0.01	-	-	-	-	-	-	-	-	-	-	-	-
Alkalinity														
Bicarbonate Alkalinity (as CaCO3)	mg/L	1	-	-	-	-	-	-	22	-	-	22	-	-
Carbonate Alkalinity (as CaCO3)	mg/L	1	-	-	-	-	-	-	<1	-	-	<1	-	-
Hydroxide Alkalinity (as CaCO3)	mg/L	1	-	-	-	-	-	-	<1	-	-	<1	-	-
Total Alkalinity (as CaCO3)	mg/L	1	-	-	-	-	-	-	22	-	-	22	-	-
(n:2) Fluorotelomer Sulfonic Acids														
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	µg/L	0.01	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.01	0
6:2 Fluorotelomer Sulfonate (6:2 FtS)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	µg/L	0.01	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.01	0
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	µg/L	0.01	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.01	0
Perfluoroalkane Carboxylic Acids														
Perfluorohexanoic acid (PFHxA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.02	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorododecanoic acid (PFDoDA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.02	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorononanoic acid (PFNA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.02	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluoropentanoic acid (PFPeA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.02	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorotetradecanoic acid (PFTeDA)	µg/L	0.01	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.01	0
Perfluoroheptanoic acid (PFHpA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.02	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorobutanoic acid (PFBA)	µg/L	0.05	<0.1	<0.1	0	<0.1	<0.1	0	<0.1	<0.1	0	<0.1	<0.05	0
Perfluorodecanoic acid (PFDA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.02	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorotridecanoic acid (PFTrDA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.02	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluoroundecanoic acid (PFUnDA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.02	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorooctanoic acid (PFOA)	µg/L	0.01	<0.01	<0.01	0	<0.01	<0.01	0	<0.01	<0.01	0	<0.01	<0.01	0
Perfluoroalkane Sulfonic Acids														
Perfluorononanesulfonic acid (PFNS)	µg/L	0.01	-	-	-	-	-	-	-	-	-	-	<0.01	-
Perfluorooctanesulfonic acid (PFOS)	µg/L	0.01	<0.01	<0.01	0	<0.01	<0.01	0	<0.01	<0.01	0	<0.01	<0.01	0
Perfluoropentane sulfonic acid (PFPeS)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.02	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorohexane sulfonic acid (PFHxS)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.02	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluoroheptane sulfonic acid (PFHpS)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.02	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorodecanesulfonic acid (PFDS)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.02	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorobutane sulfonic acid (PFBS)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.02	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluoropropanesulfonic acid (PFPrS)	µg/L	0.01	-	-	-	-	-	-	-	-	-	-	<0.01	-
Sum of PFHxS and PFOS	µg/L	0.01	<0.01	<0.01	0	<0.01	<0.01	0	<0.01	<0.01	0	<0.01	<0.01	0
Perfluoroalkyl Sulfonamides														
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0
N-methylperfluorooctane sulfonamidoacetic acid (NMeFOSAA)	µg/L	0.02	<0.02	<0.02	0	<0.02	<0.02	0	<0.02	<0.02	0	<0.02	<0.05	0
N-ethyl-perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	µg/L	0.02	<0.02	<0.02	0	<0.02	<0.02	0	<0.02	<0.02	0	<0.02	<0.05	0
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0
N-Methyl perfluorooctane sulfonamide (MeFOSA)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0
Perfluorooctane sulfonamide (FOSA)	µg/L	0.02	<0.02	<0.02	0	<0.02	<0.02	0	<0.02	<0.02	0	<0.02	<0.05	0
PFAS														
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	µg/L	0.01	-	-	-	-	-	-	-	-	-	-	<0.01	-
Sum of US EPA PFAS (PFOS + PFOA)*	µg/L	0.01	-	-	-	-	-	-	-	-	-	-	<0.01	-
Sum of PFAS	µg/L	0.01	<0.01	<0.01	0	<0.01	<0.01	0	<0.01	<0.01	0	<0.01	<0.1	0

***RPDs have only been considered where a concentration is greater than 1 times the EQL.**
****Elevated RPDs are highlighted as per QAQC Profile settings (Acceptable RPDs for each EQL multiplier range are: 1000 (1 - 10 x EQL); 50 (10 - 20 x EQL); 30 (> 20 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 L-2: RPD Analytical Results - Water
Preliminary Site Investigation
Norfolk Island
DITCRD

