Airservices Australia

Ayers Rock (Yulara) Airport

Preliminary Sampling Report

October 2017

Sections of this report have been redacted to protect personnel privacy and commercial in confidence information

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List of abbreviations

General terms	
AFFF	Aqueous Film Forming Foam
ASLP	Australian Standard Leachate Procedure
bgl	Below ground level
CSM	Conceptual Site Model
DBYD	Dial Before You Dig
DQI	Data Quality Indicator
EISL	Ecological Interim Screening level
FTG	Fire Training Ground
HISL	Human Health Interim Screening Level
HBSC	Health Based Screening Criteria
HSE	Health, Safety and Environment
ISL	Interim Screening Level
JSEA	Job Safety and Environmental Assessment
LOR	Limit of Reporting
NATA	National Association of Testing Authorities
NEPC	National Environment Protection Council
NEPM	National Environment Protection Measure
PFASs	Per- and poly fluorinated alkyl substances
PFOS	Perfluorooctane sulfonate
PFOA	Perfluorooctanoic acid
QA	Quality Assurance
QC	Quality Control
RPD	Relative Percentage Difference
SAQP	Sampling Analysis and Quality Plan
TDS	Total Dissolved Solids
TOC	Total Organic Carbon
WHS	Work Health and Safety

Units	
ha	Hectare
L	Litre
km	Kilometre
m	Metre
m^2	square metres
mbgl	metres below ground level
mg/kg	milligrams per kilogram
µg/L	micrograms per litre

1. Introduction

Airservices Australia (Airservices) engaged GHD Pty Ltd (GHD) to complete a program of preliminary sampling for the Ayres Rock (Yulara) Airport (herein referred as 'the site'). The preliminary sampling focused on the assessment of potential contamination from the historical use of Aqueous Film Forming Foams (AFFF). The investigation area is shown in Figure 1 of Appendix A.

Aqueous film-forming foams (AFFF) have been used for fire-fighting purposes around Australia for decades. On airports, AFFF has been used at fuel depots, hangars, and for aviation rescue fire-fighting (for both operational and training purposes). AFFF has not been used for aviation rescue and fire-fighting by Airservices since 2010. AFFF products currently or historically used on airport sites contain per- and/or poly- fluorinated compounds (PFASs). Depending on the type of AFFF used, the principal PFAS constituents (as active or by-product ingredients) could have included perfluorooctane sulfonate (PFOS), perfluorooctanoic acid (PFOA) and fluorotelomers such as 6:2 fluorotelomer sulfonate (6:2FtS) and 8:2 fluorotelomer sulfonate (8:2FtS).

A preliminary site investigation (PSI) of Ayers Rock (Yulara) Airport was conducted by GHD in October 2016 (GHD, 2016a). The PSI results were used to define a Sample Analysis and Quality Plan (SAQP) to set out the requirements of the Preliminary Sampling (GHD, 2016b).

The PSI identified the following areas of the site as areas of potential concern:

- Fire Station
- Fire Training Ground (FTG)
- Former interim fire station
- Sewage Treatment Plant (STP)
- Biopiled spoil near FTG

This report documents the methodology and findings of the Preliminary Sampling and provides supporting information to the PSI (GHD reference 31\34249\252961).

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

1.1 Objective of the preliminary sampling

The objective of the Preliminary Sampling was to provide some quantitative information on the contamination status of the site with respect to PFASs to allow for a more informed assessment of the potential risk to site users.

1.2 Scope of works

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

The scope of the Preliminary Sampling was as follows:

- Development of a Site Work Program including a Health Safety & Environment (HSE) Plan, and review of underground services plans and site plans
- Liaison and coordination of fieldwork with subcontractors, Airservices, Yulara Airport
- Clearance of all sample locations by a Services Locator
- Hand augering of all boreholes to a maximum depth of 1.0 m at all 18 borehole locations (SB01 to SB18)
- Collection of soil samples from soil boreholes at depths of 0.2, 0.5 and 1.0 mbgl with additional samples collected at any changes in the lithology
- Collection of five stockpile soil samples (SP01 to SP05)
- Collection of two sediment samples (SS01 to SS02). Initially surface water samples were proposed as per GHD SAQP (2016a). However, as all surface water sites were found to be dry during the field program, sediment sampling was conducted in its place to assess whether any PFAS was present in the general environment of the drain.
- Laboratory analysis of collected samples at Australian Laboratory Services (ALS) Environmental (primary lab) and Eurofins MGT (secondary lab)
- Collection of QA / QC samples for soil including "Blind" and "Split" duplicate samples
- Placement of all soil cuttings back into soil bores so that material is returned its original location
- Preparation of this Preliminary Sampling Report

1.3 Methodology references

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

- *Airports Act*, 1996
- *Airports (Environment Protection) Regulations* 1997
- Australian Standard AS 4482.1,2005. *Guide to the investigation and sampling of sites with potentially contaminated soil - Part 1: Non-volatile and semi-volatile compounds*
- Australian/New Zealand Standard (AS/NZ) 5667.1,1998. *Water Quality – Sampling. Standards Australia*
- EnHealth, 2016. *enHealth Statement: Interim National guidance on human health reference values for per- and poly-fluoroalkyl substances for use in site investigations in Australia.*
- GHD, 2015. *Airservices Australia, Managing PFC Contamination at Airports, Interim Contamination Management Strategy and Decision Framework* (GHD Reference 31\32279\239419)
- GHD, 2016a. *Airservices Australia, Ayers Rock (Yulara) Sampling Analysis and Quality Plan* (GHD reference 31\34249\252998)
- Government of Western Australia, Department of Environmental Regulation (DER), 2016: Interim Guideline on the Assessment and Management of Perfluoroalkyl and Polyfluoroalkyl Substances (PFAS)

- National Environment Protection Council (NEPC), *National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended by the National Environment Protection (Assessment of Site Contamination) Amendment Measure 2013 No. 1* (the ASC NEPM)

1.4 Limitations

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

GHD otherwise disclaims responsibility to any person other than Airservices Australia arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

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

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

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

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

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

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

2. Field investigations

2.1 Fieldwork methodology

2.1.1 Fieldwork program

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

- Drilling of 18 soil bores with hand auger to a maximum depth of 1.0 mbgl:
  - SB01 to SB05 at the STP
  - SB06 to SB08 at the Former interim fire station
  - SB09 to SB15 at the FTG
  - SB16 to SB19 at the Fire Station
- Collection of five stockpile soil samples (SP01 to SP05) from stockpiled material in the vicinity of the Fire Training Ground (FTG)
- Collection of two sediment samples (SS01, SS02) from a drainage basin between the fire station and FTG

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

Table 1 Summary of fieldwork program

Date	Activity
29 November 2016	Underground services location
30 November 2016	Drilling and sampling of soil bores for SB12 to SB18 to a maximum depth of 1.0 mbgl Sampling of five stockpile samples (SP01 – SP05) Sediment sampling from two locations (SS01 – SS02) at the base of a drainage basin
01 December 2016	Drilling and sampling of soil bores for SB01 to SB11 to a maximum depth of 1.0 mbgl

2.1.2 Soil investigation

The soil sampling methodology is summarised in Table 2.

Table 2 Soil sampling methodology

Activity	Details
Underground services locating	A Telstra-accredited independent contractor cleared underground services using radio-detection and ground penetrating radar with reference to utility plans provided by Dial Before You Dig (DBYD), prior to any sub-surface works being undertaken
Sampling plan design	The objectives and rationale of the sampling locations were detailed in the SAQP (GHD, 2016).
Soil borehole drilling	For the 18 soil borehole sampling locations (SB01 to SB18) a hand auger was utilised to drill all locations to a depth of 1.0 mbgl. Decontamination of the hand auger was undertaken between each sampling location in accordance with the decontamination methodology outlined in the SAQP.

Activity	Details
Soil bore sampling	Soil samples were collected from each of the soil boreholes generally at the near surface, 0.2 mbgl, 0.5 mbgl and 1 mbgl, or where changes in lithology or potential contamination were observed. Please note that at SB10 and SB12, no samples were collected after 0.2 and 0.25 mbgl respectively, as the soil was extremely hard and cemented resulting in refusal. Soil samples were placed into laboratory-supplied plastic jars. A total of 54 soil bore samples were collected [including four quality assurance (QA)/quality control (QC) samples (QA01, QA02, QA03 & QA04)]. The records of the soils encountered, and the samples collected (including depths and related observations) are presented in the borehole records (Appendix B). Samples were identified with a unique label, incorporating the sample location and depth (i.e. SB16_0.2 was collected from borehole SB16 at a depth of 0.2 mbgl). Care was taken during the sampling to obtain representative samples from each target level.
Stockpile samples	A total of five stockpile samples (SP01-SP05) were collected from one stockpile area, in the stockpile area located in the vicinity of the FTG and fire station. Description of samples collected are provided in surface soil observation notes (Appendix C). The stockpile soil samples were collected by loosening soil with a spade and placing into laboratory-supplied plastic jars. Sampling implements were decontaminated between sampling locations in accordance with the decontamination methodology outlined in the SAQP.
Sediment samples	Two sediment samples (SS01-SS02) were collected from a drainage basin between the FTG and fire station, focusing on areas of potential contamination risk and surface water runoff. Description of samples collected are provided in Appendix C. The surface soil samples were collected by loosening soil with a spade followed by placing the soils into laboratory-supplied plastic jars. Sampling implements were decontaminated between sampling locations in accordance with the decontamination methodology outlined in the SAQP.
Soil logging	Soils encountered during drilling were described and logged by an environmental scientist. Borehole logs are presented in Appendix B.
QA/QC	Four quality control samples (QA01, QA02, QA03 and QA04) were collected including two intra-laboratory (“blind”) samples and one inter-laboratory (“split”) sample. Refer to Appendix E.
Sample preservation and transport	Samples were chilled upon collection, stored on ice in an insulated cooler box while on site and in transit to the laboratory. Samples were transferred to the laboratory under Chain of Custody (COC) documentation. COC documentation is presented in Appendix F.
Soil cuttings	All soil cuttings from drilling activities were placed back into boreholes with all boreholes being re-instated.

2.2 Work health and safety

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

2.3 Laboratory analysis program

2.3.1 Analytical laboratories

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

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

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

2.3.2 Sample analysis

The number of soil, stockpile and sediment samples collected at the site and analysed for the selected analytical suite are summarised in Table 3.

Table 3 Laboratory analytical schedule

Sample type	No. primary samples		No. QC samples	Analytical suite
	Collected	Analysed		
Soil				
Soil borehole	50	34	4	PFOS, PFOA, 6:2 FtS, 8:2 FtS + extended PFASs suite Total organic carbon (TOC) Metals Potassium PFOS, PFOA, 6:2 FtS, 8:2 FtS + extended PFASs suite ASLP (5 samples only)
Stockpile samples	5	5	0	PFOS, PFOA, 6:2 FtS, 8:2 FtS + extended PFASs suite PFOS, PFOA, 6:2 FtS, 8:2 FtS + extended PFASs suite ASLP (2 samples only)
Drain basin sediment	2	2	0	PFOS, PFOA, 6:2 FtS, 8:2 FtS + extended PFASs suite
For the full PFASs suite – refer to the summary tables in Appendix D Metal analysis: aluminium, arsenic, cadmium, chromium (III+VI), copper, iron, lead, mercury, nickel, silicon and zinc.				

Table 4 PFASs analysed within the PFAS suite

Perfluoroalkyl Sulfonic Acids	Abbreviation
Perfluorobutane sulfonic acid	PFBS
Perfluoropentane sulfonic acid	PFPeS
Perfluorohexane sulfonic acid	PFHxS
Perfluoroheptane sulfonic acid	PFHpS
Perfluorooctane sulfonic acid	PFOS
Perfluorodecane sulfonic acid	PFDS
Perfluoroalkyl Carboxylic Acids	
Perfluorobutanoic acid	PFBA
Perfluoropentanoic acid	PFPeA
Perfluorohexanoic acid	PFHxA
Perfluoroheptanoic acid	PFHpA
Perfluorooctanoic acid	PFOA
Perfluorononanoic acid	PFNA
Perfluorodecanoic acid	PFDA
Perfluoroundecanoic acid	PFUnDA
Perfluorododecanoic acid	PFDoDA
Perfluorotridecanoic acid	PFTrDA
Perfluorotetradecanoic acid	PFTeDA
Perfluoroalkyl Sulfonamides	
Perfluorooctane sulfonamide	FOSA
N-Methyl perfluorooctane sulfonamide	MeFOSA
N-Ethyl perfluorooctane sulfonamide	EtFOSA
N-Methyl perfluorooctane sulfonamidoethanol	MeFOSE
N-Ethyl perfluorooctane sulfonamidoethanol	EtFOSE
N-Methyl perfluorooctane sulfonamidoacetic acid	MeFOSAA
N-Ethyl perfluorooctane sulfonamidoacetic acid	EtFOSAA
Fluorotelomer Sulfonic Acids	
4:2 Fluorotelomer sulfonic acid	4:2 FTS
6:2 Fluorotelomer sulfonic acid	6:2 FTS
8:2 Fluorotelomer sulfonic acid	8:2 FTS
10:2 Fluorotelomer sulfonic acid	10:2 FTS

3. Assessment criteria

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

A national consensus has not yet been reached on appropriate investigation levels for PFASs in soil, sediment, groundwater or surface water in Australia. In the interim, use of the following is considered appropriate and has been adopted as the basis for this assessment:

- *Australian Department of Health 2017, Health Based Guidance Values for PFAS – For use in site investigations in Australia*. Human health screening levels were developed by Food Standards Australia New Zealand (FSANZ) on behalf of the Australian Government Department of Health for concentration of PFOS/PFHxS[1] and PFOA in drinking water and recreational water.
- *GHD (2017).* PFAS Investigation – Derivation of PFAS soil and water criteria (GHD Reference 31\34249\256856). Based on the released interim national guidance on PFAS human health toxicity reference values by FSANZ, GHD derived PFAS criteria to be consistent with the FSANZ toxicity review, for use by Airservices.
- *GHD (2015). Airservices Australia, Managing PFC Contamination at Airports, Interim Contamination Management Strategy and Decision Framework* (GHD Reference 31\32279\239419). GHD has developed a set of interim screening levels (ISLs) for use at federally leased airport sites, based on currently available international guidelines. The ISLs include criteria for of soils, sediments, groundwater and surface water to assess protection of human health (HISLs) and ecosystems (EISLs).

The values for the adopted screening / investigation levels from these sources are summarised in Table 5.

Table 5 Adopted PFAS assessment criteria for soil and sediment

SOIL			
Exposure Scenario	PFOS	PFOA / 8:2FtS	Source
Ecological interim screening levels (EISLs) (terrestrial)	0.373 mg/kg (95% protection) 0.91 mg/kg (residential, 80% protection, low reliability) 4.71 mg/kg (commercial / industrial, 60% protection, low reliability)	3.73 mg/kg	GHD, 2015 [UK Environmental Agency 2009]
	PFOS + Perfluorohexane sulfonic acid (PFHxS)	PFOA	Source
Health-based screening criteria (HBSC) – Recreational Public Open Space	6.0 mg/kg	48 mg/kg	GHD, 2017
HBSC - Commercial/Industrial	81 mg/kg	680 mg/kg	GHD, 2017
SOIL (Leachate)			
Due to the absence of PFAS leachate criteria, the soil ASLP-PFAS results will be compared against the surface water and groundwater screening criteria.			
	PFOS	PFOA / 8:2FtS	6:2FtS
EISLs (toxicity effects on aquatic organisms)	6.66 µg/L	2900 µg/L	NA
	PFOS + PFHxS	PFOA	Source
Human health interim screening levels (HISLs) (consumption of fish)	1.0 ng/L (Freshwater)	8.2 ng/L (Freshwater)	GHD 2017
Recreational water quality value	0.7 µg/L	5.6 µg/L µg/L	Australian Department of Health 2017
Drinking water quality value	0.07 µg/L	0.56 µg/L	Australian Department of Health 2017

4. Results

The following sections summarise the field observations and analytical results of the Preliminary Sampling. Sample locations are shown in Figure 2 of Appendix A. No exceedances of the adopted screening levels were reported.

4.1 Soil

4.1.1 Field observations

Soil samples were collected from boreholes and surface soils. The soil field observations are presented in the borehole logs and soil field observations sheets contained in Appendix B and Appendix C.

Soil borehole logs typically included soils characterised as cemented fine sandy fill material overlying fine to course sub-rounded sands generally dark red in colour with some orange mottling.

4.1.2 Analytical results

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

Metals/Metalloids and minerals

The concentrations of most metals in the analysed soil samples were less than or close to the laboratory limit of reporting (LOR), with the exception of the following:

- Aluminium results ranged from 2,350 mg/kg (SB16_0.2) to 6,630 mg/kg (SB05_0.1)
- Iron concentrations ranged from 10,400 mg/kg (SB03_0.2) to 35,400 mg/kg (SB09_1.0)
- Silica (Silicon Dioxide) of the soil bore samples ranged from 4 (SB13_0.5) to 3,800 mg/kg (SB02_0.5)

There was no discernible difference in soil bore and surface soil metal results.

