



Darwin Turf Club – EPL Monitoring

Groundwater and Air Monitoring Report

Darwin Turf Club Inc

30 October 2023

➔ **The Power of Commitment**



Project name		Darwin Turf Club - EPL Management					
Document title		Darwin Turf Club – EPL Monitoring Groundwater and Air Monitoring Report					
Project number		12618429					
File name		12618429-REP_Darwin Turf Club EPL Management Monitoring Report September 2023.docx					
Status Code	Revision	Author	Reviewer		Approved for issue		
			Name	Signature	Name	Signature	Date
S0	0	K. Gurung	M. Clough	*on file	N. Fries	*on file	27/10/23
[Status code]							
[Status code]							
[Status code]							
[Status code]							

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Contents

1.	Introduction	1
1.1	Purpose of this report	1
1.2	Scope	2
1.2.1	September 2023 Oil Application Event	2
1.2.2	Legislative Framework	2
1.3	Limitations	2
2.	Site details	4
2.1	Site location and setting	4
2.1.1	Climate	4
2.1.2	Geology and hydrogeology	4
2.1.3	Topography and hydrology	5
3.	Groundwater monitoring methodology	5
3.1	Overview	5
3.2	Sampling protocol	5
3.3	Assessment criteria (Trigger Values)	6
4.	Air quality monitoring methodology	8
4.1	Sampling protocol	8
4.2	Assessment criteria	9
5.	Oil sampling methodology	10
5.1	Sampling protocol	10
6.	Quality control and assurance	11
6.1	Field quality control methods	11
6.2	Blind and split duplicates	11
6.3	Laboratory quality control methods	11
7.	Groundwater monitoring results	12
7.1	Field observations and measurements	12
7.1.1	GME 18 and GME 19	12
7.1.2	Pre-application GME field water quality parameters	15
7.1.3	Post-application GME field water quality parameters	15
7.2	Laboratory results	15
7.3	Quality control/Quality Assurance	18
7.3.1	Field quality control	18
7.3.2	Laboratory QAQC results	18
8.	Air quality monitoring results	19
8.1	Summary of air quality data	19
8.2	Laboratory results	20
9.	Oil assessment results	21
10.	Results	22
11.	Discussion	23
12.	Conclusions and recommendations	24

12.1	Conclusion	24
12.2	Recommendations	24
13.	References	25

Table index

Table 1	Groundwater sampling program	5
Table 2	Groundwater trigger values	6
Table 3	Air quality assessment criteria	9
Table 4	Monitoring well observations and depths for GME18 and GME 19	12
Table 5	GME 18 and GME 19 Groundwater field parameters	14
Table 6	GME results with exceedances highlighted	16
Table 7	EPL Clause 46.1: NT EPA notifiable exceedances: three consecutive exceedances	17
Table 8	EPL Clause 46.2: NT EPA notifiable exceedances: results greater than or equal to three times the assessment criteria	17
Table 9	September 2023 GME QAQC sample summary	18
Table 10	Quality control sample frequency outliers	19
Table 11	September 2023 AQME Weather monitoring data	19
Table 12	September 2023 air quality monitoring results	20
Table 13	Oil assessment results	21

Figure index

Figure 1	Rainfall data from Darwin airport (BOM, 2023)	4
Figure 2	Wind direction and speed over the 12-hour period on oil application day 11 September 2023	20

Appendices

Appendix A	Figures
Appendix B	EPL218-02
Appendix C	Field Results
Appendix D	Laboratory Results
Appendix E	Results Tables
Appendix F	Calibration Certificates
Appendix G	Historical Field Data

1. Introduction

Darwin Turf Club Incorporated (DTC) engaged GHD Pty Ltd (GHD) to undertake groundwater and air quality environmental monitoring at the Darwin Turf Club Fannie Bay Racecourse ('the Site'). GHD has undertaken the routine monitoring on behalf of DTC since April 2020, amounting to 19 groundwater monitoring events (GMEs) and nine air quality monitoring events (AQMEs).

The monitoring of groundwater and air quality is a requirement of the Site's Environment Protection Licence number 218-02 (EPL 218-02), which was updated and issued to DTC by the Northern Territory Environment Protection Authority (NT EPA) on 1 September 2022. The EPL is attached in Appendix B.

EPL 218-02 permits the application of oil to the racecourse surface, as part of soil conditioning and track maintenance works. NT EPA conditions contained within the EPL require DTC to undertake routine environmental monitoring of groundwater and air quality before, during, and after the application of oil to the track surface. In addition, oil sampling is now a requirement of the EPL 218-02 and is taken 10 days prior to the application event and on the day of the application event.

Measures associated with environmental protection are presented in the Fannie Bay Racecourse Environmental Management Plan (EMP) prepared by GHD in 2022 and updated in 2023 (GHD, 2023).

The EPL includes specific clauses relating to monitoring specifications, control measures, reporting and non-compliance notification requirements.

The environmental monitoring requirements documented in the EPL prescribe the following:

- A groundwater monitoring event (GME) to be conducted up to two weeks prior to the oil application to the track.
- A second GME must be conducted within 48 hours after the oil has been applied to the track surface.
- An air quality monitoring event (AQME) must be conducted on the day of oil application, capturing ambient air during the application period.
- Oil sampling is to be conducted up to two weeks prior to oil application and on the day of oil application.
- Additional specifications on the monitoring requirements including monitoring locations are documented in the EMP (GHD, 2023).

1.1 Purpose of this report

The purpose of this report is to document the results of the AQME and two GMEs conducted by GHD on behalf of DTC, during the September 2023 monitoring period. The monitoring was associated with an oil application event, conducted by DTC on 11 September 2023.