Location Code			Cockpit_SW01	Cockpit_SW01		Cockpit_SW01	Cockpit_SW01		DEPOT_TANK1	DEPOT_TANK1		DEPOT_TANK1	DEPOT_TANK1	
Field ID			Cockpit_SW01	QC104		Cockpit_SW01	QC204		DEPOT_TANK1	QC110		DEPOT_TANK1	QC210	
Date			18/01/2020	18/01/2020		18/01/2020	18/01/2020		21/01/2020	21/01/2020		21/01/2020	21/01/2020	
Sample Type			Normal	Field_D		Normal	Interlab_D		Normal	Field_D		Normal	Interlab_D	
Lab Report No.			ES2002808	ES2002803	RPD	ES2002808	699303	RPD	ES2002819	ES2002803	RPD	ES2002819	699303	RPD
	Unit	EQL												
Major Ions														
Calcium (filtered)	mg/L	1	-	-	-	-	-	-	-	-	-	-	-	-
Chloride	mg/L	1	-	-	-	-	-	-	-	-	-	-	-	-
Magnesium (filtered)	mg/L	1	-	-	-	-	-	-	-	-	-	-	-	-
Potassium (filtered)	mg/L	1	-	-	-	-	-	-	-	-	-	-	-	-
Sulfate (as SO4) (filtered)	mg/L	1	-	-	-	-	-	-	-	-	-	-	-	-
Sodium (filtered)	mg/L	1	-	-	-	-	-	-	-	-	-	-	-	-
Anions Total	meq/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-
Cations Total	meq/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-
Ionic Balance	%	0.01	-	-	-	-	-	-	-	-	-	-	-	-
Alkalinity														
Bicarbonate Alkalinity (as CaCO3)	mg/L	1	-	-	-	-	-	-	-	-	-	-	-	-
Carbonate Alkalinity (as CaCO3)	mg/L	1	-	-	-	-	-	-	-	-	-	-	-	-
Hydroxide Alkalinity (as CaCO3)	mg/L	1	-	-	-	-	-	-	-	-	-	-	-	-
Total Alkalinity (as CaCO3)	mg/L	1	-	-	-	-	-	-	-	-	-	-	-	-
(n:2) Fluorotelomer Sulfonic Acids														
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	µg/L	0.01	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0
6:2 Fluorotelomer Sulfonate (6:2 FtS)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	µg/L	0.01	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	µg/L	0.01	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0
Perfluoroalkane Carboxylic Acids														
Perfluorohexanoic acid (PFHxA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorododecanoic acid (PFDoDA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorononanoic acid (PFNA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluoropentanoic acid (PFPeA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorotetradecanoic acid (PFTeDA)	µg/L	0.01	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0
Perfluoroheptanoic acid (PFHpA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorobutanoic acid (PFBA)	µg/L	0.05	<0.1	<0.1	0	<0.1	<0.05	0	<0.1	<0.1	0	<0.1	<0.05	0
Perfluorodecanoic acid (PFDA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorotridecanoic acid (PFTrDA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluoroundecanoic acid (PFUnDA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorooctanoic acid (PFOA)	µg/L	0.01	<0.01	<0.01	0	<0.01	<0.01	0	<0.01	<0.01	0	<0.01	<0.01	0
Perfluoroalkane Sulfonic Acids														
Perfluorononanesulfonic acid (PFNS)	µg/L	0.01	-	-	-	-	<0.01	-	-	-	-	-	<0.01	-
Perfluorooctanesulfonic acid (PFOS)	µg/L	0.01	0.02	0.02	0	0.02	0.01	67	<0.01	<0.01	0	<0.01	<0.01	0
Perfluoropentane sulfonic acid (PFPeS)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorohexane sulfonic acid (PFHxS)	µg/L	0.01	0.02	0.02	0	0.02	<0.01	67	<0.02	<0.02	0	<0.02	<0.01	0
Perfluoroheptane sulfonic acid (PFHpS)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorodecanesulfonic acid (PFDS)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorobutane sulfonic acid (PFBS)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	0.01	0
Perfluoropropanesulfonic acid (PFPrS)	µg/L	0.01	-	-	-	-	<0.01	-	-	-	-	-	<0.01	-
Sum of PFHxS and PFOS	µg/L	0.01	0.04	0.04	0	0.04	0.01	120	<0.01	<0.01	0	<0.01	<0.01	0
Perfluoroalkyl Sulfonamides														
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0
N-methylperfluorooctane sulfonamidoacetic acid (NMeFOSAA)	µg/L	0.02	<0.02	<0.02	0	<0.02	<0.05	0	<0.02	<0.02	0	<0.02	<0.05	0
N-ethyl-perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	µg/L	0.02	<0.02	<0.02	0	<0.02	<0.05	0	<0.02	<0.02	0	<0.02	<0.05	0
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0
N-Methyl perfluorooctane sulfonamide (MeFOSA)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0
Perfluorooctane sulfonamide (FOSA)	µg/L	0.02	<0.02	<0.02	0	<0.02	<0.05	0	<0.02	<0.02	0	<0.02	<0.05	0
PFAS														
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	µg/L	0.01	-	-	-	-	0.01	-	-	-	-	-	<0.01	-
Sum of US EPA PFAS (PFOS + PFOA)*	µg/L	0.01	-	-	-	-	0.01	-	-	-	-	-	<0.01	-
Sum of PFAS	µg/L	0.01	0.04	0.04	0	0.04	<0.1	0	<0.01	<0.01	0	<0.01	<0.1	0