PFASs

Soil borehole samples analysed as part of the assessment recorded concentrations of 18 species of PFASs above the laboratory level of reporting (LOR). The species present included those with perfluorinated carbon chains from C_3 to C_{12}. All samples analysed reported at least two PFAS species. Total PFASs ranged from 0.0006 to 1.17 mg/kg. All results were less than the adopted HBSCs, HSLs, ESLs and EISLs criteria for PFASs where such criteria had been derived. In summary:

- 27 soil bore samples reported detectable PFOS concentrations above the LOR, ranging from 0.0002 mg/kg (SB15_0.2) to 0.145 mg/kg (SB04_0.2)
- 33 samples reported detectable PFOA ranging between at 0.0002 mg/kg (SB18_0.1) and 0.141 mg/kg (SB09_0.2)

Stockpile samples analysed as part of the assessment recorded concentrations of 17 species of PFASs above the laboratory LOR. The species present included those with perfluorinated carbon chains from C_3 to C_{11}. All samples analysed reported at least two PFAS species. Total PFASs ranged from 0.0016 to 0.0904 mg/kg. All results were less than the adopted HBSCs and EISLs criteria for PFASs where such criteria had been derived.

In summary:

- All five stockpile soil samples reported detectable concentration for PFOS, ranging from 0.0008 mg/kg (SP01) to 0.0434 mg/kg (SP05)
- All five samples also reported detectable PFOA concentrations, ranging between 0.0008 mg/kg (SP01) and 0.0273 mg/kg (SP04)

Sediment samples analysed as part of the assessment recorded concentrations of 15 species of PFASs above the laboratory LOR. The species present included those with perfluorinated carbon chains from C_4 to C_{13}. Total PFASs ranged from 0.035 to 0.0964 mg/kg. All results were less than the adopted HBSCs and EISLs criteria for PFASs where such criteria had been derived. In summary:

- The sediment samples reported detectable concentrations of PFOS of 0.0024 mg/kg (SS02) and 0.0069 mg/kg (SS01)
- The sediment samples reported PFOA concentrations of 0.002 mg/kg (SS02) and 0.0045 mg/kg (SS01)

4.1.3 Leached Results (ASLP)

A total of seven soil samples were chosen for Leachate analysis using the Australian Standard Leaching procedure (ASLP) with five soil bore samples and two stockpile samples chosen for analysis. Soil samples containing a range of PFAS concentrations from low to high primary PFAS concentrations were used for the analysis of leachate potential.

Leachate analysis was undertaken for the extended PFAS suite. Leached results are summarised below:

- Five out of seven samples analysed were reported with detectable levels of PFOS concentrations, ranged between 0.06 µg/L (SB06-0.5) and 2.98 µg/L (SP05). All PFOS results are within the adopted EISL for toxicity effects on aquatic organisms (6.66 µg/L).
- Five of the samples reported with detectable PFOS+PFHxS (ASLP) concentrations have exceeded the adopted FSANZ drinking water guideline with results ranging between 0.13 µg/L (SB06-0.5) and 3.46 µg/L (SP05). Two of the results (SB10-0.2 and SP05) also exceeded the adopted FSANZ recreational waters guideline.
- Three of the PFOA results (SB06-0.5, SP04 and SP05) were reported greater than the adopted FSANZ drinking water, range from 0.75 µg/L (SP05) to 2.05 µg/L (SP04).
- The laboratory LOR for PFOS+PFHxS (ASLP) (0.01 µg/L) and PFOA (ASLP) (0.01 µg) were greater than the adopted HISL for fish consumption (0.004 µg/L and 0.0029 µg/L, respectively) and consequently all results are reported as above the adopted guideline level.

In summary, the leachate results reported detectable PFAS species in all samples analysed. The species present included those with perfluorinated carbon chains from C_3 to C_9, which represented somewhat shorter chain PFASs than those reported in the soil and sediment samples. However, it should be noted that no surface water (or groundwater) was encountered during the investigation and given the hydrogeological and hydrological setting of the site, screening the results against drinking water and surface water recreational and aquatic organisms criteria represents a very conservative approach.

5. Quality assurance and quality control

The following Table 6 is a summary of the Quality Assurance and Quality Control (QA/QC) Data Quality Indicators (DQIs) used for the Preliminary Sampling and an assessment of the compliance of the data set with these QA/QC DQIs. Appendix E of this report contains further details of the QA/QC assessment program.

Table 6 Summary of QA/QC Compliance

Item	Objective	Reference	Summary of Results	Compliance
Comparison of field and analytical data	Agreement between visual and olfactory evidence with laboratory results		Field observations correspond with the laboratory results	Yes
Calibration of field instruments	Meet calibration specifications	AS4482.1-2005	Calibration certificates included Refer to Appendix G	Yes
Chain of Custody documentation	Completed		Completed in full Refer to Appendix F	Yes
Sample analysis and extraction holding times	Comply with holding times	AS4482.1-2005/NEPM (2013)	All criteria met. Refer to Appendix E	The ASLP Leaching procedure was undertaken 5-6 days overdue as a result of initial lab reports being received later than anticipated.
Sample Preservation	Samples are collected in appropriately preserved containers		All criteria met	Yes
Analysis of intra-laboratory duplicate samples	1 for every 20 samples RPD 50%	AS4482.1-2005	Refer to Appendix E	The frequency was slightly under the adopted frequency (4.9%) but not considered to adversely affect the data set. Some exceedances due to sample heterogeneity and different analytical machinery/ method used between the two laboratories

Item	Objective	Reference	Summary of Results	Compliance
Analysis of inter-laboratory duplicate samples	1 for every 20 samples RPD 50%	AS4482.1-2005	Refer to Appendix E	The frequency was slightly under the adopted frequency (4.9%) but not considered to adversely affect the data set.
Analysis of laboratory method blanks	No contamination of blanks	NEPM (2013)	All analytes were less than the laboratory LOR for ALS	Yes
Analysis of matrix and laboratory control spikes	Recoveries within the laboratory specified recovery limits	NEPM (2013)	Outliers reported for primary laboratory samples (Refer to Appendix E)	In a number of analytes the MS recovery could not be determined, background level greater than or four times greater than spike level
Analysis of laboratory surrogates	No surrogate recovery outliers	NEPM (2013)	Refer to Appendix E	Yes.
Analysis of laboratory duplicates	Frequencies and Relative Percent Differences (RPDs) within guideline and internal laboratory limits	NEPM (2013)	RPD outliers reported for primary laboratory soil samples (Refer to Appendix E)	Yes.

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

6. Discussion

6.1 Summary of results

The scope of this investigation focused on assessment of former potential source areas of most likely impact as determined in the PSI.

The investigations completed as part of this scope of works reported the highest PFASs concentrations in soil samples at the Former interim fire station and the treated sewerage discharge area. There were also some slightly elevated PFASs concentrations at the FTG and even less impact in samples from the current fire station. However, there were no exceedances of the adopted criteria across the site.

In total there were 34 detectable PFOS concentrations out of a total of 41 primary soil samples. PFOS concentrations were identified in all areas around the site assessed. Areas not assessed were not identified as potential areas of concern and it is considered unlikely that there would be any significant impact outside the main potential sources areas.

Leachate results indicated that PFAS species are leachable although it was generally the shorter chain species that were identified in the leachate. This reflects the generally higher solubility and lower sorption of the shorter species compared to the longer chain species.

6.2 Sources

The PSI identified the FTG, current and former interim fire stations and the STP as the main potential sources of PFASs. The results appear to support this assumption. Given that the airport was only commissioned in 2003 (after Airservices discontinued the use of the PFOS-containing 3M Lightwater at all of their sites), the only foam product used at Yulara Airport should have been Ansulite, which was a fluorotelomer-based product. The soil analyses indicated that 8:2 FtS reported the highest concentration of any PFAS at the site (0.592 mg/kg) in SB04 although the most common PFAS (based on the number of detections) was PFOA. It is noteworthy that PFOA can be a degradation product of 8:2 FtS and so some of the PFOA may be a result of degradation of the Ansulite product rather than the presence of another product type.

The presence of PFOS however suggests at least two possible conclusions:

- Another product was used or stored at the site that contained PFOS and potentially other PFAS compounds not found in Ansulite
- The Ansulite product used was contaminated with PFOS

It is recognised that with the cessation of use of PFAS-containing AFFF, the primary source has been removed. Secondary sources of PFAS remaining at the site include contaminated infrastructure (e.g. concrete pads and drains) as well as residual soil and sediment contamination as well as the stockpiled soil near the FTG.

6.3 Migration

The release of AFFF containing PFASs was likely to have been due to training activities, storage and (in the case of the STP) disposal activities. Once in the soil it can sorb to soil particles and be dissolved in rain water and potentially leach to deeper levels of the soil. The degree of leaching and sorption is largely controlled by the solubility of individual PFASs species, with the large compounds generally having lower solubility and higher sorption to soil organic material.

Although the concentrations reported in this report were generally low and below the adopted assessment screening levels, the fact that the material is leachable suggests it could potentially impact groundwater at the site. However, the PSI indicated that the local aquifer may be confined and present in the order of 20 to 30 m below the surface. In such situations, there is less chance of surface waters percolating to the saturated zone of the aquifer. In addition, groundwater is not extracted on site for any purpose. Therefore, unacceptable impacts to groundwater are considered unlikely. It is noted that groundwater was not sampled during this assessment and there is no identified exploitative use of groundwater in the immediate vicinity of the site.

The presence of PFASs in the sediment samples also suggest it may migrate via overland in soil particles during high rainfall events thereby acting as an ongoing secondary source of PFASs contamination to ephemeral surface water drains.

7. Summary

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

- The primary source (use of AFFF containing PFASs) no longer exists. Secondary sources include residual soil and sediment contamination
- Soil results reported concentrations of PFASs below the adopted human health and ecological guidelines, indicating that in the areas sampled, soils do not present an unacceptable risk to human health and ecological receptors
- There is a potential, albeit low, risk to groundwater in the area but groundwater is not extracted for any use in the immediate vicinity of the site

8. References

Airports Act 1996

Airports (Environment Protection) Regulations 1997

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

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CRC Care, 2017 (Draft) *Assessment, management and remediation guidance for perfluorooctanesulfonate (PFOS) and perfluorooctanoic acid (PFOA),* Technical Report 38b, May 2017

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

Environment Protection Act 1970

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

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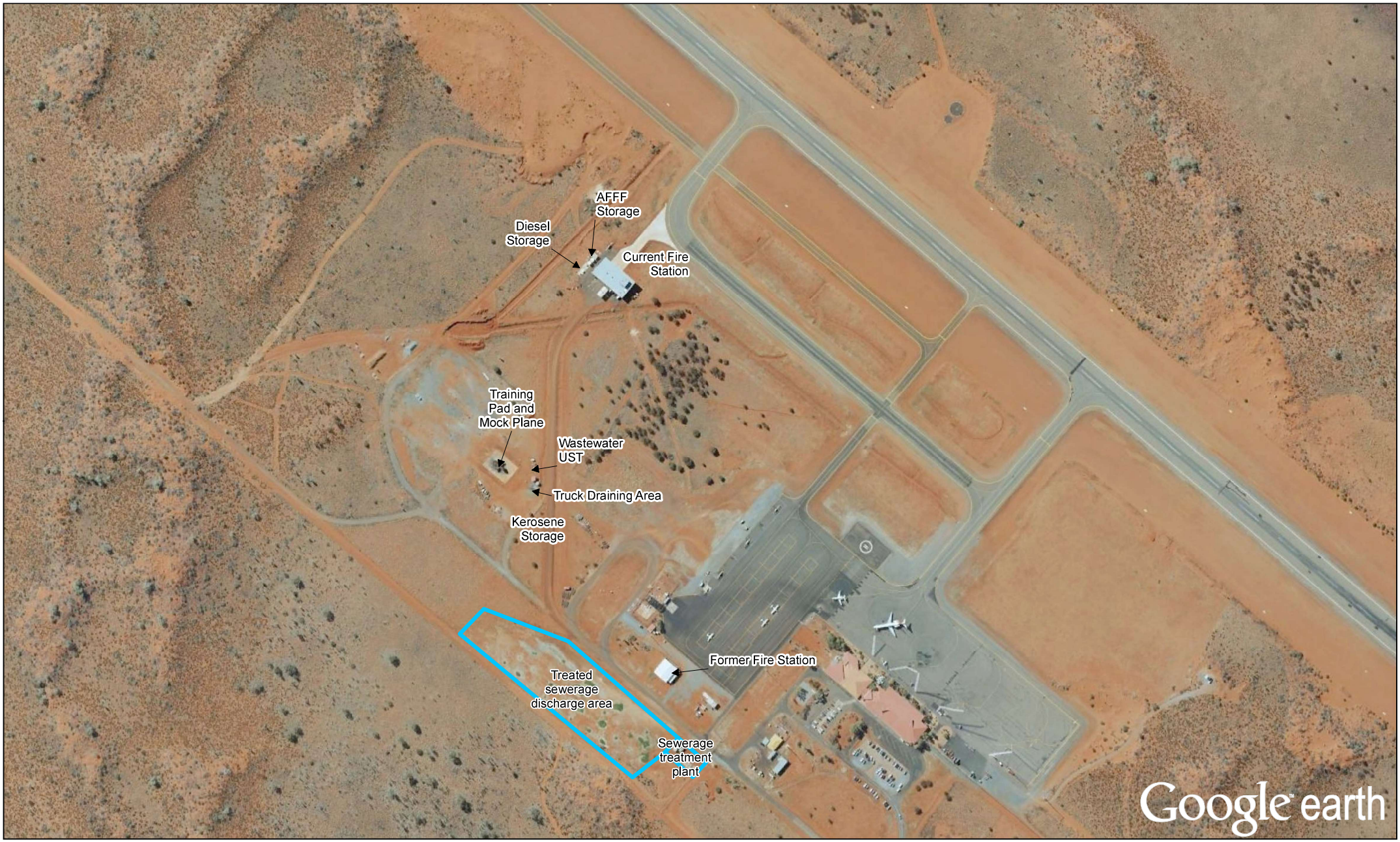
GHD, 2017. PFAS Investigation – Derivation of PFAS soil and water criteria (GHD Reference 31\34249\256856).

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

National Environment Protection Council (NEPC), *National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended by the National Environment Protection (Assessment of Site Contamination) Amendment Measure 2013 No. 1* (the ASC NEPM)

Appendices

Appendix A – Figures



1:4,000 (at A3)

0 15 30 60 90 120

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 52

N

LEGEND

Airservices Australia
Preliminary Site Investigation

Job Number	31-34249
Revision	A
Date	06/02/2017

Ayers Rock (Yulara) Airport Site Features

Figure 1

180 Lonsdale Street Melbourne VIC 3000 T 61 3 8687 8000 F 61 3 8687 8111 E melmail@ghd.com.au W www.ghd.com.au

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Data source: Image retreieved from Google Earth Pro 08/07/2016. Data custodian: DigitalGlobe. Imagery Date: 29/4/2008, 25/11/2015. Created by: ncrameri

1:2,742 (at A3)

0 12.5 25 50 75 100

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 52

N

LEGEND

- Soil Bore
- Stock pile Sample
- Sediments Sample

Airservices Australia
Preliminary Sampling Investigation

Ayers Rock (Yulara) Airport
Sampling locations

Job Number	31-34249
Revision	A
Date	11/01/2017

Figure 2

180 Lonsdale Street Melbourne VIC 3000 T 61 3 8687 8000 F 61 3 8687 8111 E melmail@ghd.com.au W www.ghd.com.au

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Data source: Image retreieved from Google Earth Pro 08/07/2016. Data custodian: DigitalGlobe; Imagery Date: 29/4/2008, 25/11/2015, GHD (11/2016) , Created by: ncrameri

Appendix B – Borehole Logs

BOREHOLE LOG

ENVIRONMENTAL-SOIL BORE

SOIL BORE SB01

Client Airservices Australia
Project Ayers Rock Airport Preliminary Sampling
Project No. 313424905
Site Ayers Rock Airport - ASA
Location Ayers Rock
Date Drilled 01/12/2016 - 01/12/2016

Drill Co. GHD
Driller NC
Rig Type HA
Drill Method HA
Total Depth (m) 1
Diameter (mm) 90

Easting -25.19131623
Northing 130.97431468
Grid Ref GDA94_MGA_zone_53
Elevation
Logged By Nick Crameri
Checked By

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials,separate phase liquids, imported fill, ash.	Elevation (m)
0	HA					SAND, fine, uniform, subrounded, orange, trace fine gravel, strong cementation (possible FILL)	D	D	no odour, no staining	0
0.2		2	SB01_0.2							-0.2
0.4						SAND, fine and coarse, gap graded, subrounded, dark red, weak to moderate cementation (NATURAL - SOIL)	SM	MD	no odour, no staining	-0.4
0.5		4	SB01_0.5							-0.5
1		4	SB01_1.0							-1
						Termination Depth at:1.00 m. Target depth achieved.				

Notes

GHD Soil Classifications The GHD Soil Classification is based on Australian Standards AS 1726-1993. This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	**Granular Soils** VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense	**Cohesive Soils** VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

BOREHOLE LOG

ENVIRONMENTAL-SOIL BORE

SOIL BORE SB02

Client Airservices Australia
Project Ayers Rock Airport Preliminary Sampling
Project No. 313424905
Site Ayers Rock Airport - ASA
Location Ayers Rock
Date Drilled 01/12/2016 - 01/12/2016

Drill Co. GHD
Driller NC
Rig Type HA
Drill Method HA
Total Depth (m) 1
Diameter (mm) 90

Easting -25.19123166
Northing 130.97411172
Grid Ref GDA94_MGA_zone_53
Elevation
Logged By Nick Crameri
Checked By

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials,separate phase liquids, imported fill, ash.	Elevation (m)
0	HA					SAND, fine, uniform, subrounded, orange, strong cementation (possible FILL)	D	D	no odour, no staining	0
0.2		1	SB02_0.2							-0.2
0.3						SAND, fine and coarse, gap graded, subrounded, dark red, weak to moderate cementation (NATURAL - SOIL)	SM	MD	no odour, no staining	-0.3
0.5		2	SB02_0.5							-0.5
1		2	SB02_1.0							-1
						Termination Depth at:1.00 m. Target depth achieved.				