This report fulfils, in part, the requirements of the EMP and EPL under which DTC operates the racecourse facility. Specifically, in fulfilment of EPL 218-02 Clause 50 relating to monitoring reporting requirements, this report was prepared in accordance with the requirements of the Northern Territory Contaminated Land Guideline (NT EPA, 2017), and therefore includes:

- Project background and site details.
- Details on the adopted methodologies for the GMEs and AQME.
- Assessment criteria adopted for evaluation of monitoring results.
- Laboratory and field data obtained from the recent investigations.
- A comparison of the historical and recent results against the relevant assessment criteria.
- Summary conclusions of monitoring results, including a brief evaluation of the reported exceedances to the assessment criteria.
- Includes an assessment of environmental impact from the activity as per EPL 218-02 Clause 50.4.
- Recommendations based on the results from this monitoring period.

1.2 Scope

1.2.1 September 2023 Oil Application Event

The following scope of works was undertaken:

- Two GMEs – GME 18 and GME 19 utilising seven groundwater bores as specified in the DTC Environmental Management Plan (EMP) (GHD, 2023). The GMEs were undertaken before and after track conditioning activities.
- One AQME involving monitoring of the three locations specified in Figure 3, Appendix A. The sampling was undertaken during the oil application activities.
- Laboratory analysis of samples of the oil mixture used for during application.

1.2.2 Legislative Framework

The environmental monitoring works were carried out in general accordance with:

- Australia and New Zealand Guidelines (ANZG) for Fresh and Marine Water Quality, 2018. This supersedes the previous guideline (Australian and New Zealand Environmental Conservation Council (ANZECC), 1992. Australian and New Zealand Guidelines (ANZG) for the Assessment and Management of Contaminated Sites).
- Australian Standards, 1998. Australian and New Zealand Guidelines for Water Quality Sampling, Australian Standard: AS5667.1.
- National Environment Protection Council (NEPC), 1999. National Environment Protection (Assessment of Site Contamination) Measure (NEPM), Assessment of Site Contamination, as amended April 2013 (ASC NEPM).
- Guidelines for groundwater quality protection in Australia – National Water Quality Management Strategy (DAWR, 2013).
- GHD, 2023. Environmental Management Plan for the Application of Use Oil – Fannie Bay Racecourse – Darwin Turf Club Inc.
- Heads of EPAs Australian and New Zealand (HEPA), PFAS National Management Plan 2.0, January 2020 (PFAS NEMP).

1.3 Limitations

This report: has been prepared by GHD for Darwin Turf Club Inc and may only be used and relied on by Darwin Turf Club Inc for the purpose agreed between GHD and Darwin Turf Club Inc as set out in section 1 of this report.

GHD otherwise disclaims responsibility to any person other than Darwin Turf Club Inc 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.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report (refer section(s) 12 of this report). GHD disclaims liability arising from any of the assumptions being incorrect.

If this report is required to be accessible in any other format, this can be provided by GHD upon request and at an additional cost if necessary.

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 prepared this report on the basis of information provided by Darwin Turf Club Inc and others who provided information to GHD (including Government authorities)], 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.

2. Site details

2.1 Site location and setting

Fannie Bay Racecourse comprises approximately 47 ha and is situated approximately 4 km north of Darwin CBD. The site is located off Dick Ward Drive.

The site is bound by Dick Ward Drive to the north, stables and Douglas Street to the east, Playford and Wells Street to the south and east. Residential properties bound Douglas Street, Playford Street and Wells Street.

The racecourse is located in close proximity to Ludmilla Primary School, residential areas of Fannie Bay and Ludmilla, and coastal areas. The activities undertaken at these sites are sensitive receptors to potential impacts from the application of waste oil to the racetrack, notably offensive odours.

A general layout of the site is provided in Figure 1, Appendix A.

2.1.1 Climate

The site is located in the wet/dry tropics and is subject to annual periods of flood and drought. The dry season extends from approximately March to September, displaying moderate temperatures, low humidity and winds predominately from the east. The wet season occurs for the remaining months and tropical cyclones, thunderstorms and monsoon rain with winds predominately from the northwest are common, in association with high temperatures and humidity.

The climate statistics for the site are shown in Figure 1, and are taken from the Darwin Airport weather station, located 4.6 km from the site.

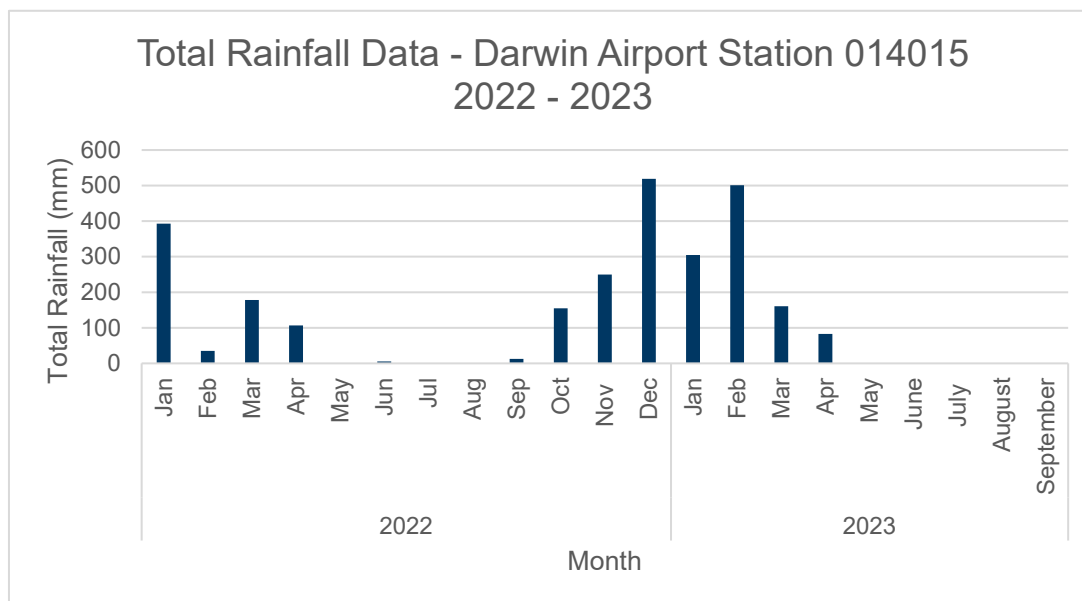


Figure 1 Rainfall data from Darwin airport (BOM, 2023)

2.1.2 Geology and hydrogeology

The superficial geology underlying the site comprises unconsolidated sand, ferruginous and clayey, sandy and gravelly soils underlain by kaolinitic claystone (NTGS, 1985).