***RPDs have only been considered where a concentration is greater than 1 times the EQL.**
****Elevated RPDs are highlighted as per QAQC Profile settings (Acceptable RPDs for each EQL multiplier range are: 1000 (1 - 10 x EQL); 50 (10 - 20 x EQL); 30 (> 20 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 L-2: RPD Analytical Results - Water
Preliminary Site Investigation
Norfolk Island
DITCRD

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	Unit	EQL									
Location Code			ID014_BORE	ID014_BORE		ID014_BORE	ID014_BORE		PWS_HOSP_TAP1	PWS_HOSP_TAP1	
Field ID			ID014_BORE	QC117		ID014_BORE	QC217		PWS_HOSP_TAP1	QC118	
Date			23/01/2020	21/01/2020		23/01/2020	23/01/2020		13/02/2020	13/02/2020	
Sample Type			Normal	Field_D		Normal	Interlab_D		Normal	Field_D	
Lab Report No.			ES2002813	ES2002803	RPD	ES2002813	699303	RPD	EM2002483	EM2002483	RPD
Major Ions											
Calcium (filtered)	mg/L	1	-	-	-	-	-	-	-	-	-
Chloride	mg/L	1	-	-	-	-	-	-	-	-	-
Magnesium (filtered)	mg/L	1	-	-	-	-	-	-	-	-	-
Potassium (filtered)	mg/L	1	-	-	-	-	-	-	-	-	-
Sulfate (as SO4) (filtered)	mg/L	1	-	-	-	-	-	-	-	-	-
Sodium (filtered)	mg/L	1	-	-	-	-	-	-	-	-	-
Anions Total	meq/L	0.01	-	-	-	-	-	-	-	-	-
Cations Total	meq/L	0.01	-	-	-	-	-	-	-	-	-
Ionic Balance	%	0.01	-	-	-	-	-	-	-	-	-
Alkalinity											
Bicarbonate Alkalinity (as CaCO3)	mg/L	1	-	-	-	-	-	-	-	-	-
Carbonate Alkalinity (as CaCO3)	mg/L	1	-	-	-	-	-	-	-	-	-
Hydroxide Alkalinity (as CaCO3)	mg/L	1	-	-	-	-	-	-	-	-	-
Total Alkalinity (as CaCO3)	mg/L	1	-	-	-	-	-	-	-	-	-
(n:2) Fluorotelomer Sulfonic Acids											
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	µg/L	0.01	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0
6:2 Fluorotelomer Sulfonate (6:2 FtS)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	µg/L	0.01	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	µg/L	0.01	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0
Perfluoroalkane Carboxylic Acids											
Perfluorohexanoic acid (PFHxA)	µg/L	0.01	0.15	0.14	7	0.15	0.11	31	<0.02	<0.02	0
Perfluorododecanoic acid (PFDoDA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0
Perfluorononanoic acid (PFNA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0
Perfluoropentanoic acid (PFPeA)	µg/L	0.01	0.04	0.04	0	0.04	0.03	29	<0.02	<0.02	0
Perfluorotetradecanoic acid (PFTeDA)	µg/L	0.01	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0
Perfluoroheptanoic acid (PFHpA)	µg/L	0.01	0.02	<0.02	0	0.02	0.02	0	<0.02	<0.02	0
Perfluorobutanoic acid (PFBA)	µg/L	0.05	<0.1	<0.1	0	<0.1	<0.05	0	<0.1	<0.1	0
Perfluorodecanoic acid (PFDA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0
Perfluorotridecanoic acid (PFTrDA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0
Perfluoroundecanoic acid (PFUnDA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0
Perfluorooctanoic acid (PFOA)	µg/L	0.01	0.05	0.04	22	0.05	0.03	50	<0.01	<0.01	0
Perfluoroalkane Sulfonic Acids											
Perfluorononanesulfonic acid (PFNS)	µg/L	0.01	-	-	-	-	<0.01	-	-	-	-
Perfluorooctanesulfonic acid (PFOS)	µg/L	0.01	1.93	1.73	11	1.93	1.5	25	0.46	0.48	4
Perfluoropentane sulfonic acid (PFPeS)	µg/L	0.01	0.17	0.14	19	0.17	0.10	52	<0.02	<0.02	0
Perfluorohexane sulfonic acid (PFHxS)	µg/L	0.01	1.20	1.02	16	1.20	0.74	**47**	0.04	0.04	0
Perfluoroheptane sulfonic acid (PFHpS)	µg/L	0.01	0.08	0.07	13	0.08	0.05	46	<0.02	<0.02	0
Perfluorodecanesulfonic acid (PFDS)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0
Perfluorobutane sulfonic acid (PFBS)	µg/L	0.01	0.16	0.14	13	0.16	0.11	37	<0.02	<0.02	0
Perfluoropropanesulfonic acid (PFPrS)	µg/L	0.01	-	-	-	-	0.04	-	-	-	-
Sum of PFHxS and PFOS	µg/L	0.01	3.13	2.75	13	3.13	2.24	**33**	0.50	0.52	4
Perfluoroalkyl Sulfonamides											
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0
N-methylperfluorooctane sulfonamidoacetic acid (NMeFOSAA)	µg/L	0.02	<0.02	<0.02	0	<0.02	<0.05	0	<0.02	<0.02	0
N-ethyl-perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	µg/L	0.02	<0.02	<0.02	0	<0.02	<0.05	0	<0.02	<0.02	0
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0
N-Methyl perfluorooctane sulfonamide (MeFOSA)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0
Perfluorooctane sulfonamide (FOSA)	µg/L	0.02	<0.02	<0.02	0	<0.02	<0.05	0	<0.02	<0.02	0
PFAS											
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	µg/L	0.01	-	-	-	-	2.27	-	-	-	-
Sum of US EPA PFAS (PFOS + PFOA)*	µg/L	0.01	-	-	-	-	1.53	-	-	-	-
Sum of PFAS	µg/L	0.01	3.80	3.32	13	3.80	2.73	**33**	0.50	0.52	4

***RPDs have only been considered where a concentration is greater than 1 times the EQL.**
****Elevated RPDs are highlighted as per QAQC Profile settings (Acceptable RPDs for each EQL multiplier range are: 1000 (1 - 10 x EQL); 50 (10 - 20 x EQL); 30 (> 20 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 L-3: Rinsate Blank Analytical Results
Preliminary Site Investigation
Norfolk Island
DITCRD