Notes

GHD Soil Classifications The GHD Soil Classification is based on Australian Standards AS 1726-1993. This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	**Granular Soils** VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense	**Cohesive Soils** VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

BOREHOLE LOG

ENVIRONMENTAL-SOIL BORE

SOIL BORE SB03

Client Airservices Australia
Project Ayers Rock Airport Preliminary Sampling
Project No. 313424905
Site Ayers Rock Airport - ASA
Location Ayers Rock
Date Drilled 01/12/2016 - 01/12/2016

Drill Co. GHD
Driller NC
Rig Type HA
Drill Method HA
Total Depth (m) 1
Diameter (mm) 90

Easting -25.1910785
Northing 130.97379346
Grid Ref GDA94_MGA_zone_53
Elevation
Logged By Nick Crameri
Checked By

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials,separate phase liquids, imported fill, ash.	Elevation (m)
0	HA					SAND, fine and coarse, gap graded, subrounded, dark red, weak to moderate cementation (NATURAL - SOIL)	SM	MD	no odour, no staining	0
0.2		0.5	SB03_0.2							-0.2
0.5		1.2	SB03_0.5							-0.5
1		0	SB03_1.0			Termination Depth at:1.00 m. Target depth achieved.				-1

Notes

GHD Soil Classifications The GHD Soil Classification is based on Australian Standards AS 1726-1993. This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	**Granular Soils** VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense	**Cohesive Soils** VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

BOREHOLE LOG

ENVIRONMENTAL-SOIL BORE

SOIL BORE SB04

Client Airservices Australia
Project Ayers Rock Airport Preliminary Sampling
Project No. 313424905
Site Ayers Rock Airport - ASA
Location Ayers Rock
Date Drilled 01/12/2016 - 01/12/2016

Drill Co. GHD
Driller NC
Rig Type HA
Drill Method HA
Total Depth (m) 1
Diameter (mm) 90

Easting -25.19066219
Northing 130.97327541
Grid Ref GDA94_MGA_zone_53
Elevation
Logged By Nick Crameri
Checked By

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials,separate phase liquids, imported fill, ash.	Elevation (m)
0	HA					SAND, fine, uniform, subrounded, orange, strong cementation (possible FILL)	D	D	no odour, no staining	0
0.2		0.3	SB04_0.2							-0.2
0.45						SAND, fine and coarse, gap graded, subrounded, dark red, weak to moderate cementation (NATURAL - SOIL)	SM	MD	no odour, no staining	-0.45
0.5		1.7	SB04_0.5							-0.5
0.95		2.3	SB04_1.0							-0.95
1						Termination Depth at:1.00 m. Target depth achieved.				-1

Notes

GHD Soil Classifications The GHD Soil Classification is based on Australian Standards AS 1726-1993. This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	**Granular Soils** VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense	**Cohesive Soils** VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

BOREHOLE LOG

ENVIRONMENTAL-SOIL BORE

SOIL BORE SB05

Client Airservices Australia
Project Ayers Rock Airport Preliminary Sampling
Project No. 313424905
Site Ayers Rock Airport - ASA
Location Ayers Rock
Date Drilled 01/12/2016 - 01/12/2016

Drill Co. GHD
Driller NC
Rig Type HA
Drill Method HA
Total Depth (m) 1
Diameter (mm) 90

Easting -25.19033591
Northing 130.97271919
Grid Ref GDA94_MGA_zone_53
Elevation
Logged By Nick Crameri
Checked By

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials,separate phase liquids, imported fill, ash.	Elevation (m)
0	HA					SAND, fine, uniform, subrounded, orange, strong cementation (possible FILL)	D	D	no odour, no staining	0
0.2		1.7	SB05_0.2							-0.2
0.5		0.3	SB05_0.5			SAND, fine and coarse, gap graded, subrounded, dark red, weak to moderate cementation (NATURAL - SOIL)	SM	MD	no odour, no staining	-0.5
1		0.7	SB05_1.0			Termination Depth at:1.00 m. Target depth achieved.				-1

Notes

GHD Soil Classifications The GHD Soil Classification is based on Australian Standards AS 1726-1993. This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	**Granular Soils** VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense	**Cohesive Soils** VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

BOREHOLE LOG

ENVIRONMENTAL-SOIL BORE

SOIL BORE SB06

Client Airservices Australia
Project Ayers Rock Airport Preliminary Sampling
Project No. 313424905
Site Ayers Rock Airport - ASA
Location Ayers Rock
Date Drilled 01/12/2016 - 01/12/2016

Drill Co. GHD
Driller NC
Rig Type HA
Drill Method HA
Total Depth (m) 1
Diameter (mm) 90

Easting -25.19053051
Northing 130.97446298
Grid Ref GDA94_MGA_zone_53
Elevation
Logged By Nick Crameri
Checked By

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials,separate phase liquids, imported fill, ash.	Elevation (m)
0	HA					PROCESSED PEA GRAVEL			Loose fine gravel.	0
0.05										-0.05
0.1						SAND, fine and coarse, gap graded, subrounded, dark red, weak to moderate cementation (NATURAL - SOIL)	SM	MD	no odour, no staining	-0.1
0.15										-0.15
0.2		1	SB06_0.2							-0.2
0.25										-0.25
0.3										-0.3
0.35										-0.35
0.4										-0.4
0.45										-0.45
0.5		2	SB06_0.5							-0.5
0.55										-0.55
0.6										-0.6
0.65										-0.65
0.7										-0.7
0.75										-0.75
0.8										-0.8
0.85										-0.85
0.9										-0.9
0.95										-0.95
1		2	SB06_1.0							1
						Termination Depth at:1.00 m. Target depth achieved.				

Notes

GHD Soil Classifications The GHD Soil Classification is based on Australian Standards AS 1726-1993. This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	**Granular Soils** VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense	**Cohesive Soils** VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

BOREHOLE LOG

ENVIRONMENTAL-SOIL BORE

SOIL BORE SB07

Client Airservices Australia
Project Ayers Rock Airport Preliminary Sampling
Project No. 313424905
Site Ayers Rock Airport - ASA
Location Ayers Rock
Date Drilled 01/12/2016 - 01/12/2016

Drill Co. GHD
Driller NC
Rig Type HA
Drill Method HA
Total Depth (m) 1
Diameter (mm) 90

Easting -25.19067922
Northing 130.974629
Grid Ref GDA94_MGA_zone_53
Elevation
Logged By Nick Crameri
Checked By

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials,separate phase liquids, imported fill, ash.	Elevation (m)
0	-					SAND, fine, uniform, subrounded, orange, trace fine gravel, strong cementation (possible FILL)	D	D	no odour, no staining, with concrete	0
0.2		0	SB07_0.2							-0.2
0.35						SAND, fine and coarse, gap graded, subrounded, dark red, weak to moderate cementation (NATURAL - SOIL)	SM	MD	no odour, no staining	-0.35
0.5		0	SB07_0.5 (QA03, QA04)							-0.5
1		1	SB07_1.0							-1
						Termination Depth at:1.00 m. Target depth achieved.				

Notes

GHD Soil Classifications The GHD Soil Classification is based on Australian Standards AS 1726-1993. This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	**Granular Soils** VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense	**Cohesive Soils** VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

BOREHOLE LOG

ENVIRONMENTAL-SOIL BORE

SOIL BORE SB08

Client Airservices Australia
Project Ayers Rock Airport Preliminary Sampling
Project No. 313424905
Site Ayers Rock Airport - ASA
Location Ayers Rock
Date Drilled 01/12/2016 - 01/12/2016

Drill Co. GHD
Driller NC
Rig Type HA
Drill Method HA
Total Depth (m) 1
Diameter (mm) 90

Easting -25.19068928
Northing 130.9744791
Grid Ref GDA94_MGA_zone_53
Elevation
Logged By Nick Crameri
Checked By

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials,separate phase liquids, imported fill, ash.	Elevation (m)
0	HA					PROCESSED PEA GRAVEL			Loose fine gravel.	0
0.1						SAND, fine, uniform, subrounded, orange, trace fine gravel, strong cementation (possible FILL)	D	D	no odour, no staining	-0.1
0.2		0	SB08_0.2							-0.2
0.4						SAND, fine and coarse, gap graded, subrounded, dark red, weak to moderate cementation (NATURAL - SOIL)	SM	MD	no odour, no staining	-0.4
0.5		1	SB08_0.5							-0.5
1		1	SB08_1.0			Termination Depth at:1.00 m				-1

Notes

GHD Soil Classifications The GHD Soil Classification is based on Australian Standards AS 1726-1993. This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	**Granular Soils** VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense	**Cohesive Soils** VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

BOREHOLE LOG

ENVIRONMENTAL-SOIL BORE

SOIL BORE SB09

Client Airservices Australia
Project Ayers Rock Airport Preliminary Sampling
Project No. 313424905
Site Ayers Rock Airport - ASA
Location Ayers Rock
Date Drilled 01/12/2016 - 01/12/2016

Drill Co. GHD
Driller NC
Rig Type HA
Drill Method HA
Total Depth (m) 1
Diameter (mm) 90

Easting -25.18871993
Northing 130.97225122
Grid Ref GDA94_MGA_zone_53
Elevation
Logged By Nick Crameri
Checked By

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials,separate phase liquids, imported fill, ash.	Elevation (m)
0	HA					SAND, fine, uniform, subrounded, orange, trace fine gravel, strong cementation (possible FILL)	D	D	no odour, no staining	0
0.2		0.8	SB09_0.2							-0.2
0.4						SAND, fine and coarse, gap graded, subrounded, dark red, weak to moderate cementation (NATURAL - SOIL)	SM	MD	no odour, no staining	-0.4
0.5		3.2	SB09_0.5							-0.5
1		1.8	SB09_1.0							-1
						Termination Depth at:1.00 m. Target depth achieved.				

Notes

GHD Soil Classifications The GHD Soil Classification is based on Australian Standards AS 1726-1993. This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	**Granular Soils** VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense	**Cohesive Soils** VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

BOREHOLE LOG

ENVIRONMENTAL-SOIL BORE

SOIL BORE SB10

Client Airservices Australia
Project Ayers Rock Airport Preliminary Sampling
Project No. 313424905
Site Ayers Rock Airport - ASA
Location Ayers Rock
Date Drilled 01/12/2016 - 01/12/2016

Drill Co. GHD
Driller NC
Rig Type HA
Drill Method HA
Total Depth (m) 1
Diameter (mm) 90

Easting -25.18843653
Northing 130.97219387
Grid Ref GDA94_MGA_zone_53
Elevation
Logged By Nick Crameri
Checked By

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials,separate phase liquids, imported fill, ash.	Elevation (m)
0.05	HA					gravelly SAND, fine, uniform, rounded, dark orange, moderate to strong cementation, subangular, fine to medium, uniform gravel (FILL)	D	VD	no odour, no staining	-0.05
0.1										-0.1
0.15										-0.15
0.2		1	SB10_0.2							-0.2
0.25										-0.25
0.3										-0.3
0.35										-0.35
0.4										-0.4
0.45										-0.45
0.5										-0.5
0.55										-0.55
0.6										-0.6
0.65										-0.65
0.7										-0.7
0.75										-0.75
0.8										-0.8
0.85										-0.85
0.9										-0.9
0.95										-0.95
1						Termination Depth at:1.00 m. Heavily compacted gravelly sand.				-1

Notes

GHD Soil Classifications The GHD Soil Classification is based on Australian Standards AS 1726-1993. This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	**Granular Soils** VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense	**Cohesive Soils** VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

BOREHOLE LOG

ENVIRONMENTAL-SOIL BORE

SOIL BORE SB11

Client Airservices Australia
Project Ayers Rock Airport Preliminary Sampling
Project No. 313424905
Site Ayers Rock Airport - ASA
Location Ayers Rock
Date Drilled 01/12/2016 - 01/12/2016

Drill Co. GHD
Driller NC
Rig Type HA
Drill Method HA
Total Depth (m) 1
Diameter (mm) 90

Easting -25.18840211
Northing 130.97193261
Grid Ref GDA94_MGA_zone_53
Elevation
Logged By Nick Crameri
Checked By

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials,separate phase liquids, imported fill, ash.	Elevation (m)
0	HA					SAND, fine, uniform, subrounded, orange, trace fine gravel, strong cementation (possible FILL)	D	D	no odour, no staining	0
0.2		2.1	SB11_0.2							-0.2
0.4						SAND, fine and coarse, gap graded, subrounded, dark red, weak to moderate cementation (NATURAL - SOIL)	SM	MD	no odour, no staining	-0.4
0.5		3.1	SB11_0.5							-0.5
1		5.1	SB11_1.0							-1
						Termination Depth at:1.00 m. Target depth achieved.				

Notes

GHD Soil Classifications The GHD Soil Classification is based on Australian Standards AS 1726-1993. This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	**Granular Soils** VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense	**Cohesive Soils** VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

BOREHOLE LOG

ENVIRONMENTAL-SOIL BORE

SOIL BORE SB12

Client Airservices Australia
Project Ayers Rock Airport Preliminary Sampling
Project No. 313424905
Site Ayers Rock Airport - ASA
Location Ayers Rock
Date Drilled 30/11/2016 - 30/11/2016

Drill Co. GHD
Driller NC
Rig Type HA
Drill Method HA
Total Depth (m) 0.25
Diameter (mm) 90

Easting -25.18821917
Northing 130.97245252
Grid Ref GDA94_MGA_zone_53
Elevation
Logged By Nick Crameri
Checked By

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials,separate phase liquids, imported fill, ash.	Elevation (m)
0.05	HA					gravelly SAND, fine, uniform, rounded, dark orange, moderate to strong cementation, subangular, fine to medium, uniform gravel (FILL)	D	VD	no odour, no staining	-0.05
0.1										-0.1
0.15										-0.15
0.2										-0.2
0.25		3.3	SB12_0.25_1480			Termination Depth at:0.25 m. Refusal on cemented sandy material.				-0.25
0.3										-0.3
0.35										-0.35
0.4										-0.4
0.45										-0.45
0.5										-0.5
0.55										-0.55
0.6										-0.6
0.65										-0.65
0.7										-0.7
0.75										-0.75
0.8										-0.8
0.85										-0.85
0.9										-0.9
0.95										-0.95

Notes

GHD Soil Classifications The GHD Soil Classification is based on Australian Standards AS 1726-1993. This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	**Granular Soils** VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense	**Cohesive Soils** VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

BOREHOLE LOG

ENVIRONMENTAL-SOIL BORE

SOIL BORE SB13

Client Airservices Australia
Project Ayers Rock Airport Preliminary Sampling
Project No. 313424905
Site Ayers Rock Airport - ASA
Location Ayers Rock
Date Drilled 30/11/2016 - 30/11/2016

Drill Co. GHD
Driller NC
Rig Type HA
Drill Method HA
Total Depth (m) 1
Diameter (mm) 90

Easting -25.18823086
Northing 130.97246073
Grid Ref GDA94_MGA_zone_53
Elevation
Logged By Nick Crameri
Checked By

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials,separate phase liquids, imported fill, ash.	Elevation (m)
0	HA					SAND, fine, uniform, subrounded, orange, trace fine gravel, strong cementation (possible FILL)	D	D	no odour, no staining	0
0.2		1.4	SB13_0.2							-0.2
0.25						SAND, fine and coarse, gap graded, subrounded, dark red, weak to moderate cementation (NATURAL - SOIL)	SM	MD	no odour, no staining	-0.25
0.5		2.7	SB13_0.5							-0.5
1		3.5	SB13_1.0							-1
						Termination Depth at:1.00 m. Target depth achieved.				

Notes

GHD Soil Classifications The GHD Soil Classification is based on Australian Standards AS 1726-1993. This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	**Granular Soils** VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense	**Cohesive Soils** VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

BOREHOLE LOG

ENVIRONMENTAL-SOIL BORE

SOIL BORE SB14

Client Airservices Australia
Project Ayers Rock Airport Preliminary Sampling
Project No. 313424905
Site Ayers Rock Airport - ASA
Location Ayers Rock
Date Drilled 30/11/2016 - 30/11/2016

Drill Co. GHD
Driller NC
Rig Type HA
Drill Method HA
Total Depth (m) 1
Diameter (mm) 90

Easting -25.18827906
Northing 130.97262572
Grid Ref GDA94_MGA_zone_53
Elevation
Logged By Nick Crameri
Checked By

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials,separate phase liquids, imported fill, ash.	Elevation (m)
0	HA					SAND, fine, uniform, subrounded, orange, trace fine gravel, strong cementation (possible FILL)	D	D	no odour, no staining	0
0.2		4	SB14_0.2							-0.2
0.3						SAND, fine and coarse, gap graded, subrounded, dark red, weak to moderate cementation (NATURAL - SOIL)	SM	MD	no odour, no staining	-0.3
0.5		3.7	SB14_0.5							-0.5
1		1.3	SB14_1.0							-1
						Termination Depth at:1.00 m. Target depth achieved.				