DEPWS (2000) indicated the southern portion of the site is underlain by a shallow freshwater aquifer, potentially suitable for human consumption and garden watering. The groundwater yield is less than 0.5 L/s. However, the map indicates that the northernmost 200 m of the site is likely to be underlain by shallow groundwater which is brackish to saline and unsuitable for most extractive uses, with a yield less than 0.5 L/s. It is likely that the groundwater towards the north is subject to saline influence from the Ludmilla Creek estuary (GHD, 2022).

Interpretation of groundwater standing water levels (SWLs) from the September GMEs, indicated a generally northerly groundwater flow direction towards Ludmilla Creek wetland area (refer to Figure 2, Appendix A). Based on the contours, the hydraulic gradient is approximately 0.007 m/m (GHD, 2023).

2.1.3 Topography and hydrology

The site is relatively flat with the track approximately 0.5 m above the surrounding ground level. Surface water drainage at the site generally flows from south to north.

The closest surface water feature is Ludmilla Creek and associated mangrove wetlands, situated approximately 500 m to the northeast of the site. It is assumed the surface water on the site ultimately drains into Ludmilla Creek which discharges into the Beagle Gulf.

A drainage culvert is present within the northern portion of the site. Surface water runoff from the grassed central area and the racetrack are likely to flow into this drainage culvert under Dick Ward Drive and into Ludmilla Creek which discharges into the Beagle Gulf.

3. Groundwater monitoring methodology

3.1 Overview

Two GMEs were undertaken on 8 September 2023 (GME 18) and 12 September 2023 (GME 19), respectively, in accordance with EPL 218-2 requirements. Seven boreholes were monitored as identified in Table 1. A location plan is included in Figure 2, Appendix A.

The weather at the time of the GMEs is summarised below. Data was gathered from Darwin Airport weather station and field observations (Station No.: 014015):

- GME 18– sunny, with a maximum temperature of 33.8° Celsius ©. No rainfall was recorded.
- GME 19 – sunny and windy, with a maximum temperature of 36.2° C. No rainfall was recorded.

Table 1 Groundwater sampling program

Bore ID	Location (in relation to racetrack)	Analytical suite
MW01	North	– Total Recoverable Hydrocarbons (TRH) – Benzene, Toluene, Ethylbenzene, o- & m- & p- Xylenes (BTEX) – Dissolved metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc) – Per- and poly-fluoroalkyl substances (PFAS)
MW02	North	
MW03	Northwest	
MW04	Northeast	
MW05	East	
MW06	South	
MW07	West	

3.2 Sampling protocol

During each GME, the following activities were completed at each groundwater bore location:

- Each bore was visually inspected, and the bore condition was noted.
- The bore cap was removed, and the headspace was immediately monitored using a calibrated photo-ionisation detector (PID).
- An initial standing water level (SWL) reading was measured using a calibrated interface probe.

- Groundwater sampling was undertaken using low flow sampling techniques comprising a peristaltic pump and flow cell with calibrated YSI Pro DSS water quality meter.
- Purging was undertaken until the water quality parameters listed in Table 5 stabilised according to the definitions defined by the NT EPA Methodology for the Sampling of Groundwater (DIR, 2016)
- Where purging was not possible due to inadequate water levels, grab sampling was performed using bailers.
- Samples were collected into laboratory supplied containers with appropriate preservative, as required.
- Samples for dissolved metals analysis were field filtered through a <0.45 µm disposable in-line filter.
- The samples were placed in chilled storage containers and transported under Chain of Custody (CoC) documentation to ALS Environmental Darwin, who organised transportation to ALS Environmental Sydney for analysis.
- Additional quality assurance / quality control (QAQC) samples were collected to maintain data quality.

SWLs, PID readings and field water quality parameters were measured using a calibrated interface probe, calibrated PID and calibrated YSI Pro DSS® water quality meter. The calibration certificates for this equipment are attached in Appendix F.

The Methodology for the Sampling of Groundwater (DPIR, 2016) was used to develop the groundwater methodology and uses the following Australian/New Zealand Standards:

- 5667.1:1998 Part 1: Guidance on the design of sampling programs, sampling techniques and the preservation and handling of samples
- 5667.11:1998 Part 11 Guidance on sampling of ground waters
- The volume of water in the bore has been calculated in Table 4 (Section 7.1) and uses the following formula:
 - Water Volume (Litres) = $\pi r^2 (D-SWL) \times 1000$
 - **Where r** =radius of inner bore casing (in meters)
 - π = p6pprox.rox. 3.14)
 - **D** = total depth of the bore (in meters)
 - **SWL** = Standing Water Level (distance from ground to water level, in meters).

3.3 Assessment criteria (Trigger Values)

The DTC Environmental Management Plan (GHD, 2023) documents assessment criteria for groundwater which are based on the Australian New Zealand Guidelines (ANZG) for Fresh and Marine Water Quality published in 2018. These criteria are referred to as Trigger Values in the EPL. They provide the basis upon which non-conformances with the EPL are based.

The assessment criteria (trigger values) are summarised in Table 2.