	Unit	EQL	QC300	QC301	QC302	QC303	QC304	QC305
Field ID			QC300	QC301	QC302	QC303	QC304	QC305
Date			16/01/2020	17/01/2020	21/01/2020	21/01/2020	21/01/2020	21/01/2020
Sample Type			Rinsate	Rinsate	Rinsate	Rinsate	Rinsate	Rinsate
Lab Report No.			ES2002620	ES2002626	ES2002803	ES2002803	ES2002803	ES2002803
(n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	µg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer Sulfonate (6:2 FtS)	µg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	µg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	µg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Perfluoroalkane Carboxylic Acids								
Perfluorohexanoic acid (PFHxA)	µg/L	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	µg/L	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorononanoic acid (PFNA)	µg/L	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoropentanoic acid (PFPeA)	µg/L	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	µg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Perfluoroheptanoic acid (PFHpA)	µg/L	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorobutanoic acid (PFBA)	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluorodecanoic acid (PFDA)	µg/L	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTrDA)	µg/L	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	µg/L	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorooctanoic acid (PFOA)	µg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Perfluoroalkane Sulfonic Acids								
Perfluorooctanesulfonic acid (PFOS)	µg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Perfluoropentane sulfonic acid (PFPeS)	µg/L	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexane sulfonic acid (PFHxS)	µg/L	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroheptane sulfonic acid (PFHpS)	µg/L	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorodecanesulfonic acid (PFDS)	µg/L	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorobutane sulfonic acid (PFBS)	µg/L	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Sum of PFHxS and PFOS	µg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Perfluoroalkyl Sulfonamides								
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	µg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
N-methylperfluorooctane sulfonamidoacetic acid (NMeFOSAA)	µg/L	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
N-ethyl-perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	µg/L	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	µg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamide (MeFOSA)	µg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	µg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Perfluorooctane sulfonamide (FOSA)	µg/L	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
PFAS								
Sum of PFAS	µg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

Appendix M: Water Field Parameters

Attachment M: Stabilised Field Chemical Parameters
Project: Preliminary Site Investigation
Client: Department of Infrastructure, Transport, Regional Development and Communications
Site Address: Norfolk Island
Job Number: 17776