Notes

GHD Soil Classifications The GHD Soil Classification is based on Australian Standards AS 1726-1993. This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	**Granular Soils** VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense	**Cohesive Soils** VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

BOREHOLE LOG

ENVIRONMENTAL-SOIL BORE

SOIL BORE SB15

Client Airservices Australia
Project Ayers Rock Airport Preliminary Sampling
Project No. 313424905
Site Ayers Rock Airport - ASA
Location Ayers Rock
Date Drilled 30/11/2016 - 30/11/2016

Drill Co. GHD
Driller NC
Rig Type HA
Drill Method HA
Total Depth (m) 1
Diameter (mm) 90

Easting -25.18793163
Northing 130.97253634
Grid Ref GDA94_MGA_zone_53
Elevation
Logged By Nick Crameri
Checked By

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials,separate phase liquids, imported fill, ash.	Elevation (m)
0	HA					SAND, fine, uniform, subrounded, orange, trace fine gravel, strong cementation (possible FILL)	D	D	no odour, no staining	0
0.2		0	SB15_0.2_1512							-0.2
0.25						SAND, fine and coarse, gap graded, subrounded, dark red, weak to moderate cementation (NATURAL - SOIL)	D	MD	no odour, no staining	-0.25
0.5		0	SB15_0.5_1513							-0.5
1		0	SB15_1.0			Termination Depth at:1.00 m. Target depth achieved.				-1

Notes

GHD Soil Classifications The GHD Soil Classification is based on Australian Standards AS 1726-1993. This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	**Granular Soils** VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense	**Cohesive Soils** VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

BOREHOLE LOG

ENVIRONMENTAL-SOIL BORE

SOIL BORE SB16

Client Airservices Australia
Project Ayers Rock Airport Preliminary Sampling
Project No. 313424905
Site Ayers Rock Airport - ASA
Location Ayers Rock
Date Drilled 30/11/2016 - 30/11/2016

Drill Co. GHD
Driller NC
Rig Type HA
Drill Method HA
Total Depth (m) 1
Diameter (mm) 90

Easting -25.18656922
Northing 130.97326741
Grid Ref GDA94_MGA_zone_53
Elevation
Logged By Nick Crameri
Checked By

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials,separate phase liquids, imported fill, ash.	Elevation (m)
0	HA					SAND, fine, uniform, rounded, orange, trace fine to medium gravel, moderate to strong cementation (FILL)	D	D	no odour, no staining	0
0.15		0.6	SB16_0.2			SAND, fine, uniform, rounded, dark red with mottled orange, weak cementation (NATURAL - SOIL)	M	L	no odour, no staining	-0.15
0.5		1.3	SB16_0.5							-0.5
1		0.6	SB16_1.0							-1
						Termination Depth at:1.00 m. Target depth achieved.				

Notes

GHD Soil Classifications The GHD Soil Classification is based on Australian Standards AS 1726-1993. This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	**Granular Soils** VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense	**Cohesive Soils** VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

BOREHOLE LOG

ENVIRONMENTAL-SOIL BORE

SOIL BORE SB17

Client Airservices Australia
Project Ayers Rock Airport Preliminary Sampling
Project No. 313424905
Site Ayers Rock Airport - ASA
Location Ayers Rock
Date Drilled 30/11/2016 - 30/11/2016

Drill Co. GHD
Driller NC
Rig Type HA
Drill Method HA
Total Depth (m)
Diameter (mm) 90

Easting -25.1860165
Northing 130.97346926
Grid Ref GDA94_MGA_zone_53
Elevation
Logged By Nick Crameri
Checked By

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials,separate phase liquids, imported fill, ash.	Elevation (m)
0						gravelly SAND, fine, uniform, subrounded, dark orange, moderate cementation, angular, fine, uniform gravel (FILL)	D	D	no odour, no staining	0
0.2		0.8	SB17_0.2_1471 (QA01, QA02)							-0.2
0.3						SAND, fine, uniform, rounded, dark red with mottled orange, weak cementation (NATURAL - SOIL)	M	L	no odour, no staining	-0.3
0.5		0.5	SB17_0.5_1472							-0.5
1		0.5	SB17_1.0							-1
						Termination Depth at:1.00 m. Target depth achieved.				

Notes

GHD Soil Classifications The GHD Soil Classification is based on Australian Standards AS 1726-1993. This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	**Granular Soils** VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense	**Cohesive Soils** VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

BOREHOLE LOG

ENVIRONMENTAL-SOIL BORE

SOIL BORE SB18

Client Airservices Australia
Project Ayers Rock Airport Preliminary Sampling
Project No. 313424905
Site Ayers Rock Airport - ASA
Location Ayers Rock
Date Drilled 30/11/2016 - 30/11/2016

Drill Co. GHD
Driller NC
Rig Type HA
Drill Method HA
Total Depth (m) 1
Diameter (mm) 90

Easting -25.18640761
Northing 130.97389389
Grid Ref GDA94_MGA_zone_53
Elevation
Logged By Nick Crameri
Checked By

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials,separate phase liquids, imported fill, ash.	Elevation (m)
0	HA					gravelly SAND, fine, uniform, subrounded, dark orange, moderate cementation, angular, fine, uniform gravel (FILL)	D	D	no odour, no staining	0
0.2		1	SB18_0.2							-0.2
0.25						SAND, fine, uniform, rounded, dark red with mottled orange, weak cementation (NATURAL - SOIL)	M	L	no odour, no staining	-0.25
0.5		2.7	SB18_0.5							-0.5
1		2.2	SB18_1.0							-1
						Termination Depth at:1.00 m. Target depth achieved.				

Notes

GHD Soil Classifications The GHD Soil Classification is based on Australian Standards AS 1726-1993. This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	**Granular Soils** VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense	**Cohesive Soils** VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

Appendix C – Surface Soil Observation Notes

Surface Soil Samples

Site: Ayers Rock (Yulara) **Date: 30**/11/2016 - 01/12/2016

Monitoring Personnel: N.Crameri

Field Observations

Location	Time/ date	Comments
SP01	30/11/2016	Gravelly SAND, Very fine sand, Dark Red, Dry, with medium to coarse gravel.
SP02	30/11/2016	Gravelly SAND, Very fine sand, Dark Red, Dry, with medium to coarse gravel.
SP03	30/11/2016	Gravelly SAND, Very fine sand, Dark Red, Dry, with medium to coarse gravel.
SP04	30/11/2016	Gravelly SAND, Very fine sand, Dark Red, Dry, with medium to coarse gravel.
SP05	30/11/2016	Gravelly SAND, Very fine sand, Dark Red, Dry, with medium to coarse gravel.
SS01	30/11/2016	Sandy SILT, Orange, Dry, fine sand.
SS02	30/11/2016	Sandy SILT, Orange, Dry, fine sand.

Appendix D – Summary Tabulated Results

Table 1. Soil Results

Site_ID	Location_Code	Field_ID	Sampled_Date_Time	% Moisture	pH (Final)	pH (Initial)	pH (aqueous extract)	pH (after HCL)	Total Organic Carbon	Potassium	Aluminium	Arsenic	Cadmium	Chromium (III+VI)	Copper	Iron	Lead	Mercury	Nickel	Silicon	Zinc
				Inorganics					TOC	Major Ions	Metals										
				%	pH Units	pH Units	pH Units	pH Units	%	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL				1	0.1	0.1	0.1	0.1	0.02	10	50	5	1	2	5	50	5	0.1	2	1	5
Airservices EISLs (terrestrial) - 95% protection																					
Airservices EISLs (terrestrial) - com./ind., 60% protection, low reliability																					
Airservices EISLs (terrestrial) - residential, 80% protection, low reliability																					
GHD 2017 - Airservices HBSC - Commercial/Industrial																					
GHD 2017 - Airservices HBSC - Recreational Public Open Space																					
Ayers Rock Airport - ASA	SB01	SB01_0.2	1/12/2016	2.1	-	-	-	-	0.11	70	4660	<5	<1	22	<5	13,400	<5	<0.1	4	1230	<5
		SB01_1.0	1/12/2016	5.3	-	-	-	-	0.04	40	4090	<5	<1	18	<5	12,000	<5	<0.1	<2	901	<5
	SB02	SB02_0.2	1/12/2016	2.4	-	-	-	-	0.08	140	3790	<5	<1	29	<5	12,800	<5	<0.1	7	2180	6
		SB02_0.5	1/12/2016	3.5	-	-	-	-	0.13	220	4030	<5	<1	20	<5	12,000	<5	<0.1	4	3800	<5
	SB03	SB03_0.2	1/12/2016	2.9	-	-	-	-	0.14	90	3250	<5	<1	18	<5	10,400	<5	<0.1	<2	1570	<5
		SB03_1.0	1/12/2016	2.2	4.9	7.6	4.9	1.8	0.05	80	3570	<5	<1	18	<5	11,200	<5	<0.1	2	1560	6
	SB04	SB04_0.2	1/12/2016	2.4	4.9	7.7	4.9	1.8	0.27	70	3740	<5	<1	21	<5	12,200	<5	<0.1	4	1010	32
		SB04_0.5	1/12/2016	2.5	-	-	-	-	0.09	90	4690	<5	<1	21	<5	15,300	<5	<0.1	3	1670	<5
	SB05	SB05_0.2	1/12/2016	2	-	-	-	-	0.38	140	4400	<5	<1	24	<5	15,700	<5	<0.1	3	301	25
		SB05_1.0	1/12/2016	4.9	-	-	-	-	0.09	40	6630	<5	<1	29	6	23,000	7	<0.1	6	17	6
	SB06	SB06_0.2	1/12/2016	1.1	-	-	-	-	0.09	20	3550	<5	<1	17	6	10,600	<5	<0.1	3	470	5
		SB06_0.5	1/12/2016	3.2	4.9	7.1	4.9	1.7	0.04	50	3600	<5	<1	37	12	17,200	<5	<0.1	4	1060	<5
	SB07	SB07_0.2	1/12/2016	2.4	-	-	-	-	0.07	50	4370	<5	<1	23	<5	14,600	<5	<0.1	5	852	<5
		SB07_0.5	1/12/2016	3.5	-	-	-	-	0.04	<10	4110	<5	<1	23	<5	14,300	<5	<0.1	2	59	<5
	SB08	SB08_0.2	1/12/2016	17.2	-	-	-	-	0.05	20	5430	<5	<1	32	6	15,100	<5	<0.1	9	448	5
		SB08_1.0	1/12/2016	3.6	4.9	6.2	4.9	1.8	0.04	<10	3840	<5	<1	21	<5	12,200	<5	<0.1	<2	136	<5
	SB09	SB09_0.2	1/12/2016	4.7	-	-	-	-	0.05	40	5680	<5	<1	38	7	18,800	<5	<0.1	10	302	6
		SB09_1.0	1/12/2016	2.7	-	-	-	-	0.03	<10	5160	<5	<1	87	10	35,400	6	<0.1	7	6	<5
	SB10	SB10_0.2	1/12/2016	2.9	5	8.4	4.9	1.8	0.06	90	4320	<5	<1	50	9	26,000	6	<0.1	13	28	6
	SB11	SB11_0.2	1/12/2016	4.9	-	-	-	-	0.07	40	5220	<5	<1	45	6	17,400	<5	<0.1	12	750	6
		SB11_0.5	1/12/2016	3	-	-	-	-	0.05	<10	4360	<5	<1	30	<5	17,100	<5	<0.1	2	5	<5
	SB12	SB12_0.25	30/11/2016	2.3	-	-	-	-	0.06	160	4650	<5	<1	29	6	22,100	<5	<0.1	5	451	<5
	SB13	SB13_0.2	30/11/2016	2.5	-	-	-	-	0.04	40	4150	<5	<1	40	5	20,400	<5	<0.1	7	1010	<5
		SB13_0.5	30/11/2016	5.1	-	-	-	-	0.1	20	4420	<5	<1	25	<5	16,900	<5	<0.1	2	4	<5
	SB14	SB14_0.2	30/11/2016	3.4	-	-	-	-	0.04	40	4190	<5	<1	45	5	17,100	<5	<0.1	11	804	<5
		SB14_1.0	30/11/2016	6	-	-	-	-	0.04	10	5570	<5	<1	22	<5	16,600	<5	<0.1	4	6	<5
	SB15	SB15_0.2	30/11/2016	2.8	-	-	-	-	0.08	20	4720	<5	<1	38	7	20,900	<5	<0.1	8	219	<5
		SB15_0.5	30/11/2016	2.3	-	-	-	-	0.1	10	4220	<5	<1	24	<5	16,100	<5	<0.1	3	18	<5
	SB16	SB16_0.2	30/11/2016	1.8	-	-	-	-	0.05	50	2350	<5	<1	30	<5	12,300	<5	<0.1	3	1230	<5
		SB16_0.5	30/11/2016	3	-	-	-	-	0.06	50	2540	<5	<1	18	<5	10,700	<5	<0.1	<2	1370	<5
	SB17	SB17_0.2	30/11/2016	2.3	-	-	-	-	0.07	50	3150	<5	<1	20	<5	15,000	<5	<0.1	2	1440	<5
		SB17_1.0	30/11/2016	2.2	-	-	-	-	0.04	20	3520	<5	<1	23	<5	14,400	<5	<0.1	2	7	<5
	SB18	SB18_0.2	30/11/2016	1.9	-	-	-	-	0.04	30	4310	<5	<1	39	8	12,600	5	<0.1	22	975	7
		SB18_1.0	30/11/2016	2.9	-	-	-	-	0.03	<10	4130	<5	<1	24	<5	17,000	<5	<0.1	2	65	<5
	SP01	SP01	30/11/2016	6.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	SP02	SP02	30/11/2016	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	SP03	SP03	30/11/2016	1.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	SP04	SP04	30/11/2016	<1	4.9	6	4.9	1.8	-	-	-	-	-	-	-	-	-	-	-	-	-
	SP05	SP05	30/11/2016	-	4.9	7.1	4.9	1.8	-	-	-	-	-	-	-	-	-	-	-	-	-
			30/11/2016	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	SS01	SS01	30/11/2016	1.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	SS02	SS02	30/11/2016	1.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Site_ID	Location_Code	Field_ID	Sampled_Date_Time	N-Ethyl perfluorooctane sulfonamidoacetic acid	Perfluoroheptane sulfonic acid	10:2 Fluorotelomer sulfonic acid	4:2 Fluorotelomer sulfonic acid	N-Methyl perfluorooctane sulfonamidoacetic acid	PFHxS and PFOS (Sum of Total) - Lab Calc	Perfluorobutane sulfonic acid	Perfluorohexane sulfonic acid (PFHxS)	Perfluoropentanoic acid	8:2 Fluorotelomer sulfonic acid	N-Ethyl perfluorooctane sulfonamide	N-Ethyl perfluorooctane sulfonamidoethanol	N-Methyl perfluorooctane sulfonamide	N-Methyl perfluorooctane sulfonamidoethanol	6:2 Fluorotelomer Sulfonate (6:2 FTS)
				PFAS														
				mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL				0.0002	0.0002	0.0005	0.0005	0.0002	0.0002	0.0002	0.0002	0.0002	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Airservices EISLs (terrestrial) - 95% protection													3.73					
Airservices EISLs (terrestrial) - com./ind., 60% protection, low reliability													3.73					
Airservices EISLs (terrestrial) - residential, 80% protection, low reliability													**3.73**					
GHD 2017 - Airservices HBSC - Commercial/Industrial									*81*[#1]									
GHD 2017 - Airservices HBSC - Recreational Public Open Space									6									
Ayers Rock Airport - ASA	SB01	SB01_0.2	1/12/2016	<0.0002	<0.0002	<0.0005	<0.0005	<0.0002	0.0021	<0.0002	<0.0002	<0.0002	0.0046	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
		SB01_1.0	1/12/2016	<0.0002	<0.0002	<0.0005	<0.0005	<0.0002	0.0013	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	SB02	SB02_0.2	1/12/2016	<0.0002	<0.0002	<0.0005	<0.0005	<0.0002	0.0047	<0.0002	<0.0002	0.0006	0.0272	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
		SB02_0.5	1/12/2016	<0.0002	<0.0002	<0.0005	<0.0005	<0.0002	0.0022	<0.0002	<0.0002	0.0012	0.0275	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	SB03	SB03_0.2	1/12/2016	<0.0002	<0.0002	<0.0005	<0.0005	<0.0002	0.0063	<0.0002	<0.0002	0.0002	0.0011	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
		SB03_1.0	1/12/2016	<0.0002	<0.0002	<0.0005	<0.0005	<0.0002	0.0014	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	SB04	SB04_0.2	1/12/2016	<0.0002	0.0006	0.0136	<0.0005	<0.0002	0.153	0.0019	0.0082	0.0005	0.592	<0.0005	<0.0005	<0.0005	<0.0005	0.0046
		SB04_0.5	1/12/2016	<0.0002	<0.0002	<0.0005	<0.0005	<0.0002	0.0037	<0.0002	0.0031	0.0004	0.0836	<0.0005	<0.0005	<0.0005	<0.0005	0.0197
	SB05	SB05_0.2	1/12/2016	<0.0002	<0.0002	0.0013	<0.0005	<0.0002	0.005	<0.0002	<0.0002	0.0022	0.0216	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
		SB05_1.0	1/12/2016	<0.0002	<0.0002	<0.0005	<0.0005	<0.0002	0.0004	<0.0002	0.0004	0.0044	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	SB06	SB06_0.2	1/12/2016	<0.0002	<0.0002	0.0044	<0.0005	<0.0002	0.022	0.0006	0.004	0.0107	0.324	<0.0005	<0.0005	<0.0005	<0.0005	0.0773
		SB06_0.5	1/12/2016	<0.0002	<0.0002	0.0022	<0.0005	<0.0002	0.0058	<0.0002	0.0016	0.0147	0.0448	<0.0005	<0.0005	<0.0005	<0.0005	0.0242
	SB07	SB07_0.2	1/12/2016	<0.0002	<0.0002	<0.0005	<0.0005	<0.0002	0.0024	<0.0002	0.0006	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
		SB07_0.5	1/12/2016	<0.0002	<0.0002	<0.0005	<0.0005	<0.0002	0.001	<0.0002	0.0004	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	SB08	SB08_0.2	1/12/2016	<0.0002	<0.0002	<0.0005	<0.0005	<0.0002	0.0046	<0.0002	0.0016	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
		SB08_1.0	1/12/2016	<0.0002	<0.0002	<0.0005	<0.0005	<0.0002	0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	SB09	SB09_0.2	1/12/2016	<0.0002	0.001	0.0009	<0.0005	<0.0002	0.13	0.0003	0.107	0.0051	0.125	<0.0005	<0.0005	<0.0005	<0.0005	0.0115
		SB09_1.0	1/12/2016	<0.0002	<0.0002	<0.0005	<0.0005	<0.0002	0.0016	0.001	0.0011	0.0009	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	SB10	SB10_0.2	1/12/2016	<0.0002	0.001	<0.0005	<0.0005	<0.0002	0.0493	0.0041	0.0103	0.0222	0.0023	<0.0005	<0.0005	<0.0005	<0.0005	0.003
	SB11	SB11_0.2	1/12/2016	<0.0002	<0.0002	<0.0005	<0.0005	<0.0002	0.0028	<0.0002	0.0016	<0.0002	0.0019	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
		SB11_0.5	1/12/2016	<0.0002	<0.0002	<0.0005	<0.0005	<0.0002	0.0011	<0.0002	0.0005	0.0008	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	SB12	SB12_0.25	30/11/2016	<0.0002	0.0009	<0.0005	<0.0005	<0.0002	0.0634	0.0036	0.0081	0.02	0.0019	<0.0005	<0.0005	<0.0005	<0.0005	0.0216
	SB13	SB13_0.2	30/11/2016	<0.0002	0.0032	<0.0005	<0.0005	<0.0002	0.112	0.0021	0.0625	0.0029	0.0023	<0.0005	<0.0005	<0.0005	<0.0005	0.0326
		SB13_0.5	30/11/2016	<0.0002	<0.0002	<0.0005	<0.0005	<0.0002	0.0122	0.0053	0.0095	0.0044	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	SB14	SB14_0.2	30/11/2016	<0.0002	<0.0002	<0.0005	<0.0005	<0.0002	0.0113	<0.0002	0.0042	0.0009	0.001	<0.0005	<0.0005	<0.0005	<0.0005	0.0026
		SB14_1.0	30/11/2016	<0.0002	<0.0002	<0.0005	<0.0005	<0.0002	0.0057	0.0011	0.0049	0.0021	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	SB15	SB15_0.2	30/11/2016	<0.0002	<0.0002	<0.0005	<0.0005	<0.0002	0.0005	0.0003	0.0003	0.0007	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
		SB15_0.5	30/11/2016	<0.0002	<0.0002	<0.0005	<0.0005	<0.0002	0.0003	0.0006	0.0003	0.0014	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	SB16	SB16_0.2	30/11/2016	<0.0002	<0.0002	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
		SB16_0.5	30/11/2016	<0.0002	<0.0002	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002	0.0008	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	SB17	SB17_0.2	30/11/2016	<0.0002	<0.0002	<0.0005	<0.0005	<0.0002	0.0009	<0.0002	0.0005	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
		SB17_1.0	30/11/2016	<0.0002	<0.0002	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	SB18	SB18_0.2	30/11/2016	<0.0002	<0.0002	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
		SB18_1.0	30/11/2016	<0.0002	<0.0002	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002	0.0003	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	SP01	SP01	30/11/2016	<0.0002	<0.0002	<0.0005	<0.0005	<0.0002	0.0008	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	SP02	SP02	30/11/2016	<0.0002	<0.0002	<0.0005	<0.0005	<0.0002	0.046	<0.0002	0.0019	0.0003	0.0016	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	SP03	SP03	30/11/2016	<0.0002	<0.0002	<0.0005	<0.0005	<0.0002	0.0156	<0.0002	0.0005	<0.0002	0.0015	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	SP04	SP04	30/11/2016	<0.0002	<0.0002	<0.0005	<0.0005	<0.0002	0.0051	<0.0002	0.0026	0.002	0.0145	<0.0005	<0.0005	<0.0005	<0.0005	0.0097
	SP05	SP05	30/11/2016	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			30/11/2016	<0.0002	0.0028	<0.0005	<0.0005	<0.0002	0.0527	0.0005	0.0046	0.0012	0.0049	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	SS01	SS01	30/11/2016	<0.0002	<0.0002	0.0086	<0.0005	<0.0002	0.0073	<0.0002	0.0004	0.0004	0.009	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	SS02	SS02	30/11/2016	<0.0002	<0.0002	0.002	<0.0005	<0.0002	0.0024	<0.0002	<0.0002	0.0004	0.0042	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005