Table 2 Groundwater trigger values

Parameter	Units	Assessment criteria (Trigger Values)
Field parameters		
pH	pH units	6.0 – 8.0
Temperature	°C	N/A
Turbidity	NTU–2 - 15	
Electrical conductivity	µS/cm	–0 - 250
Dissolved oxygen	% saturation	–0 - 110
Laboratory analysis		
Dissolved metals		
Arsenic	mg/L	0.013
Cadmium	mg/L	0.0002

Parameter	Units	Assessment criteria (Trigger Values)
Chromium	mg/L	0.001
Copper	mg/L	0.0014
Lead	mg/L	0.0034
Mercury	mg/L	0.0006
Nickel	mg/L	0.011
Zinc	mg/L	0.008
BTEX		
Benzene	µg/L	950
Toluene	µg/L	180
Ethylbenzene	µg/L	80
Xylenes	µg/L	350
Total Recoverable Hydrocarbons (TRH)		
TRH (C10 – C36)	mg/L	0.6
PFAS		
Perfluorooctane sulfonic acid (PFOS)	µg/L	0.13
Perfluorooctanoic acid (PFOA)	µg/L	220

Clause 46 of the EPL states that a non-compliance with the EPL includes:

- 46.1 an exceedance of a trigger value specified in Attachment 1 on three consecutive sampling occasions; or
- 46.2 an exceedance of a trigger value specified in Attachment 1 on a single occasion where the parameter measures greater than or equal to three times or more the trigger value.
- DTC must notify the EPA when a non-compliance has occurred, as detailed in the Clause 45 of the EPL. Notification must include:
 - 45.1 when the non-compliance was detected and by whom;
 - 45.2 the date and time of the non-compliance;
 - 45.3 the actual and potential causes and contributing factors to the non-compliance;
 - 45.4 the risk of environmental harm arising from the non-compliance;
 - 45.5 the action(s) that have or will be undertaken to mitigate any environmental harm arising from the non-compliance;
 - 45.6 corrective actions that have or will be undertaken to ensure the non-compliance does not reoccur; and
 - 45.7 if no action was taken, why no action was taken;
 - 45.8 a date when an incident investigation report will be submitted to the NT EPA.

4. Air quality monitoring methodology

One ambient AQME was undertaken on 11 September 2023 to coincide with the oil application to the track on the same day. Three locations were monitored which are typically down-wind of the track area: AQM01, AQM02 and AQM03, see Figure 3, Appendix A. These locations have been identified to assess the risk to potentially sensitive nearby receptors.

The weather at the time of the AQME is summarised below (Darwin Airport weather station: 014015):

- Temperature was recorded at a maximum of 36.4° C
- No rainfall was recorded.
- Wind direction at 9 am was east to south easterly and north to north easterly at 3 pm, with maximum wind gusts up to 44 km/h.

4.1 Sampling protocol

GHD commenced the AQME at 06:00 am on 11 September 2023. Portable canisters were placed at the three nominated sampling locations to collect a single round of air samples on the day of oil application to the track surface. The air monitoring used portable 6 L Summa® canisters, fitted with flow meters, to collect a single round of air samples. The Summa® canister draws a sample of air under vacuum and the flow meter controls the continuous intake of air for a period of 12 hours.

The Summa® canisters were then dispatched for analysis to Eurofins MGT, a NATA-accredited laboratory for analysis. At the time of deployment, the weather conditions were noted as: warm, humid and dark.

Wind speed, wind direction, and temperature were measured during the application period with a calibrated ScarletTech™ anemometer fitted with a data recording device.

During the AQME, the following activities were completed at each sampling location:

- Portable canisters were calibrated for an ultra-low-level 12-hour fill time prior to setup.
- The pressure gauge on each of the canisters was checked to ensure a vacuum pressure of approximately -30 kPa within the canister, prior to sampling.
- The canisters were set up at each of sampling location prior to the commencement of oil application for track conditioning.
- At the time of deployment, the weather conditions were noted.
- The canisters were placed between 1.2 – 1.5 m above ground level.
- Once the canister fill period had expired, the canisters were recovered and transported under CoC documentation to Eurofins MGT for laboratory analysis.
- The samples were analysed for BTEX compounds.
- A weather monitoring station was deployed during the air quality sampling period to collect data on wind speed and direction and temperature to inform the assessment of air quality samples.

Samples were analysed by the receiving laboratory using a laboratory that is NATA-accredited for the analysis method.

4.2 Assessment criteria

Assessment criteria specified in the DTC EMP (GHD, 2023) have been derived from the National Environment Protection (Air Toxics) Measure (NEPM) (NEPC, 2013). The assessment criteria are referred to as ‘trigger values’ in the EPL and define the criteria for when a non-conformance with the EPL has occurred. The assessment criteria are summarised in Table 3.

Table 3 Air quality assessment criteria

Parameter	Units	Assessment criteria / Trigger Values	Source
BTEX			
Benzene	ppb	3	Value provided in EMP derived from the National Environment Protection (Air Toxics) Measure (NEPM)
Toluene	ppb	1,000	
Ethylbenzene	ppb	N/A	
o-Xylene	ppb	250	
m- & p- Xylenes	ppb	250	

5. Oil sampling methodology

As per the EPL 218-02, analysis of a representative sample (where practicable) of the oil applied for track conditioning was undertaken prior to and on the day of application. Oil analysis was undertaken to ensure the composition is not contaminated by polychlorinated biphenyls and per- and polyfluoroalkyl substances (PFAS) to the lowest limit of laboratory reporting (LOR).

5.1 Sampling protocol

An oil sample was collected prior to the application from Cleanaway on 31 August 2023. An soil sample was also collected on the day of application on 11 September 2023.

Oil samples were collected into laboratory supplied containers with appropriate preservative, as required. Samples were immediately placed into chilled coolers and sent to NATA accredited laboratory.

6. Quality control and assurance

6.1 Field quality control methods

All field works were undertaken by experienced Environmental Scientists in accordance with GHD's standard operating procedures and in general compliance with ASC NEPM contamination sampling recommendations and requirements.

6.2 Blind and split duplicates

A single sample is divided into three separate sampling containers. The parent sample and the blind sample are sent anonymously to the primary project laboratory (ALS Environmental) with the split sample sent to the secondary laboratory (Eurofins MGT). Blind duplicates provide an indication of the analytical precision of the laboratory but are susceptible to influence by other factors such as sampling techniques and sample media heterogeneity. Split duplicate samples provide an indication of the repeatability of the results between laboratories.