senversa

Monitoring Well Information			Water Quality Results				
Sample ID	DO (mg/L)	EC (µS/cm)	TDS	pH	Redox (mV)	Temp (°C)	Field Observations
	±10% (1)	±3% (1)	0.65 conversion	±0.05 (1)	±10mV (1)	±10%	
BBC_SW01	1.26	889	577.85	6.38	-150.8	24.8	Slightly turbid, slight odour. Stagnant water, flowing until recently
PWS_hosp_bore	3.51	623	404.95	4.96	-120.5	22.1	Clear, low turbidity, no odour, no sheen.
PWS_HOSP_TANK1	5.8	147.0	95.55	6.72	-199.0	29.2	Clear, low turbidity, no odour, no sheen.
PWS_HOSP_TANK2	4.70	190.2	123.63	6.79	-149.2	27.8	Clear, low turbidity, no odour, no sheen.
PWS_hosp_tank_3	5.94	149.7	97.31	6.20	-150.7	26.1	Clear, low turbidity, no odour, no sheen.
PWS_HOSP_TANK4	5.73	143.5	93.28	5.48	-105.2	25.9	Clear, low turbidity, no odour, no sheen.
PWS_HOSP_TANK5	5.66	140.9	91.59	5.11	-89.0	25	Clear, low turbidity, no odour, no sheen.
WC01	6.80	851	553.15	4.45	-83.8	22.4	Clear, low turbidity, no odour, no sheen.
WC02	3.02	366.2	238.03	5.90	-68.4	20.2	Clear, low turbidity, no odour, no sheen.
PWS_SCH_BORE	6.13	484	314.60	5.9	-61.5	21.9	Clear, low turbidity, no odour, no sheen.
PWS_SCH_TANK1	5.58	189.9	123.44	7.89	-82.2	23.3	Clear, low turbidity, no odour, no sheen.
PWS_SCH_TAP	6.2	184.7	120.06	7.81	-90.5	19.9	Clear, low turbidity, no odour, no sheen.
TC_SW02	3.72	705	458.25	6.55	-94.1	20.8	Clear, low turbidity, no odour, no sheen.
ID001_bore	5.96	701	455.65	5.59	-95.1	29.5	Clear, low turbidity, no odour, no sheen.
ID002_TANK	5.82	198.9	129.29	6.90	-156.9	29.6	Clear, low turbidity, no odour, no sheen.
ID003_BORE	4.88	737	479.05	5.37	-132.2	22.9	Clear, low turbidity, no odour, no sheen.
ID003_WELL	2.16	1033	671.45	4.84	-150.2	21.3	Clear, low turbidity, no odour, no sheen.
ID003_SW01	2.2	725	471.25	5.78	-165.9	21.7	Clear, low turbidity, no odour, no sheen.
ID004_TANK	0.59	478.2	310.83	6.82	-197.3	25.1	Light yellow brown, Sulfur odour
TC_SW01	4.64	850	552.50	7.59	-108.5	21.7	Clear, low turbidity, no odour, no sheen.
PWS_pound_bore_A	5.93	802	521.30	6.66	-79.6	23	Clear, low turbidity, no odour, no sheen.
PWS_hessies_reservoir	3.45	821	533.65	6.52	-93.4	20.6	Clear, low turbidity, no odour, no sheen.
PWS_duck_dam	5.40	915	594.75	6.87	-103.8	23.6	Clear, low turbidity, slight odour, no sheen.