Site_ID	Location_Code	Field_ID	Sampled_Date_Time	Perfluorooctanoic acid (PFOA)	Perfluoropentane sulfonic acid	Perfluorobutanoic acid	Perfluorodecanoic acid	Perfluorodecane sulfonic acid	Perfluorododecanoic acid	Perfluoroheptanoic acid	Perfluorohexanoic acid (PFHxA)	Perfluorononanoic acid	Perfluorooctane sulfonic acid (PFOS)	Perfluorooctane sulfonamide (FOSA)	Perfluorotetradecanoic acid	Perfluorotridecanoic acid	Perfluoroundecanoic acid	PFAS (Sum of Total)	PFAS (Sum of Total)(WA DER List)
				PFAS															
				mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL				0.0002	0.0002	0.001	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0005	0.0002	0.0002	0.0002	0.0002
Airservices EISLs (terrestrial) - 95% protection				3.73									0.373						
Airservices EISLs (terrestrial) - com./ind., 60% protection, low reliability				3.73									4.71						
Airservices EISLs (terrestrial) - residential, 80% protection, low reliability				**3.73**									**0.91**						
GHD 2017 - Airservices HBSC - Commercial/Industrial				*680*[#1]															
GHD 2017 - Airservices HBSC - Recreational Public Open Space				48															
Ayers Rock Airport - ASA	SB01	SB01_0.2	1/12/2016	0.0033	<0.0002	<0.001	0.0003	<0.0002	<0.0002	0.0008	<0.0002	0.0008	0.0021	<0.0002	<0.0005	<0.0002	<0.0002	0.0119	0.0108
		SB01_1.0	1/12/2016	0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0013	<0.0002	<0.0005	<0.0002	<0.0002	0.0015	0.0015
	SB02	SB02_0.2	1/12/2016	0.003	<0.0002	<0.001	0.003	<0.0002	0.0003	0.0006	0.0003	0.0048	0.0047	<0.0002	<0.0005	<0.0002	0.0005	0.045	0.0364
		SB02_0.5	1/12/2016	0.0071	<0.0002	<0.001	0.0006	<0.0002	<0.0002	0.0009	0.0004	0.0047	0.0022	<0.0002	<0.0005	<0.0002	<0.0002	0.0446	0.0393
	SB03	SB03_0.2	1/12/2016	0.0005	<0.0002	<0.001	0.0005	<0.0002	<0.0002	<0.0002	<0.0002	0.0069	0.0063	<0.0002	<0.0005	<0.0002	0.0002	0.0157	0.0081
		SB03_1.0	1/12/2016	0.0014	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	0.0003	<0.0002	<0.0002	0.0014	<0.0002	<0.0005	<0.0002	<0.0002	0.0031	0.0031
	SB04	SB04_0.2	1/12/2016	0.0056	0.0011	<0.001	0.0791	<0.0002	0.004	0.0016	0.0019	0.0432	0.145	<0.0002	<0.0005	0.0006	0.0087	0.912	0.761
		SB04_0.5	1/12/2016	0.114	<0.0002	<0.001	0.0005	<0.0002	<0.0002	0.0043	0.0009	0.0069	0.0006	<0.0002	<0.0005	<0.0002	<0.0002	0.234	0.227
	SB05	SB05_0.2	1/12/2016	0.0016	<0.0002	<0.001	0.001	<0.0002	0.0003	0.0004	0.0006	0.003	0.005	<0.0002	<0.0005	<0.0002	0.0003	0.0373	0.0314
		SB05_1.0	1/12/2016	0.0003	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	0.0016	0.0027	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	0.0094	0.0094
	SB06	SB06_0.2	1/12/2016	0.0787	0.0006	<0.001	0.0179	<0.0002	0.0084	0.388	0.177	0.0504	0.018	<0.0002	<0.0005	0.0011	0.0118	1.17	1.08
		SB06_0.5	1/12/2016	0.0454	0.0002	<0.001	0.0072	<0.0002	0.0044	0.0922	0.0747	0.0195	0.0042	<0.0002	<0.0005	0.0004	0.004	0.34	0.302
	SB07	SB07_0.2	1/12/2016	0.0042	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	0.0002	<0.0002	0.0009	0.0018	<0.0002	<0.0005	<0.0002	<0.0002	0.0077	0.0068
		SB07_0.5	1/12/2016	0.0003	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0006	<0.0002	<0.0005	<0.0002	<0.0002	0.0013	0.0013
	SB08	SB08_0.2	1/12/2016	0.0213	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	0.0008	<0.0002	0.0008	0.003	<0.0002	<0.0005	<0.0002	<0.0002	0.0275	0.0267
		SB08_1.0	1/12/2016	0.0029	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	0.0006	0.0002	0.0002	0.0002	<0.0002	<0.0005	<0.0002	<0.0002	0.0041	0.0039
	SB09	SB09_0.2	1/12/2016	0.141	0.0018	<0.001	0.0086	<0.0002	0.0031	0.132	0.0346	0.0128	0.0233	<0.0002	<0.0005	0.0007	0.0034	0.612	0.58
		SB09_1.0	1/12/2016	0.0007	0.0004	<0.001	<0.0002	<0.0002	<0.0002	0.0003	0.0046	<0.0002	0.0005	<0.0002	<0.0005	<0.0002	<0.0002	0.0095	0.0091
	SB10	SB10_0.2	1/12/2016	0.0022	0.0006	<0.001	<0.0002	<0.0002	<0.0002	0.0111	0.0989	<0.0002	0.039	<0.0002	<0.0005	<0.0002	<0.0002	0.195	0.193
	SB11	SB11_0.2	1/12/2016	0.0462	<0.0002	<0.001	0.0006	<0.0002	<0.0002	0.0071	<0.0002	0.0055	0.0012	<0.0002	<0.0005	<0.0002	0.0002	0.0643	0.058
		SB11_0.5	1/12/2016	0.0035	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	0.0036	0.0022	0.0004	0.0006	<0.0002	<0.0005	<0.0002	<0.0002	0.0116	0.0112
	SB12	SB12_0.25	30/11/2016	0.0056	0.0018	<0.001	0.0003	<0.0002	<0.0002	0.0788	0.0382	0.0004	0.0553	<0.0002	<0.0005	<0.0002	<0.0002	0.236	0.233
	SB13	SB13_0.2	30/11/2016	0.0598	0.0063	0.003	<0.0002	<0.0002	<0.0002	0.0796	0.0083	0.0006	0.049	<0.0002	<0.0005	<0.0002	<0.0002	0.312	0.302
		SB13_0.5	30/11/2016	0.0006	0.0039	0.001	<0.0002	<0.0002	<0.0002	0.0034	0.0262	<0.0002	0.0027	<0.0002	<0.0005	<0.0002	<0.0002	0.057	0.0531
	SB14	SB14_0.2	30/11/2016	0.0255	0.0005	0.001	0.0003	<0.0002	<0.0002	0.0212	0.002	0.001	0.0071	<0.0002	<0.0005	<0.0002	<0.0002	0.0673	0.0655
		SB14_1.0	30/11/2016	0.001	0.0007	<0.001	<0.0002	<0.0002	<0.0002	0.0005	0.004	<0.0002	0.0008	<0.0002	<0.0005	<0.0002	<0.0002	0.0151	0.0144
	SB15	SB15_0.2	30/11/2016	0.0014	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	0.0047	0.0027	<0.0002	0.0002	<0.0002	<0.0005	<0.0002	<0.0002	0.0103	0.0103
		SB15_0.5	30/11/2016	0.0005	<0.0002	0.001	<0.0002	<0.0002	<0.0002	0.0005	0.0024	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	0.0067	0.0067
	SB16	SB16_0.2	30/11/2016	0.0022	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	0.0004	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	0.0026	0.0026
		SB16_0.5	30/11/2016	0.0005	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	0.0015	0.0004	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	0.0032	0.0032
	SB17	SB17_0.2	30/11/2016	0.0019	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	0.0013	<0.0002	<0.0002	0.0004	<0.0002	<0.0005	<0.0002	<0.0002	0.0041	0.0041
		SB17_1.0	30/11/2016	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	0.0003	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	0.0008	0.0008
	SB18	SB18_0.2	30/11/2016	0.0006	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	0.0006	0.0006
		SB18_1.0	30/11/2016	0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	0.0009	0.0007	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	0.0021	0.0021
	SP01	SP01	30/11/2016	0.0008	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0008	<0.0002	<0.0005	<0.0002	<0.0002	0.0016	0.0016
	SP02	SP02	30/11/2016	0.0027	<0.0002	<0.001	0.0004	0.0003	<0.0002	0.0007	0.0009	0.0012	0.0441	<0.0002	<0.0005	<0.0002	<0.0002	0.0541	0.0522
	SP03	SP03	30/11/2016	0.0028	<0.0002	0.001	0.0009	<0.0002	<0.0002	<0.0002	<0.0002	0.0019	0.0151	<0.0002	<0.0005	<0.0002	<0.0002	0.0237	0.0209
	SP04	SP04	30/11/2016	0.0273	<0.0002	0.002	0.0018	<0.0002	0.001	0.0156	0.0068	0.0036	0.0025	<0.0002	<0.0005	<0.0002	0.001	0.0904	0.083
	SP05	SP05	30/11/2016	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			30/11/2016	0.0083	0.0002	0.002	0.0019	<0.0002	0.0003	0.0017	0.0021	0.0092	0.0481	<0.0002	<0.0005	<0.0002	0.0005	0.0883	0.0734
	SS01	SS01	30/11/2016	0.0045	<0.0002	<0.001	0.0051	0.0003	0.0366	0.0009	0.0006	0.0041	0.0069	<0.0002	0.0033	0.0073	0.0084	0.0964	0.0227
	SS02	SS02	30/11/2016	0.002	<0.0002	<0.001	0.0019	<0.0002	0.0111	0.001	0.0008	0.0024	0.0024	<0.0002	0.001	0.0026	0.0032	0.035	0.0108