One set of field duplicate samples (Field Duplicate and Interlab Duplicate) was collected and analysed as part of the QAQC analytical program. The precision of the data from these samples was assessed by calculating the Relative Percent Difference (RPD) between duplicate sample pairs, using the following formula:

$$RPD\% = \frac{|C_o - C_d|}{C_o + C_d} \times 100$$

C_o = Analyte concentration of the original sample

C_d = Analyte concentration of the duplicate sample

Nominal acceptance criteria of 30% and 50% were adopted for field duplicates of inorganics and organics, respectively. Blind and split duplicate samples should return RPDs within these criteria, however it is noted that the criteria will not always be achieved, particularly in heterogeneous media or when comparing low analyte concentrations. In the event RPD values exceed these limits, an explanation is offered for the source of these discrepancies in sample results.

6.3 Laboratory quality control methods

In addition to field QAQC procedures, the receiving laboratories also adopt internal QAQC procedures to ensure data quality and reliability. These procedures are required as part of their NATA-accreditation.

The nominated NATA accredited analytical laboratories (ALS Environmental and Eurofins MGT Laboratory) adopted their internal procedures and methods in accordance with their quality assurance systems. Results from these procedures are provided alongside the individual monitoring reports as appendices.

7. Groundwater monitoring results

The groundwater monitoring events were undertaken prior to and post oil application. GME 18 was completed on 8 September 2023 prior to application and GME 19 completed on 12 September 2023 which was the day following oil application (11 September 2023).

7.1 Field observations and measurements

7.1.1 GME 18 and GME 19

Bore condition notes are presented in Table 5. Generally, the bore network is in good condition and were accessible since reinstatement works for the Fannie Bay Racecourse groundwater monitoring network were completed in December 2021.

When gauging SWLs with an interface probe, non-aqueous phase liquid (NAPL) was not detected. PID readings obtained during gauging were within the acceptable limits defined by the EMP (refer to Table 4).

During GME 18 and GME 19, monitoring wells MW01 and MW05 were unable to be sampled as MW01 was dry and MW05 had insufficient levels of water.

MW02, MW03, MW04 and MW07 were purged with a peristaltic pump during GME 18. MW06 had no recharge and as a result was purged dry during GME 18. A bailer was used to collect the samples for these bores during GME 18 and GME 19.

MW07 and MW04 had sufficient water levels to be purged with a peristaltic pump during GME 19. However, MW02, MW03 and MW06 were sampled by bailer due to the lack of recharge after GME 18, causing the water levels to stay low.

Electric conductivity (EC) readings were not collected during either GME 18 or GME 19 due to a faulty probe on the water quality meter. A replacement probe could not be sourced between the GMEs. EC readings have followed a similar trend in previous monitoring rounds. The lack of EC readings is not considered material to the outcome of the sampling or assessment of trigger exceedances. Information on groundwater salinity was obtained from Total dissolved solids (TDS) readings.

The SWLs and water quality parameters for all bores are recorded in Table 4. The full set of purge parameters are attached in Appendix C for reference.

While gauging the wells with a PID, no hydrocarbons were detected in any of the monitoring wells.

Table 4 Monitoring well observations and depths for GME18 and GME 19

Monitoring well	Easting (m)	Northing (m)	Top of monitoring pipe (m AHD)	Ground surface (m AHD)	Volume of water within bore (as of 12/09/23) (L)	Length of casing above ground (m)	PID (GME 18) (ppm)	PID (GME 19) (ppm)
MW01	700459.294	8626054.921	6.098	5.205	0	0.893	0	0
MW02	700468.771	8626066.059	6.142	5.141	2.35	1.001	0	0.2
MW03	700443.913	8626042.781	6.303	5.327	2.53	0.976	0.2	0.4
MW04	700707.819	8626092.343	5.866	4.793	4.98	1.073	0.5	0.7
MW05	700852.819	8625805.358	11.085	10.375	0.56	0.710	0	0.1
MW06	700784.599	8625421.479	14.393	13.768	1.86	0.625	0	0
MW07	700489.877	8625828.824	7.111	6.102	2.58	1.009	0	0.4

Table 5 GME 18 and GME 19 Groundwater field parameters

Bore ID	Bore Depth (mbTOC)	SWL (mbTOC)	SWL (mbgl)*	Temp (°C)	DO (%S)	pH (pH units)	ORP (mv)	TDS (mg/L)	Comments
GME 18 – 08/09/2023									
MW01	2.94	-	-	-	-	-	-	-	No water present.
MW02	4.33	3.16	2.159	32.5	32.4	5.13	124.6	-	Slightly turbid, no odour, no sheen.
MW03	4.61	3.28	2.304	33.5	24.7	4.90	144.7	236.60	Clear, trace white suspended sediment, no odour, no sheen.
MW04	5.09	3.59	2.517	32.7	21.9	5.01	72.4	12291.00	Clear, black floating particles, no odour, no sheen.
MW05	5.53	5.22	4.51	30.0	57.6	5.85	134.3	89.40	Clear, white particulates, no odour, no sheen – Purged dry, sample not taken due to lack of water.
MW06 (11/09/2023)	6.64	4.36	3.735	31.4	25.3	4.4	196.3	157.3	Clear, no sheen, no odour. Initially purged dry, returned to sample on 11/09/2023
MW07	6.03	4.42	3.411	31.7	21.9	4.84	100.7	-	Clear, no odour, no sheen.
GME 19 – 12/02/2023									
MW01	2.98	-	-	-	-	-	-	-	No water present.
MW02	4.28	3.08	2.196	32.2	35.5	5.36	136.4	1053.00	Very turbid brown, lots of sediment present, no odour, no sheen.
MW03	4.6	3.31	2.334	32.6	20.0	5.10	139.7	390.00	Slightly turbid with white suspended solids, no odour, no sheen.
MW04	5.80	3.26	2.187	32.4	16.7	5.01	149.0	12922.50	Clear, trace white suspended solids to no white suspended solids, no odour, no sheen.
MW05	5.48	5.19	4.48	-	-	-	-	-	Inadequate volume of water in well casing to sample.
MW06	6.67	5.72	5.095	30.3	42.5	4.85	154.2	164.45	Slightly turbid to turbid brown, no odour, no sheen.
MW07	6.02	4.705	3.696	29.6	20.5	4.22	172.9	1618.50	Clear with white and black suspended sediment, no odour, no sheen.