Bumboras_SW01	4.39	1725	1121.25	6.79	-88.8	21.9	Clear, low turbidity, slight odour, no sheen, minor organics.
PWS_head_dam	5.07	949	616.85	7.08	-99.5	26.2	Light brown, slightly turbid, no odour, no sheen.
PWS_kingfish_bore_A	3.92	950	617.50	5.12	-59.2	23.7	Clear, low turbidity, no odour, no sheen.
A_bore1	2.70	414.7	269.56	5.13	-102.4	22.7	Clear, low turbidity, no odour, no sheen.
PWS_airport_bore	5.25	716	465.40	6.27	-99.1	26.7	Clear, low turbidity, no odour, no sheen.
ID005	6.42	212.9	138.39	7.09	-119.3	23.4	Clear, low turbidity, no odour, no sheen.
WC_03_BORE	7.71	383.8	249.47	5.98	-61.6	21.4	Clear, low turbidity, no odour, no sheen.
WC_03_TANK	6.52	380.8	247.52	5.66	-68.4	21.5	Clear, low turbidity, no odour, no sheen.
WC_03_TRUCK	6.78	379.6	246.74	7.04	-98.1	22.3	Clear, low turbidity, no odour, no sheen.
ID006_BORE1	6.78	810	526.50	6.00	132.0	-	Clear, low turbidity, no odour, no sheen.
ID006_BORE2	6.61	829	538.85	4.81	102.5	24.6	Clear, low turbidity, no odour, no sheen.
COCKPIT_SW01	7.09	1226	796.90	8.09	-97.6	25.1	Clear, low turbidity, no odour, no sheen.
ID007_SPRING	3.95	819	532.35	6.86	-114.3	24.2	Clear, low turbidity, no odour, no sheen.
ID009_WELL	3.6	878	570.70	6.85	-125.5	22	Clear, low turbidity, no odour, no sheen.
ID010_BORE	6.20	815	529.75	6.47	-99.6	24.1	Clear, low turbidity, no odour, no sheen.
FRE_TAP1	3.57	309.6	201.24	9.08	-138.9	27	Clear, low turbidity, no odour, no sheen.
FRE_TAP2	2.65	555	360.75	8.47	-113.7	32.8	Clear, low turbidity, no odour, no sheen.
DEPOT_TANK1	5.5	190.5	123.83	9.39	-145.7	29.8	Clear, low turbidity, no odour, no sheen.
DEPOT_TANK2	3.54	313.1	203.52	8.5	-165.4	26.7	Clear, low turbidity, no odour, no sheen.
DEPOT_TAP	4.72	288.9	187.79	8.24	-122.6	25.8	Clear, low turbidity, no odour, no sheen.
ID012_SW02	4.34	675	438.75	6.85	-135.5	23.8	Clear, low turbidity, stagnant organic odour, no sheen.
CHAP_TAP1	6.02	169.9	110.44	6.64	-70	25.1	Clear, low turbidity, no odour, no sheen.
ID013_BORE	6.7	1174	763.10	6.31	-92.1	23.2	Clear, low turbidity, no odour, no sheen.
ID013_SW01	0.52	1196	777.40	5.98	-110.6	41.5	Clear, low turbidity, no odour, no sheen.
ID014_BORE	3.22	872	566.80	6.41	-158.1	26.2	Clear, low turbidity, no odour, no sheen.
ID015_BORE	3.41	649	421.85	4.85	-76	24.1	Clear, low turbidity, no odour, no sheen.

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