Statistical Summary

Statistic	% Moisture	pH (Final)	pH (Initial)	pH (aqueous extract)	pH (after HCL)	Total Organic Carbon	Potassium	Aluminium	Arsenic	Cadmium	Chromium (III+VI)	Copper	Iron	Lead	Mercury	Nickel	Silicon	Zinc
Number of Results	41	7	7	7	7	34	34	34	34	34	34	34	34	34	34	34	34	34
Number of Detects	38	7	7	7	7	34	29	34	0	0	34	13	34	4	0	30	34	11
Minimum Concentration	<1	4.9	6	4.9	1.7	0.03	<10	2350	<5	<1	17	<5	10400	<5	<0.1	<2	4	<5
Minimum Detect	1.1	4.9	6	4.9	1.7	0.03	10	2350	ND	ND	17	5	10400	5	ND	2	4	5
Maximum Concentration	17.2	5	8.4	4.9	1.8	0.38	220	6630	<5	<1	87	12	35400	7	<0.1	22	3800	32
Maximum Detect	17.2	5	8.4	4.9	1.8	0.38	220	6630	ND	ND	87	12	35400	7	ND	22	3800	32
Average Concentration	3.2	4.9	7.2	4.9	1.8	0.08	53	4247	2.5	0.5	29	4.3	16141	2.9	0.05	5.1	763	4.9
Median Concentration	2.5	4.9	7.1	4.9	1.8	0.06	40	4205	2.5	0.5	24	2.5	15200	2.5	0.05	4	610	2.5
Standard Deviation	2.6	0.038	0.85	0	0.038	0.07	50	868	0	0	14	2.6	5062	1.2	0	4.4	813	6.2
Number of Guideline Exceedances	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of Guideline Exceedances(Detects Only)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Statistic	N-Ethyl perfluorooctane sulfonamidoacetic acid	Perfluoroheptane sulfonic acid	10:2 Fluorotelomer sulfonic acid	4:2 Fluorotelomer sulfonic acid	N-Methyl perfluorooctane sulfonamidoacetic acid	PFHxS and PFOS (Sum of Total) - Lab Calc	Perfluorobutane sulfonic acid	Perfluorohexane sulfonic acid (PFHxS)	Perfluoropentanoic acid	8:2 Fluorotelomer sulfonic acid	N-Ethyl perfluorooctane sulfonamide	N-Ethyl perfluorooctane sulfonamidoethanol	N-Methyl perfluorooctane sulfonamide	N-Methyl perfluorooctane sulfonamidoethanol	6:2 Fluorotelomer Sulfonate (6:2 FTS)
Number of Results	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41
Number of Detects	0	6	7	0	0	36	12	26	28	21	0	0	0	0	10
Minimum Concentration	<0.0002	<0.0002	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Minimum Detect	ND	0.0006	0.0009	ND	ND	0.0002	0.0003	0.0003	0.0002	0.001	ND	ND	ND	ND	0.0026
Maximum Concentration	<0.0002	0.0032	0.0136	<0.0005	<0.0002	0.153	0.0053	0.107	0.0222	0.592	<0.0005	<0.0005	<0.0005	<0.0005	0.0773
Maximum Detect	ND	0.0032	0.0136	ND	ND	0.153	0.0053	0.107	0.0222	0.592	ND	ND	ND	ND	0.0773
Average Concentration	0.0001	0.00032	0.001	0.00025	0.0001	0.018	0.00059	0.0059	0.0025	0.032	0.00025	0.00025	0.00025	0.00025	0.0052
Median Concentration	0.0001	0.0001	0.00025	0.00025	0.0001	0.0028	0.0001	0.0005	0.0005	0.001	0.00025	0.00025	0.00025	0.00025	0.00025
Standard Deviation	0	0.00066	0.0025	0	0	0.036	0.0012	0.019	0.0051	0.11	0	0	0	0	0.014
Number of Guideline Exceedances	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of Guideline Exceedances(Detects Only)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Statistic	Perfluorooctanoic acid (PFOA)	Perfluoropentane sulfonic acid	Perfluorobutanoic acid	Perfluorodecanoic acid	Perfluorodecane sulfonic acid	Perfluorododecanoic acid	Perfluoroheptanoic acid	Perfluorohexanoic acid (PFHxA)	Perfluorononanoic acid	Perfluorooctane sulfonic acid (PFOS)	Perfluorooctane sulfonamide (FOSA)	Perfluorotetradecanoic acid	Perfluorotridecanoic acid	Perfluoroundecanoic acid	PFAS (Sum of Total)	PFAS (Sum of Total)(WA DER List)
Number of Results	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41
Number of Detects	40	12	7	19	2	10	34	28	24	34	0	2	6	12	41	41
Minimum Concentration	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	0.0006	0.0006
Minimum Detect	0.0002	0.0002	0.001	0.0003	0.0003	0.0003	0.0002	0.0002	0.0002	0.0002	ND	0.001	0.0004	0.0002	0.0006	0.0006
Maximum Concentration	0.141	0.0063	0.003	0.0791	0.0003	0.0366	0.388	0.177	0.0504	0.145	<0.0002	0.0033	0.0073	0.0118	1.17	1.08
Maximum Detect	0.141	0.0063	0.003	0.0791	0.0003	0.0366	0.388	0.177	0.0504	0.145	ND	0.0033	0.0073	0.0118	1.17	1.08
Average Concentration	0.015	0.00051	0.00068	0.0033	0.00011	0.0018	0.021	0.012	0.0046	0.012	0.0001	0.00034	0.0004	0.0011	0.12	0.11
Median Concentration	0.0027	0.0001	0.0005	0.0001	0.0001	0.0001	0.0009	0.0007	0.0006	0.0021	0.0001	0.00025	0.0001	0.0001	0.0237	0.0144
Standard Deviation	0.031	0.0012	0.00051	0.013	0.000044	0.006	0.066	0.033	0.01	0.026	0	0.00049	0.0012	0.0026	0.25	0.22
Number of Guideline Exceedances	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of Guideline Exceedances(Detects Only)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 2. Soil ASLP Results

				PFAS																																
				N-Ethyl perfluorooctane sulfonamidoacetic acid	Perfluorodecanesulfonic acid (PFDS)	Perfluoroheptane sulfonic acid	10:2 Fluorotelomer sulfonic acid	4:2 Fluorotelomer sulfonic acid	N-Methyl perfluorooctane sulfonamidoacetic acid	PFHxS and PFOS (Sum of Total) - Lab Calc	Perfluorobutane sulfonic acid	Perfluorohexane sulfonic acid (PFHxS)	Perfluoropentanoic acid	8:2 Fluorotelomer sulfonic acid	N-Ethyl perfluorooctane sulfonamide	N-Ethyl perfluorooctane sulfonamidoethanol	N-Methyl perfluorooctane sulfonamide	N-Methyl perfluorooctane sulfonamidoethanol	6:2 Fluorotelomer Sulfonate (6:2 FTS)	Perfluorooctanoic acid (PFOA)	Perfluoropentane sulfonic acid	Perfluorobutanoic acid	Perfluorodecanoic acid	Perfluorododecanoic acid	Perfluoroheptanoic acid	Perfluorohexanoic acid (PFHxA)	Perfluorononanoic acid	Perfluorooctane sulfonic acid (PFOS)	Perfluorooctane sulfonamide (FOSA)	Perfluorotetradecanoic acid	Perfluorotridecanoic acid	Perfluoroundecanoic acid	PFAS (Sum of Total)	PFAS (Sum of Total)(WA DER List)
				µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL				0.02	0.02	0.02	0.05	0.05	0.02	0.01	0.02	0.02	0.02	0.05	0.05	0.05	0.05	0.05	0.05	0.01	0.02	0.1	0.02	0.02	0.02	0.02	0.02	0.01	0.02	0.05	0.02	0.02	0.01	0.01
Airservices - GHD 2017 Human Health Criteira - FW Fish Consumption										0.0004										0.0029																
Airservices EISLs (toxicity effects on aquatic organisms)-Leach														**2900**						**2900**								**6.66**							
FSANZ - PFAS Drinking water quality guideline - Leachate										*0.07*										*0.56*															
FSANZ - PFAS Recreational water quality guideline - Leachate										0.7										5.6															
Site_ID	**Location_Code**	**Field_ID**	**Sampled_Date_Time**																																	
Ayers Rock Airport - ASA	SB03	SB03_1.0	1/12/2016	<0.02	<0.02	<0.02	<0.05	<0.05	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.11	<0.02	<0.1	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.05	<0.02	<0.02	0.11	0.11
	SB04	SB04_0.2	1/12/2016	<0.02	<0.02	<0.02	<0.05	<0.05	<0.02	*0.39*	<0.02	<0.02	<0.02	4.49	<0.05	<0.05	<0.05	<0.05	<0.05	0.23	<0.02	<0.1	0.71	<0.02	0.06	0.02	1.41	0.39	<0.02	<0.05	<0.02	<0.02	7.31	5.19
	SB06	SB06_0.5	1/12/2016	<0.02	<0.02	<0.02	<0.05	<0.05	<0.02	*0.13*	<0.02	0.07	1.33	1.89	<0.05	<0.05	<0.05	<0.05	1.13	*1.82*	<0.02	<0.1	0.16	<0.02	3.75	2.26	0.34	0.06	<0.02	<0.05	<0.02	<0.02	12.8	12.3
	SB08	SB08_1.0	1/12/2016	<0.02	<0.02	<0.02	<0.05	<0.05	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.12	<0.02	<0.1	<0.02	<0.02	<0.02	0.02	<0.02	<0.01	<0.02	<0.05	<0.02	<0.02	0.14	0.14
	SB10	SB10_0.2	1/12/2016	<0.02	<0.02	0.02	<0.05	<0.05	<0.02	*1.95*	0.45	0.39	2.24	0.07	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	0.05	0.3	<0.02	<0.02	0.64	5.01	<0.02	1.56	<0.02	<0.05	<0.02	<0.02	10.8	10.7
	SP04	SP04	30/11/2016	<0.02	<0.02	<0.02	<0.05	<0.05	<0.02	*0.33*	<0.02	0.22	0.11	0.58	<0.05	<0.05	<0.05	<0.05	0.51	*2.05*	<0.02	<0.1	0.06	<0.02	1.04	0.4	0.07	0.11	<0.02	<0.05	<0.02	<0.02	5.15	5.02
	SP05	SP05	30/11/2016	<0.02	<0.02	0.19	<0.05	<0.05	<0.02	*3.46*	0.05	0.48	0.12	0.2	<0.05	<0.05	<0.05	<0.05	<0.05	*0.75*	0.02	<0.1	0.08	<0.02	0.16	0.24	0.42	2.98	<0.02	<0.05	<0.02	<0.02	5.69	4.98
Statistical Summary																																				
Number of Results				7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
Number of Detects				0	0	2	0	0	0	5	2	4	4	5	0	0	0	0	2	7	2	1	4	0	5	6	4	5	0	0	0	0	7	7
Minimum Concentration				<0.02	<0.02	<0.02	<0.05	<0.05	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	<0.02	<0.1	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.05	<0.02	<0.02	0.11	0.11
Minimum Detect				ND	ND	0.02	ND	ND	ND	0.13	0.05	0.07	0.11	0.07	ND	ND	ND	ND	0.51	0.05	0.02	0.3	0.06	ND	0.06	0.02	0.07	0.06	ND	ND	ND	ND	0.11	0.11
Maximum Concentration				<0.02	<0.02	0.19	<0.05	<0.05	<0.02	3.46	0.45	0.48	2.24	4.49	<0.05	<0.05	<0.05	<0.05	1.13	2.05	0.05	0.3	0.71	<0.02	3.75	5.01	1.41	2.98	<0.02	<0.05	<0.02	<0.02	12.8	12.3
Maximum Detect				ND	ND	0.19	ND	ND	ND	3.46	0.45	0.48	2.24	4.49	ND	ND	ND	ND	1.13	2.05	0.05	0.3	0.71	ND	3.75	5.01	1.41	2.98	ND	ND	ND	ND	12.8	12.3
Average Concentration				0.01	0.01	0.037	0.025	0.025	0.01	0.9	0.079	0.17	0.55	1	0.025	0.025	0.025	0.025	0.25	0.73	0.017	0.086	0.15	0.01	0.81	1.1	0.32	0.73	0.01	0.025	0.01	0.01	6	5.5
Median Concentration				0.01	0.01	0.01	0.025	0.025	0.01	0.33	0.01	0.07	0.11	0.2	0.025	0.025	0.025	0.025	0.025	0.23	0.01	0.05	0.06	0.01	0.16	0.24	0.07	0.11	0.01	0.025	0.01	0.01	5.69	5.02
Standard Deviation				0	0	0.068	0	0	0	1.3	0.16	0.2	0.89	1.7	0	0	0	0	0.43	0.86	0.015	0.094	0.25	0	1.4	1.9	0.51	1.1	0	0	0	0	4.8	4.7
Number of Guideline Exceedances				0	0	0	0	0	0	7	0	0	0	0	0	0	0	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of Guideline Exceedances(Detects Only)				0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Env Stds Comments

Appendix E – QA/QC

E. Data quality objectives and quality assurance / quality control

E.1 Data quality objectives

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

The Data Quality Objectives (DQOs) establish a framework for contamination investigations which incorporates a seven stepped continuum that defines the problem at the site. A series of stages then optimises the design of the investigation.

E.1.1 Step 1: state the problem

Are PFASs contamination migrating off site from the Airport boundaries?

Are possible source, pathway, receptor linkages presenting an unacceptable risk to on site and off site receptors?

E.1.2 Step 2: Identify the principal study question

To address the problem set out in Step 1, the following decisions are required to achieve the task objective and to identify data gaps and additional information that may be required:

- Are the PFASs levels (if present) near the Airport boundaries of acceptable range?

What are the immediate impacted sensitive receptors in the surroundings if PFASs is migrating off site?

E.1.3 Step 3: Inputs to the decision

To inform the decisions and identify key data gaps and needs, the following information is considered necessary:

- Quantitative data gained through intrusive sampling, analytical works and observations during intrusive investigations

Development of a Conceptual Site Model.

E.1.4 Step 4: Boundaries of the study

The Ayers Rock (Yulara) Airport property boundary.

E.1.5 Step 5: Decision rules

Soil surface water and groundwater analytical data will be assessed against the criteria adopted from relevant guidance as discussed in Section 3.

E.1.6 Step 6: Tolerable limits on decision errors

Data generated as part of the investigation must be appropriate to allow decisions to be made with confidence. Specific limits have been adopted in accordance with the appropriate guidance from the AS4482.1 which includes appropriate indicators of data quality [data quality indicators (DQIs) used to assess QA/QC and GHD's Standard Field Operating Procedures].

To assess the usability of the data prior to making decisions, the data will be assessed against pre-determined DQIs. The DQIs including precision, accuracy, representativeness, comparability and completeness, will be reviewed at the completion of the investigation to assess for the presence of decision errors.

The pre-determined DQIs established for the investigation are discussed below and shown in Table E-1.

- Precision - measures the reproducibility of measurements under a given set of conditions. The precision of the laboratory data and sampling techniques is assessed by calculating the Relative Percentage Difference (RPD) of duplicate samples
- Accuracy - measures the bias in a measurement system. The accuracy of the laboratory data that are generated during this investigation is a measure of the closeness of the analytical results obtained by a method to the 'true' (or standard) value. Accuracy is assessed by reference to the analytical results of laboratory control samples, laboratory spikes and analyses against reference standards
- Representativeness - expresses the degree to which sample data accurately and precisely represent a characteristic of a population or an environmental condition. Representativeness is achieved by collecting samples on a representative basis across the site, and by using an adequate number of sample locations to characterise the site to the required accuracy
- Comparability - expresses the confidence with which one data set can be compared with another. This is achieved through maintaining a level of consistency in techniques used to collect samples; ensuring analysing laboratories use consistent analysis techniques and reporting methods
- Completeness - is defined as the percentage of measurements made which are judged to be valid measurements

Table E-1 Summary of quality assurance / quality control criteria

Data quality indicator	Frequency	Data quality acceptance criteria
Precision		
Duplicates (Intra-Laboratory) Duplicates (Inter-Laboratory)	1 / 20 samples 1 / 20 samples	One in every 20.5 samples was collected slightly exceeding the adopted frequency. 50% of mean concentration of analyte, however, this variation can be expected to be higher for organic analyses than for inorganics, and for low concentrations of analytes.
Accuracy		
Laboratory (Method) Blank	One sample per batch of 20 samples or fewer	Less than detection limit or limit of reporting (LOR) of the method used.
Laboratory Control Spike		Dynamic Limits varying on previous laboratory data.
Laboratory Spike (Surrogate and Matrix)		Percent recovery is used to assess spiked samples and surrogate standards. Percent recovery is dependent on the type of analyte tested, the concentrations of analytes, and the sample matrix. For matrix spikes Eurofins adopts a matrix spike recovery range of 70-130%. For surrogate spikes Eurofins adopts static limits that vary dependant on matrix and surrogate compounds.

Data quality indicator	Frequency	Data quality acceptance criteria
Laboratory Duplicates	One sample per batch of 10 samples or fewer	Laboratory duplicate samples should have RPD's within the NEPM acceptance criteria of ±30%. The laboratory RPDs have been assessed using the following ranges: Results <10 times LOR: no limits. Results between 10 and 20 times LOR 0% - 50%. Results >20 times LOR: 0-20%.
Representativeness		
Sampling appropriate for media and analytes	All samples	-
Samples extracted and analysed within holding times	All samples	Organics (14 days) Inorganics (six months)
LORs appropriate and consistent	All samples	All samples
Comparability		
Consistent field conditions, sampling staff and laboratory analysis	All samples	All samples
Standard operating procedures for sample collection & handling	All samples	All samples
Standard analytical methods used for all analyses	All samples	All samples
Completeness		
Sample description and COCs completed and appropriate	All Samples	All Samples
Appropriate documentation	All Samples	All Samples
Satisfactory frequency and result for QA/QC samples	All QA/QC samples	-
Data from critical samples is considered valid	-	Critical samples valid
Notes: COC: Chain of Custody LOR: Limit of Reporting QA/QC: Quality assurance / quality control		

E.1.7 Step 7: Optimisation of the data collection process

To optimise the design of the investigation, a sampling and analytical program was completed. Results (including QA/QC results) were reviewed as they were received from the laboratory and any inconsistencies or unexpected data were further investigated with the laboratory. Corrective actions were implemented as required.

E.2 Field QA/QC

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

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

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

E.2.1 QA/QC sampling

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

Table E-2 Field QA/QC sample details

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

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

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

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

E.2.2 Sample handling and preservation

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

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

E.2.3 Chain of custody

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

E.3 Laboratory QA/QC

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

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

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

E.3.1 Laboratory QA/QC procedures

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

Table E-3 Laboratory QC sample details

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

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

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

E.4 Field QC results

The field QC results discussion below considered all the soil samples collected as part of the investigation stage for the Ayres Rock (Yulara) site.

E.4.1 Soil

A total of 57 soil samples were collected with 34 samples being selected for analysis during the site sampling program. Four soil QC samples (including two intra-laboratory and two inter-laboratory samples) were collected and analysed as part of the field work program. The target frequency for collection and analysis of field QC samples is 1 in 20 (5%). In this instance, this frequency was slightly under the adopted frequency (4.9%).

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

Table E-4 Analysed field QC samples for soil

QA sample ID	QA/QC sample	Primary sample
QA01	Intra-laboratory	SB17_0.2
QA02	Inter-laboratory	SB17_0.2
QA03	Intra-laboratory	SB07_0.5
QA04	Inter-laboratory	SB07_0.5

All RPD results were within the adopted data quality objectives.