mbTOC – metres below top of casing. mbgl – metres below ground level % S – Percentage saturation TDS – Total Dissolved Solids # not corrected to electrode

7.1.2 Pre-application GME field water quality parameters

A summary of the field parameters observed during the pre-application GME (GME 18) is provided below:

- Groundwater temperatures were typical of Top End groundwaters and ranged between 30°C (MW05) and 33.5°C (MW03).
- With exception of MW05, DO concentrations mostly indicated anaerobic conditions in GME 16 with a DO of <50 % saturation.
- Field pH data indicated groundwater at the site was acidic, with data typical of groundwaters within shallow Top End aquifers. pH ranged from 4.4 pH units (MW06) to 5.85 pH units (MW05).
- Total dissolved solids (TDS) values indicated a wide range of salinities were present in groundwaters across the Site.
- Turbidity ranged from no turbidity to very high turbidity across the site.

7.1.3 Post-application GME field water quality parameters

A summary of the field parameters observed during the post-application GME (GME 19) is provided below:

- Groundwater temperatures were typical of Top End groundwaters ranging from 29.6°C (MW07) to 32.6°C (MW03).
- DO concentrations mostly indicated anaerobic conditions during GME 18 with a DO of < 50 % saturation.
- Field pH data indicates groundwater at the site was acidic, with data typical of groundwaters within shallow Top End aquifers. pH ranged from 4.22 pH units (MW07) to 5.36 pH units (MW02).
- TDS values indicated a wide range of salinities were present in groundwaters across the Site.
- Turbidity ranged from no turbidity to very high turbidity across the Site.

7.2 Laboratory results

Copies of the certified laboratory reports are attached in Appendix D. The results of the groundwater analyses are summarised in tables within Appendix E, and presented against the relevant assessment criteria.

TRH/ BTEXN analysis could not be completed on samples collected in GME 18. Samples transported to the laboratory froze during transit which results in the sample expanding and the glass laboratory supplied bottles being destroyed. However, results for BTEX and TRH analysis undertaken during GME 19 were not detected above the laboratory limit of reporting (LOR).

The majority of dissolved metals also reported below the laboratory LOR. Copper, lead, nickel and zinc were detected in groundwater samples at concentrations above the adopted assessment criteria in several bores as detailed in Table 6.

PFAS concentrations were above the laboratory LOR for a portion of samples however were below the adopted assessment criteria (where established).

A summary of individual analyte exceedances to the acceptance criteria are presented in Table 6.

Table 6 GME results with exceedances highlighted

Analyte	Assessment criteria (GHD, 2023)	Unit	Exceedance concentration													
			MW01	MW02	MW03	MW04	MW05	MW06	MW07	MW01	MW02	MW03	MW04	MW05	MW06	MW07
Dissolved metals			GME 18							GME 19						
Copper	0.0014	mg/L	N/A	0.002	-	-	N/A	-	-	N/A	0.003	-	-	N/A	-	-
Lead	0.0034	mg/L	N/A	-	-	-	N/A	-	-	N/A	-	-	-	N/A	-	0.004
Nickel	0.011	mg/L	N/A	-	-	0.082	N/A	-	-	N/A	-	-	0.135	N/A	-	-
Zinc	0.008	mg/L	N/A	-	-	0.164	N/A	0.010	-	N/A	-	-	0.339	N/A	0.011	-
Field water quality parameters			GME 18							GME 19						
Field pH	6.0 – 8.0	pH units	N/A	5.13	4.90	5.01	N/A	4.4	4.84	N/A	5.36	5.10	5.01	N/A	4.85	4.22
Dissolved oxygen (DO)	80 – 110	%	N/A	32.4	25.7	21.9	N/A	25.3	21.9	N/A	35.5	20.0	16.7	N/A	42.5	20.5

– Reported within the relevant assessment criteria

N/A – no sample retrieved

As per EPL requirements described in Section 3.3, DTC is required to notify NT EPA of specific non-compliances with the EPL. Considering these non-compliance definitions, the results from the September 2023 monitoring period have been assessed and tabulated against these clause definitions. These are presented in Table 7 and Table 8.

Table 7 *EPL Clause 46.1: NT EPA notifiable exceedances: three consecutive exceedances*

Bore ID	Parameter/Analyte:	pH	DO	Copper	Nickel	Zinc
	Assessment criteria:	6.0-8.0 (pH units)	80-110 (%)	0.0014 (mg/L)	0.011 (mg/L)	0.008 (mg/L)
MW02	GME 17	5.1	12.7	0.005	-	-
	GME 18	5.13	32.4	0.002		
	GME 19	5.36	35.5	0.003		
MW03	GME 17	4.9	8.6	-	-	-
	GME 18	5.13	24.7			
	GME 19	4.22	20.5			
MW04	GME 17	5.08	4.7	-	0.060	0.142
	GME 18	5.01	57.6		0.082	0.164
	GME 19	5.01	16.7		0.135	0.339
MW05	GME 17	4.73	-	-	-	-
	GME 18	5.85				
	GME 19	5.01				
MW06	GME 17	4.73	6.4	-	-	0.011
	GME 18	4.4	21.9			0.010
	GME 19	4.85	20.5			0.011
MW07	GME 17	4.26	21.2		-	-
	GME 18	4.84	21.9			
	GME 19	4.22	20.5			