Table E-5 RPD results outside of data quality limits

Primary & QA Pair	Analyte	Primary (µg/L)	QA/QC (µg/L)	RPD (%)
SB17_0.2 & QA01	PFASs (Sum of Total)	0.0041	0.0084	69
	PFASs (Sum of Total) (WA DER List)	0.0041	0.0084	69

Overall, there were only two analytes that were considered to exceed the acceptance criteria of 50% RPD for field duplicates. The extremely low concentrations are likely to be the primary reason for the exceedances. The concentrations were both laboratory calculations and combined all PFASs compounds. Neither RPD exceedance is expected to adversely affect the dataset.

E.5 Laboratory program

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

All of the internal laboratory QA QC analysis, including method blanks, control samples, laboratory spikes and surrogates spikes was within the data quality criteria, with the exceptions summarised in the following Table E-6.

Table E-6 Laboratory QA outliers summary

Types	Laboratory Reports	Analytes	Reasons
Matrix Spike	EM1614682 (Soil)	Perfluorooctane sulfonic acid (PFOS) Perfluorodecanoic acid (PFDA) Perfluoroundecanoic acid (PFUnDA) Perfluorododecanoic acid (PFDoDA) Perfluorotridecanoic acid (PFTrDA) 8:2 Fluorotelomer sulfonic acid (8:2 FTS) 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	MS recovery not determined, background level greater than or four times greater than spike level
Matrix Spike	EM1614682 (Water)	Perfluorobutane sulfonic acid (PFBS) Perfluoropentane sulfonic acid (PFPeS) Perfluorohexane sulfonic acid (PFHxS) Perfluorooctane sulfonic acid (PFOS) Perfluorohexanoic acid (PFHxA)	MS recovery not determined, background level greater than or four times greater than spike level
Holding time breach	ES1629166 (Leached Soil)	Non-Volatile Leach:14 day HT (e.g.SV organics)	The ASLP Leaching procedure was undertaken 5-6 days overdue as a result of initial lab reports being received later than anticipated.

E.6 Overall assessment of data quality

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

Appendix E
Table 1
QA/QC Results Field Duplicates/Splits

Field Duplicates (soil)
Filter: [Sampled_Date_Time] >= '20 Nov 2015' and [Sampled_Da

Lab Report Number	EM1614682	EM1614682		EM1614682	EM1614682		EM1614682	526640		EM1614682	526640	
Field ID	SB17_0.2	QA01	RPD	SB07_0.5	QA03	RPD	SB17_0.2	QA02	RPD	SB07_0.5	QA04	RPD
Sampled Date/Time	30/11/2016	30/11/2016		1/12/2016	1/12/2016		30/11/2016	30/11/2016		1/12/2016	1/12/2016	

Chem_Gr	ChemName	Units	EQL												
Inorganics	Moisture	%	1	2.3	2.2	4	3.5	2.8	22	2.3			3.5		
PFAS	PFHxS and PFOS (Sum of Total) - Lab Calc	mg/kg	0.0002	0.0009	0.0014	43	0.001	0.0021	71	0.0009			0.001		
	4:2 Fluorotelomer sulfonic acid	mg/kg	0.0005 : 0.005 (Interlab)	<0.0005	<0.0005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.005	0
	10:2 Fluorotelomer sulfonic acid	mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.0005	0	<0.0005			<0.0005		
	N-Ethyl perfluorooctane sulfonamidoacetic acid	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.0002	0	<0.0002			<0.0002		
	N-Methyl perfluorooctane sulfonamidoacetic acid	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.0002	0	<0.0002			<0.0002		
	Perfluorobutane sulfonic acid	mg/kg	0.0002 : 0.005 (Interlab)	<0.0002	<0.0002	0	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.005	0
	Perfluoroheptane sulfonic acid	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.0002	0	<0.0002			<0.0002		
	Perfluorohexane sulfonic acid (PFHxS)	mg/kg	0.0002 : 0.005 (Interlab)	0.0005	0.001	67	0.0004	<0.0002	67	0.0005	<0.005	0	0.0004	<0.005	0
	Perfluoropentanoic acid	mg/kg	0.0002 : 0.005 (Interlab)	<0.0002	<0.0002	0	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.005	0
	8:2 Fluorotelomer sulfonic acid	mg/kg	0.0005 : 0.005 (Interlab)	<0.0005	<0.0005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.005	0
	N-Ethyl perfluorooctane sulfonamide	mg/kg	0.0005 : 0.01 (Interlab)	<0.0005	<0.0005	0	<0.0005	<0.0005	0	<0.0005	<0.01	0	<0.0005	<0.01	0
	N-Ethyl perfluorooctane sulfonamidoethanol	mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.0005	0	<0.0005			<0.0005		
	N-Methyl perfluorooctane sulfonamide	mg/kg	0.0005 : 0.01 (Interlab)	<0.0005	<0.0005	0	<0.0005	<0.0005	0	<0.0005	<0.01	0	<0.0005	<0.01	0
	N-Methyl perfluorooctane sulfonamidoethanol	mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.0005	0	<0.0005			<0.0005		
	6:2 Fluorotelomer Sulfonate (6:2 FTS)	mg/kg	0.0005 : 0.01 (Interlab)	<0.0005	<0.0005	0	<0.0005	<0.0005	0	<0.0005	<0.01	0	<0.0005	<0.01	0
	Perfluorooctanoic acid (PFOA)	mg/kg	0.0002 : 0.005 (Interlab)	0.0019	0.0036	62	0.0003	<0.0002	40	0.0019	<0.005	0	0.0003	<0.005	0
	Perfluoropentane sulfonic acid	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.0002	0	<0.0002			<0.0002		
	Perfluorobutanoic acid	mg/kg	0.001 : 0.005 (Interlab)	<0.001	<0.001	0	<0.001	<0.001	0	<0.001	<0.005	0	<0.001	<0.005	0
	Perfluorodecanoic acid	mg/kg	0.0002 : 0.005 (Interlab)	<0.0002	<0.0002	0	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.005	0
	Perfluorodecane sulfonic acid	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.0002	0	<0.0002			<0.0002		
	Perfluorododecanoic acid	mg/kg	0.0002 : 0.005 (Interlab)	<0.0002	<0.0002	0	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.005	0
	Perfluoroheptanoic acid	mg/kg	0.0002 : 0.005 (Interlab)	0.0013	0.0034	89	<0.0002	<0.0002	0	0.0013	<0.005	0	<0.0002	<0.005	0
	Perfluorohexanoic acid (PFHxA)	mg/kg	0.0002 : 0.005 (Interlab)	<0.0002	<0.0002	0	<0.0002	0.0003	40	<0.0002	<0.005	0	<0.0002	<0.005	0
	Perfluorononanoic acid	mg/kg	0.0002 : 0.005 (Interlab)	<0.0002	<0.0002	0	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.005	0
	Perfluorooctane sulfonic acid (PFOS)	mg/kg	0.0002 : 0.005 (Interlab)	0.0004	0.0004	0	0.0006	0.0021	111	0.0004	<0.005	0	0.0006	<0.005	0
	Perfluorooctane sulfonamide (FOSA)	mg/kg	0.0002 : 0.01 (Interlab)	<0.0002	<0.0002	0	<0.0002	<0.0002	0	<0.0002	<0.01	0	<0.0002	<0.01	0
	Perfluorotetradecanoic acid	mg/kg	0.0005 : 0.005 (Interlab)	<0.0005	<0.0005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.005	0
	Perfluorotridecanoic acid	mg/kg	0.0002 : 0.005 (Interlab)	<0.0002	<0.0002	0	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.005	0
	Perfluoroundecanoic acid	mg/kg	0.0002 : 0.005 (Interlab)	<0.0002	<0.0002	0	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.005	0
	PFAS (Sum of Total)	mg/kg	0.0002	**0.0041**	**0.0084**	**69**	0.0013	0.0024	59	0.0041			0.0013		
	PFAS (Sum of Total)(WA DER List)	mg/kg	0.0002	**0.0041**	**0.0084**	**69**	0.0013	0.0024	59	0.0041			0.0013		

*RPDs have only been considered where concentrations are greater than 10 times the EQL.
**High RPDs are in bold (Acceptable RPDs for each EQL multiplier range are: 200 (1-10 x EQL); 50 (10-30 x EQL); 50 (> 30 x EQL))
***Interlab Duplicates are matched on a per compound basis as methods vary between laboratories. Any methods in the row header relate to those used in the primary laboratory

Appendix E
Table 2
Rinsate Blanks

Lab Report Number	EM1614682	EM1614682
Field ID	RB01	RB02
Sampled_Date/Time	30/11/2016 15:00	1/12/2016
Sample Type	Rinsate	Rinsate

Chem_Group	ChemName	Units	EQL		
PFAS	PFHxS and PFOS (Sum of Total) - Lab Calc	µg/L	0.01	<0.01	<0.01
	4:2 Fluorotelomer sulfonic acid	µg/L	0.05	<0.05	<0.05
	10:2 Fluorotelomer sulfonic acid	µg/L	0.05	<0.05	<0.05
	N-Ethyl perfluorooctane sulfonamidoacetic acid	µg/L	0.02	<0.02	<0.02
	N-Methyl perfluorooctane sulfonamidoacetic acid	µg/L	0.02	<0.02	<0.02
	Perfluorobutane sulfonic acid	µg/L	0.02	<0.02	<0.02
	Perfluoroheptane sulfonic acid	µg/L	0.02	<0.02	<0.02
	Perfluorohexane sulfonic acid (PFHxS)	µg/L	0.02	<0.02	<0.02
	Perfluoropentanoic acid	µg/L	0.02	<0.02	<0.02
	8:2 Fluorotelomer sulfonic acid	µg/L	0.05	<0.05	<0.05
	N-Ethyl perfluorooctane sulfonamide	µg/L	0.05	<0.05	<0.05
	N-Ethyl perfluorooctane sulfonamidoethanol	µg/L	0.05	<0.05	<0.05
	N-Methyl perfluorooctane sulfonamide	µg/L	0.05	<0.05	<0.05
	N-Methyl perfluorooctane sulfonamidoethanol	µg/L	0.05	<0.05	<0.05
	6:2 Fluorotelomer Sulfonate (6:2 FTS)	µg/L	0.05	<0.05	<0.05
	Perfluorooctanoic acid (PFOA)	µg/L	0.01	<0.01	<0.01
	Perfluoropentane sulfonic acid	µg/L	0.02	<0.02	<0.02
	Perfluorobutanoic acid	µg/L	0.1	<0.1	<0.1
	Perfluorodecanoic acid	µg/L	0.02	<0.02	<0.02
	Perfluorodecane sulfonic acid	µg/L	0.02	<0.02	<0.02
	Perfluorododecanoic acid	µg/L	0.02	<0.02	<0.02
	Perfluoroheptanoic acid	µg/L	0.02	<0.02	<0.02
	Perfluorohexanoic acid (PFHxA)	µg/L	0.02	<0.02	<0.02
	Perfluorononanoic acid	µg/L	0.02	<0.02	<0.02
	Perfluorooctane sulfonic acid (PFOS)	µg/L	0.01	<0.01	<0.01
	Perfluorooctane sulfonamide (FOSA)	µg/L	0.02	<0.02	<0.02
	Perfluorotetradecanoic acid	µg/L	0.05	<0.05	<0.05
	Perfluorotridecanoic acid	µg/L	0.02	<0.02	<0.02
	Perfluoroundecanoic acid	µg/L	0.02	<0.02	<0.02
	PFAS (Sum of Total)	µg/L	0.01	<0.01	<0.01
	PFAS (Sum of Total)(WA DER List)	µg/L	0.01	<0.01	<0.01

Appendix F – Laboratory Reports

GHD

GHD

Melbourne Office Address
180 Lonsdale Street, Melbourne 3000
Telephone: 613 8687 8000 Fax: 613 8687 8111

Completion Date / Turnaround: Standard

Quote # / GHD Reference: 31342490S

(7)

Page

Job Number	GHD Contact
31342490S	N. Cranei
Project	
Ayers Rock (Yulara) Airport PSI	
GHD Project Manager	GHD Contact
T. Hammond	N. Cranei
GHD PM email	GHD Contact email

Laboratory: ALS
Address: 2-4 Westall Rd, Springvale
Laboratory Contact: Shirley L

COURIER AND LABORATORY INSTRUCTIONS:
Sign **white copy** on receipt and release of samples.
Samples are to be delivered to the Laboratory Address.
On receipt of samples, **the laboratory contact** to sign white copy and fax/email to GHD Contact.
On completion of analyses please **return white** copy with results.
Pink copy is returned to the sampler once the courier has signed for the samples.
E-mail results to the **GHD Project Manager** and **GHD Contact** with the GHD Job Number in the e-mail subject line.
Note email format: firstname.lastname@ghd.com
Results to be provided in ESDAT compatible format

Sample I.D.	Date	Time	Composite Sample	Sample Matrix S: Soil SL: Sludge W: Water A: Air GW: Groundwater	Container Type J: soil jar B: bag V: vial G: glass bottle P: plastic bottle	Number	Volume (mL)	PFAS Extended suite	TOC	Total Iron	8 metals	K	Al	Si	HOLD	Sample Comments
SB15-0.5	30/11/16			S	J	1		✓	✓	✓	✓	✓	✓	✓		
SB15-1.0	↓			↓	↓	1									✓	
SB12_0.25						1		✓	✓	✓	✓	✓	✓	✓		
SB13_0.2						1		✓	✓	✓	✓	✓	✓	✓		
SB13_0.5						1		✓	✓	✓	✓	✓	✓	✓		
SB13_1.0						1									✓	
~~SB13~~QA01						1		✓								
~~SB13~~QA02						1		✓								→ Please send to MGT
SB14_0.2						1		✓	✓	✓	✓	✓	✓	✓		
SB14_0.5						1									✓	
SB14_1.0				↓		1		✓	✓	✓	✓	✓	✓	✓		
RB01	↓			W		2		✓								
SB11_0.2	1/12/16			S		1		✓	✓	✓	✓	✓	✓	✓		
SB11_0.5						1		✓	✓	✓	✓	✓	✓	✓		
SB11_1.0						1									✓	
SB10_0.2						1		✓	✓	✓	✓	✓	✓	✓		
SB09_0.2	↓			↓	↓	1		✓	✓	✓	✓	✓	✓	✓		

TOTAL NUMBER OF SAMPLES:	63
TOTAL NUMBER OF ESKIES:	4
SAMPLES/ESKY CHILLED? Y / N	Y

GENERAL COMMENTS:

USTODY DETAILS:

	Name	Date/Time Received	Date/Time Relinquished
AMPLER	N. Cranei	30/11/16 - 1/12/16	5/12/16 1.41pm
HD SERVICE CENTRE	Kyle Steech	5/12/16 1.41pm	5/12/16 EBall 2:05pm
OURIER	SRS 24	5/12/16 2.05PM.	
ABORATORY	[illegible] (AM)	[illegible] 16:00	

Relinquished - [illegible] 6/12/16 [illegible]

Jonathan 7/12 10:45am.

(7)

CHAIN OF CUSTODY RECORD

GHD

Melbourne Office Address
180 Lonsdale Street, Melbourne 3000
Telephone: 613 8687 8000 Fax: 613 8687 8111

Completion Date / Turnaround: Standard

Quote # / GHD Reference: 31342405

Job Number	GHD Contact
31342405	N. Cramesi
Project	
Ayers Rock (Yulara) Airport PSI	
GHD Project Manager	**GHD Contact**
T. Hammond	N. Cramesi
GHD PM email	**GHD Contact email**

Laboratory: ALS
Address: 2-4 Westall Rd, Springvale
Laboratory Contact: Shirley

COURIER AND LABORATORY INSTRUCTIONS:
Sign **white copy** on receipt and release of samples.
Samples are to be delivered to the Laboratory Address.
On receipt of samples, **the laboratory contact** to sign white copy and fax/email to GHD Contact.
On completion of analyses please **return white** copy with results.
Pink copy is returned to the sampler once the courier has signed for the samples.
E-mail results to the **GHD Project Manager** and **GHD Contact** with the GHD Job Number in the e-mail subject line.

Note email format: firstname.lastname@ghd.com

Results to be provided in ESDAT compatible format

	Sample I.D.	Date	Time	Composite Sample	Sample Matrix S: Soil SL: Sludge W: Water A: Air GW: Groundwater	Container Type J: soil jar B: bag V: vial G: glass bottle P: plastic bottle	Container Number	Container Volume (mL)	Analyses Required: PFAS Extended Suite	TOC	Total Iron	8 metals	K	AL	Si	Hold	SAMPLE COMMENTS
51	SB03_0.2	1/12/16			S	J	1		✓	✓	✓	✓	✓	✓	✓		
52	SB03_0.5						1									✓	
53	SB03_1.0						1		✓	✓	✓	✓	✓	✓	✓		
54	SB02_0.2						1		✓	✓	✓	✓	✓	✓	✓		
55	SB02_0.5						1		✓	✓	✓	✓	✓	✓	✓		
56	SB02_1.0						1									✓	
57	SB01_0.2						1		✓	✓	✓	✓	✓	✓	✓		
58	SB01_0.5						1									✓	
59	SB01_1.0						1		✓	✓	✓	✓	✓	✓	✓		
60	QA03						1		✓								
~~61~~	QA04				↓	↓	1		✓								MGT as per email
62	RB02	↓			W	P	2		✓								

TOTAL NUMBER OF SAMPLES:	63
TOTAL NUMBER OF ESKIES:	4
SAMPLES/ESKY CHILLED? Y / N	Y

GENERAL COMMENTS:

Relinquished by (Ayers) 6/12/16 @ 1-00 pm

CUSTODY DETAILS:

	Name	Date/Time Received	Date/Time Relinquished
SAMPLER	N. Cramesi	1/12/16	~~30~~ 5/12/16 1.24pm
GHD SERVICE CENTRE	Steele	5/12/16 1.41 pm	5/12/16 2.05pm
COURIER	SRC 24 March	5/12/16 2.01 pm.	
LABORATORY	(Ayers)	16:40	

(7)

From: [redacted]
Sent: Tuesday, 6 December 2016 10:33 AM
To: Melbourne Enviro Services <MelbourneEnviroSer@alsglobal.com>
Subject: Sample request change

Hi,

I made a mistake on the COC. Could I get QA04 sent to MGT for analysis. Please keep the analysis the same (PFAS exteneded suite).

Thanks!

Regards

[redacted]
Environmental Scientist
Contamination Assessment and Remediation

GHD
T: +6[redacted] | [redacted]
Level 8, 180 Lonsdale Street, Melbourne, Victoria 3000, Australia | http://www.ghd.com/
Water | Energy & Resources | Environment | Property & Buildings | Transportation

Please consider our environment before printing this email

6/12/16 @ 1.30 pm

eurofins | mgt

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

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

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

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

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

Sample Receipt Advice

Company name:	**GHD Pty Ltd VIC**
Contact name:	Nick Crameri
Project name:	AYERS ROCK AIRPORT PSI
Project ID:	313424905
COC number:	Not provided
Turn around time:	5 Day
Date/Time received:	Dec 7, 2016 3:52 PM
Eurofins | mgt reference:	**526640**

Sample information

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

☑ All samples have been received as described on the above COC.

☑ COC has been completed correctly.

☑ Attempt to chill was evident.

☑ Appropriately preserved sample containers have been used.

☑ All samples were received in good condition.

☑ Samples have been provided with adequate time to commence analysis in accordance with the relevant holding times.

☑ Appropriate sample containers have been used.

☒ Some samples have been subcontracted.

N/A Custody Seals intact (if used).

Contact notes

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

Mary Makarios on Phone : +61 3 8564 5000 or by e.mail: [redacted]

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

eurofins | mgt

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

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

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NATA # 1261 Site # 20794

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

Company Name: GHD Pty Ltd VIC
Address: Level 8, 180 Lonsdale St
Melbourne
VIC 3000

Project Name: AYERS ROCK AIRPORT PSI
Project ID: 313424905

Order No.:
Report #: 526640
Phone: 8687 8000
Fax: 8687 8111

Received: Dec 7, 2016 3:52 PM
Due: Dec 14, 2016
Priority: 5 Day
Contact Name: Nick Crameri

Eurofins | mgt Analytical Services Manager : Mary Makarios

Sample Detail						Per- and Polyfluorinated Alkyl Substances (PFASs)	Moisture Set
Melbourne Laboratory - NATA Site # 1254 & 14271							
Sydney Laboratory - NATA Site # 18217							
Brisbane Laboratory - NATA Site # 20794						X	X
Perth Laboratory - NATA Site # 18217							
External Laboratory							
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**		
1	QA02	Nov 30, 2016		Soil	M16-De06396	X	X
2	QA04	Nov 30, 2016		Soil	M16-De06397	X	X
Test Counts						2	2

eurofins | mgt

Certificate of Analysis

GHD Melbourne
Level 8, 180 Lonsdale St
Melbourne
VIC 3000

NATA Accredited
Accreditation Number 1261
Site Number 1254

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: **Nick Crameri**

Report **526640-S**
Project name AYERS ROCK AIRPORT PSI
Project ID 313424905
Received Date Dec 07, 2016

Client Sample ID			**QA02**	**QA04**
Sample Matrix			**Soil**	**Soil**
Eurofins | mgt Sample No.			**M16-De06396**	**M16-De06397**
Date Sampled			**Nov 30, 2016**	**Nov 30, 2016**
Test/Reference	LOR	Unit		
Per- and Polyfluorinated Alkyl Substances (PFASs)				
Perfluorobutanesulfonic acid (PFBS)	0.005	mg/kg	< 0.005	< 0.005
Perfluorobutanoic acid (PFBA)	0.005	mg/kg	< 0.005	< 0.005
Perfluorohexanesulfonic acid (PFHxS)	0.005	mg/kg	< 0.005	< 0.005
Perfluorooctanesulfonic acid (PFOS)	0.005	mg/kg	< 0.005	< 0.005
Perfluorodecanesulfonic acid (PFDS)	0.005	mg/kg	< 0.005	< 0.005
Perfluoropentanoic acid (PFPeA)	0.005	mg/kg	< 0.005	< 0.005
Perfluorohexanoic acid (PFHxA)	0.005	mg/kg	< 0.005	< 0.005
Perfluoroheptanoic acid (PFHpA)	0.005	mg/kg	< 0.005	< 0.005
Perfluorooctanoic acid (PFOA)	0.005	mg/kg	< 0.005	< 0.005
Perfluorononanoic acid (PFNA)	0.005	mg/kg	< 0.005	< 0.005
Perfluorodecanoic acid (PFDA)	0.005	mg/kg	< 0.005	< 0.005
Perfluoroundecanoic acid (PFUnA)	0.005	mg/kg	< 0.005	< 0.005
Perfluorododecanoic acid (PFDoA)	0.005	mg/kg	< 0.005	< 0.005
Perfluorotridecanoic acid (PFTrDA)	0.005	mg/kg	< 0.005	< 0.005
Perfluorotetradecanoic acid (PFTeDA)	0.005	mg/kg	< 0.005	< 0.005
Perfluorooctanesulfonamide (PFOSA)	0.01	mg/kg	< 0.01	< 0.01
N-ethyl-perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	0.01	mg/kg	< 0.01	< 0.01
N-methyl-perfluorooctanesulfonamidoacetic acid (NMeFOSAA)	0.01	mg/kg	< 0.01	< 0.01
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTS)	0.005	mg/kg	< 0.005	< 0.005
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTS)	0.01	mg/kg	< 0.01	< 0.01
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTS)	0.005	mg/kg	< 0.005	< 0.005
d5-n-EtFOSAA (surr.)	1	%	105	120
13C-PFHxA (surr.)	1	%	103	114
13C8-PFOS (surr.)	1	%	116	108
% Moisture	1	%	1.9	2.8

Sample History

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

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Per- and Polyfluorinated Alkyl Substances (PFASs)	Brisbane	Dec 09, 2016	180 Day
- Method: LTM-ORG-2100 Per- and Polyfluorinated Alkyl Substances by LC-MS/MS			
% Moisture	Brisbane	Dec 07, 2016	14 Day
- Method: LTM-GEN-7080 Moisture			

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

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Oakleigh VIC 3166
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NATA # 1261
Site # 18217

Company Name: GHD Pty Ltd VIC
Address: Level 8, 180 Lonsdale St
Melbourne
VIC 3000

Project Name: AYERS ROCK AIRPORT PSI
Project ID: 313424905

Order No.:
Report #: 526640
Phone: 8687 8000
Fax: 8687 8111

Received: Dec 7, 2016 3:52 PM
Due: Dec 14, 2016
Priority: 5 Day
Contact Name: Nick Crameri

Eurofins | mgt Analytical Services Manager : Mary Makarios

Sample Detail						Per- and Polyfluorinated Alkyl Substances (PFASs)	Moisture Set
Melbourne Laboratory - NATA Site # 1254 & 14271							
Sydney Laboratory - NATA Site # 18217							
Brisbane Laboratory - NATA Site # 20794						X	X
Perth Laboratory - NATA Site # 18217							
External Laboratory							
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**		
1	QA02	Nov 30, 2016		Soil	M16-De06396	X	X
2	QA04	Nov 30, 2016		Soil	M16-De06397	X	X
Test Counts						2	2

Internal Quality Control Review and Glossary

General

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

Holding Times

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

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

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

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

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

Units

mg/kg: milligrams per Kilogram

ug/l: micrograms per litre

ppb: Parts per billion

org/100ml: Organisms per 100 millilitres

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

mg/l: milligrams per litre

ppm: Parts per million

%: Percentage

NTU: Nephelometric Turbidity Units

Terms

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

QC - Acceptance Criteria

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

Results <10 times the LOR : No Limit

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

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

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

QC Data General Comments

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

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Per- and Polyfluorinated Alkyl Substances (PFASs)							
Perfluorobutanesulfonic acid (PFBS)	mg/kg	< 0.005			0.005	Pass	
Perfluorobutanoic acid (PFBA)	mg/kg	< 0.005			0.005	Pass	
Perfluorohexanesulfonic acid (PFHxS)	mg/kg	< 0.005			0.005	Pass	
Perfluorooctanesulfonic acid (PFOS)	mg/kg	< 0.005			0.005	Pass	
Perfluorodecanesulfonic acid (PFDS)	mg/kg	< 0.005			0.005	Pass	
Perfluoropentanoic acid (PFPeA)	mg/kg	< 0.005			0.005	Pass	
Perfluorohexanoic acid (PFHxA)	mg/kg	< 0.005			0.005	Pass	
Perfluoroheptanoic acid (PFHpA)	mg/kg	< 0.005			0.005	Pass	
Perfluorooctanoic acid (PFOA)	mg/kg	< 0.005			0.005	Pass	
Perfluorononanoic acid (PFNA)	mg/kg	< 0.005			0.005	Pass	
Perfluorodecanoic acid (PFDA)	mg/kg	< 0.005			0.005	Pass	
Perfluoroundecanoic acid (PFUnA)	mg/kg	< 0.005			0.005	Pass	
Perfluorododecanoic acid (PFDoA)	mg/kg	< 0.005			0.005	Pass	
Perfluorotridecanoic acid (PFTrDA)	mg/kg	< 0.005			0.005	Pass	
Perfluorotetradecanoic acid (PFTeDA)	mg/kg	< 0.005			0.005	Pass	
Perfluorooctanesulfonamide (PFOSA)	mg/kg	< 0.01			0.01	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	mg/kg	< 0.01			0.01	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (NMeFOSAA)	mg/kg	< 0.01			0.01	Pass	
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTS)	mg/kg	< 0.005			0.005	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTS)	mg/kg	< 0.01			0.01	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTS)	mg/kg	< 0.005			0.005	Pass	
LCS - % Recovery							
Per- and Polyfluorinated Alkyl Substances (PFASs)							
Perfluorobutanesulfonic acid (PFBS)	%	80			50-150	Pass	
Perfluorobutanoic acid (PFBA)	%	83			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	%	88			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	%	77			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	%	77			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	%	72			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	%	77			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	%	78			50-150	Pass	
Perfluorooctanoic acid (PFOA)	%	84			50-150	Pass	
Perfluorononanoic acid (PFNA)	%	83			50-150	Pass	
Perfluorodecanoic acid (PFDA)	%	80			50-150	Pass	
Perfluoroundecanoic acid (PFUnA)	%	83			50-150	Pass	
Perfluorododecanoic acid (PFDoA)	%	79			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	%	80			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	%	82			50-150	Pass	
Perfluorooctanesulfonamide (PFOSA)	%	76			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	%	96			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (NMeFOSAA)	%	83			50-150	Pass	
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTS)	%	86			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTS)	%	79			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTS)	%	82			50-150	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
Per- and Polyfluorinated Alkyl Substances (PFASs)				Result 1					
Perfluorobutanesulfonic acid (PFBS)	M16-De06397	CP	%	88			50-150	Pass	
Perfluorobutanoic acid (PFBA)	M16-De06397	CP	%	83			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	M16-De06397	CP	%	95			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	M16-De06397	CP	%	79			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	M16-De06397	CP	%	85			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	M16-De06397	CP	%	75			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	M16-De06397	CP	%	74			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	M16-De06397	CP	%	83			50-150	Pass	
Perfluorooctanoic acid (PFOA)	M16-De06397	CP	%	83			50-150	Pass	
Perfluorononanoic acid (PFNA)	M16-De06397	CP	%	88			50-150	Pass	
Perfluorodecanoic acid (PFDA)	M16-De06397	CP	%	83			50-150	Pass	
Perfluoroundecanoic acid (PFUnA)	M16-De06397	CP	%	87			50-150	Pass	
Perfluorododecanoic acid (PFDoA)	M16-De06397	CP	%	89			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	M16-De06397	CP	%	93			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	M16-De06397	CP	%	96			50-150	Pass	
Perfluorooctanesulfonamide (PFOSA)	M16-De06397	CP	%	80			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	M16-De06397	CP	%	106			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (NMeFOSAA)	M16-De06397	CP	%	87			50-150	Pass	
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTS)	M16-De06397	CP	%	91			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTS)	M16-De06397	CP	%	94			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTS)	M16-De06397	CP	%	88			50-150	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Duplicate									
Per- and Polyfluorinated Alkyl Substances (PFASs)				Result 1	Result 2	RPD			
Perfluorobutanesulfonic acid (PFBS)	M16-De06396	CP	mg/kg	< 0.005	< 0.005	<1	30%	Pass	
Perfluorobutanoic acid (PFBA)	M16-De06396	CP	mg/kg	< 0.005	< 0.005	<1	30%	Pass	
Perfluorohexanesulfonic acid (PFHxS)	M16-De06396	CP	mg/kg	< 0.005	< 0.005	<1	30%	Pass	
Perfluorooctanesulfonic acid (PFOS)	M16-De06396	CP	mg/kg	< 0.005	< 0.005	<1	30%	Pass	
Perfluorodecanesulfonic acid (PFDS)	M16-De06396	CP	mg/kg	< 0.005	< 0.005	<1	30%	Pass	
Perfluoropentanoic acid (PFPeA)	M16-De06396	CP	mg/kg	< 0.005	< 0.005	<1	30%	Pass	
Perfluorohexanoic acid (PFHxA)	M16-De06396	CP	mg/kg	< 0.005	< 0.005	<1	30%	Pass	
Perfluoroheptanoic acid (PFHpA)	M16-De06396	CP	mg/kg	< 0.005	< 0.005	<1	30%	Pass	
Perfluorooctanoic acid (PFOA)	M16-De06396	CP	mg/kg	< 0.005	< 0.005	<1	30%	Pass	
Perfluorononanoic acid (PFNA)	M16-De06396	CP	mg/kg	< 0.005	< 0.005	<1	30%	Pass	
Perfluorodecanoic acid (PFDA)	M16-De06396	CP	mg/kg	< 0.005	< 0.005	<1	30%	Pass	
Perfluoroundecanoic acid (PFUnA)	M16-De06396	CP	mg/kg	< 0.005	< 0.005	<1	30%	Pass	
Perfluorododecanoic acid (PFDoA)	M16-De06396	CP	mg/kg	< 0.005	< 0.005	<1	30%	Pass	
Perfluorotridecanoic acid (PFTrDA)	M16-De06396	CP	mg/kg	< 0.005	< 0.005	<1	30%	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
Per- and Polyfluorinated Alkyl Substances (PFASs)				Result 1	Result 2	RPD			
Perfluorotetradecanoic acid (PFTeDA)	M16-De06396	CP	mg/kg	< 0.005	< 0.005	<1	30%	Pass	
Perfluorooctanesulfonamide (PFOSA)	M16-De06396	CP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	M16-De06396	CP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (NMeFOSAA)	M16-De06396	CP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTS)	M16-De06396	CP	mg/kg	< 0.005	< 0.005	<1	30%	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTS)	M16-De06396	CP	mg/kg	< 0.01	< 0.01	<1	30%	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTS)	M16-De06396	CP	mg/kg	< 0.005	< 0.005	<1	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
% Moisture	M16-De06396	CP	%	1.9	1.8	3.0	30%	Pass	

Comments

Sample Integrity

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

Authorised By

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

Glenn Jackson
National Operations Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

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

Measurement uncertainty of test data is available on request or please click here.

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Appendix G – Calibration Certificates

PID Calibration Certificate

Instrument Minirae 3000
Serial No. 592-906546

airmet

Air-Met Scientific Pty Ltd
1300 137 067

Item	Test	Pass	Comments
Battery	Charge Condition	✓	
	Fuses	✓	
	Capacity	✓	
	Recharge OK?	✓	
Switch/keypad	Operation	✓	
Display	Intensity	✓	
	Operation (segments)	✓	
Grill Filter	Condition	✓	
	Seal	✓	
Pump	Operation	✓	
	Filter	✓	
	Flow	✓	
	Valves, Diaphragm	✓	
PCB	Condition	✓	
Connectors	Condition	✓	
Sensor	PID	✓	10.6 ev
Alarms	Beeper	✓	Low: 50ppm; High: 100ppm; TWA: 10ppm; STEL: 25ppm
	Settings	✓	
Software	Version	✓	
Data logger	Operation	✓	
Download	Operation	✓	
Other tests:			

Certificate of Calibration

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

Diffusion mode Aspirated mode

Sensor	Serial no	Calibration gas and concentration	Certified	Gas bottle No		Instrument Reading
PID Lamp		97ppm Isobutylene	NATA	ME358		97ppm Isobutylene

Calibrated by: Ken Xu

Calibration date: 21-Nov-16

Next calibration due: 20-May-17

GHD

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

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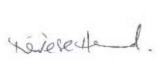
Document Status

Revision	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
DRAFT						13/01/2017
DRAFT B						03/03/2017
DRAFT C						24/07/2017
0	N Crameri	T Hammond		M Clough		19/10/2017

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