Table 8 *EPL Clause 46.2: NT EPA notifiable exceedances: results greater than or equal to three times the assessment criteria*

Parameter/Analyte:	Nickel		Zinc	
	GME 18	GME 19	GME 18	GME 19
Assessment criteria:	0.011 mg/L		0.008 mg/L	
MW01	Nil	Nil	Nil	Nil
MW02	Nil	Nil	Nil	Nil
MW03	Nil	Nil	Nil	Nil
MW04	0.082	0.135	0.164	0.339
MW05	Nil	Nil	Nil	Nil
MW06	Nil	Nil	Nil	Nil
MW07	Nil	Nil	Nil	Nil

7.3 Quality control/Quality Assurance

7.3.1 Field quality control

In accordance with NEPM (2013) quality control requirements, one duplicate sample was collected and analysed for each GME, achieving a 1:10 primary-to-duplicate pair sampling ratio. These samples were collected alongside a nominated primary sample and analysed as a blind duplicate and split duplicate respectively.

The duplicates that were analysed are summarised in Table 9.

Table 9 September 2023 GME QAQC sample summary

September 2023 GME QAQC sample summary				
Parent sample	Duplicate sample	Sample Date	Laboratory	Analysis
MW07	Field Duplicate	08/04/2023	ALS	– 8 metals – PFAS
MW07	Field Duplicate	12/04/2023	ALS	– TRH – BTEX – 8 metals – PFAS

The following table summarises the RPD exceedances reported:

Table 10 RPD Summary

Sample ID	Parent Sample	Analyte	RPD Exceedance (%)
FD_01	MW07	Arsenic	100
		Nickel	40
		Perfluorohexane sulfonic acid (PFHxS)	67
		Sum of PFHxS and PFOS	67
FD_02	MW07	Nickel	40
		Sum of PFHxS and PFOS	67

Overall based on QA/QC results the dataset can be considered of sufficient quality and reliability to fulfil the requirements of this investigation.

7.3.2 Laboratory QAQC results

The analysis of matrix spikes, matrix spike duplicates, internal laboratory control samples and surrogates was undertaken by the laboratory. A summary of the laboratory quality control procedures is given below:

- All samples were received by the laboratory in good condition and chilled and within appropriate sample containers for analysis with exception of glass sample jars submitted for GME 18.
- Samples were extracted and analysed within appropriate holding times.
- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Laboratory Control outliers occur.
- No Matrix Spike outliers occur.
- No surrogate recovery outliers occur.
- No Analysis Holding Time outliers exist.
- Quality Control Sample Frequency Outliers exist (see Table 11).

- Laboratory QAQC reports are presented within the laboratory documentation in Appendix D.

Table 11 Quality control sample frequency outliers

Analyte	Method	Rate (%)		Quality control specification
		Actual	Expected	
Per- and polyfluoroalkyl substances (PFAS)	EP231X	0	10	NEMP 2013 B3 & ALS QC Standard
TRH – Semi volatile fraction	EP071	0	10	NEMP 2013 B3 & ALS QC Standard

8. Air quality monitoring results

8.1 Summary of air quality data

Weather data was collected through an on-site continuous weather monitoring device during the oil application period: 06:00 to 18:00 on 11 September 2023. The on-site weather monitoring results are summarised in Table 12. At the time of deployment, the weather conditions were noted as: warm, dry, sunny with calm, south-easterly winds.

Figure 2 displays the wind direction and speed over the 12-hour air quality monitoring period (11/09/2023 06:00 – 18:00) on a wind rose. The wind was easterly in the morning and north north easterly in the afternoon.

The weather data collected during the oil application period indicated the locations of the three air quality monitoring locations: AQM01 and AQM02 were not optimal for this wind direction however these locations were identified to assess nearby potentially sensitive receptors.

Table 12 September 2023 AQME Weather monitoring data

Parameters	AQM01	AQM02	AQM03
Canister deployment			
Date / Time	11/09/2023 6:00	11/09/2023 6:10	11/09/2023 6:20
Wind speed	15 km/h		
Wind direction	E		
Temperature	28.9		
Canister collection			
Date / Time	11/09/2023 17:45	11/09/2023 17:50	11/09/2023 18:00
Wind speed	28 km/h		
Wind direction	NNE		
Temperature	32.8		

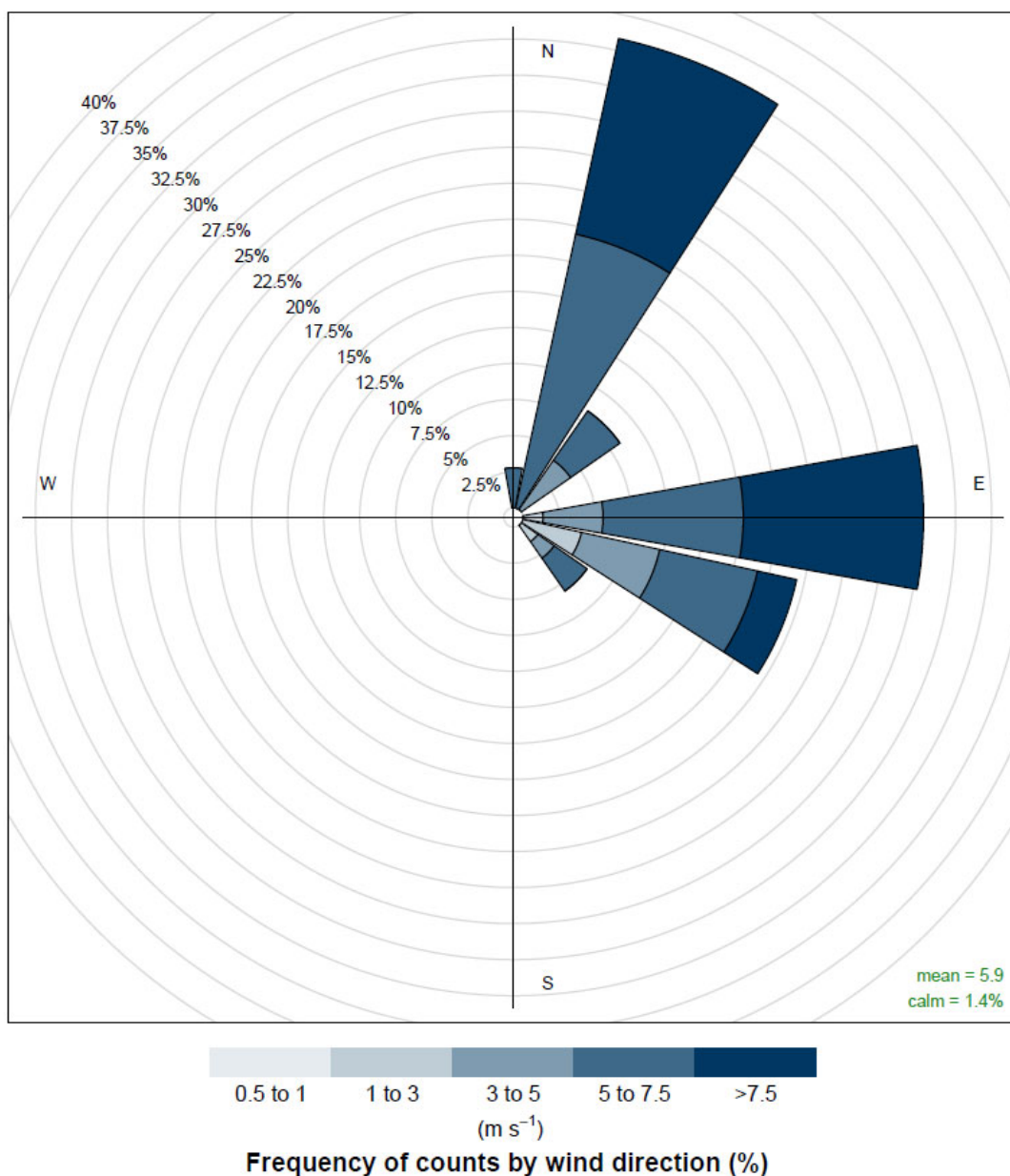


Figure 2 Wind direction and speed over the 12-hour period on oil application day 11 September 2023

8.2 Laboratory results

Table 13 September 2023 air quality monitoring results

Analyte	Assessment criteria (NEPM)		Unit	Sample pollutant concentration		
				AQM01	AQM02	AQM03
Benzene	0.010		ppb	<0.003	<0.003	<0.004
Toluene	3.766		ppb	<0.0075	<0.0075	0.047
Ethylbenzene	N/A		ppb	<0.004	<0.004	0.042
o-Xylene	1.085		ppb	<0.004	<0.004	0.012
m- & p- Xylenes	N/A		ppb	<0.008	<0.008	<0.01
Naphthalene	2.17		ppb	<0.02	<0.021	<0.02
NA – no assessment criterion						

9. Oil assessment results

Samples of the oil were collected prior to, and on, the application day as per the conditions of EPL 218-02. An outline of these results is presented in Table 14. The full results are presented in Appendix E.

Table 14 Oil assessment results

Analyte	Unit	LOR	31 August 2023	11 September 2023
PCBS				
PCBs	µg/L	1000	<1000	<1000
PFAS				
PFOS	µg/L	5	<5	<5
PFHxS	µg/L	5	<5	<5
PFOA	µg/L	5	<5	<5
6:2 Fluorotelomer Sulfonate (6:2 FTS)	µg/L	10	<10	<10
Sum of (PFHxS + PFOS)	µg/L	5	<5	<5
Sum of PFASs	µg/L	50	<50	<50
PFAS (Sum of Total) (WA DER List)	µg/L	10	<10	<10

10. Results

Groundwater

Laboratory analytical results reported concentrations below the laboratory LOR for the majority of analytes with exception of dissolved metals and PFAS. Generally, one or more concentrations of contaminants of potential concern were detected at each location, either pre-application or post-application.

The results are summarised below:

- Comparing pre-application GME 18 (08 September 2023) and post-application GME 19 (12 September 2023), there was no change in arsenic levels. Concentrations of arsenic were detected at MW04 and MW07 during both GMEs with no change in levels at MW04 and a slight decrease from GME 18 to GME 19 at MW07. No concentrations of arsenic exceeded the applied trigger values.
- Cadmium was detected above laboratory LOR at MW04 and MW07, with a slight increase seen from the post-application GME 19. MW04 recorded no concentrations above the laboratory LOR for GME 18, however recorded 0.0002 mg/L during GME 19. MW07 recorded 0.001 mg/L during GME 18 and 0.002 mg/L during GME 19.
- Chromium and mercury concentrations were below the laboratory LOR for all bores. Concentrations for chromium and mercury were detected in previous GMEs.
- Concentrations of copper were detected above the laboratory LOR during both GMEs at MW04 and exceeded the applied trigger values during both GMEs at MW02. Copper detections were below the laboratory LOR at all other locations.
- Lead concentrations were detected above laboratory LOR at MW04 and above applied trigger values at MW07. The results showed a slight increase in lead levels post-application of the oil at these locations as there were no detections of lead during the pre-application GME.
- Nickel and zinc exceeded the applied trigger values at MW04 during both GMEs. This is consistent with historical concentrations at this monitoring bore. Zinc exceeded the applied trigger values at MW06 for both GMEs and was detected above laboratory LOR during the post-application GME at MW02. MW06 and MW07 reported exceedances in both nickel and zinc. There was a slight increase in nickel and zinc levels during the post-application GME at MW04.
- pH concentrations were generally acidic across the site and ranged from 3.3 pH units (MW03 in GME19) to 5.36 pH units (MW02 in GME19). pH exceeded the adopted assessment criteria in all of the bores.
- Groundwater pH values are reflective of the nature of the site near the coast. Copper, Zinc and Nickel have been detected regularly throughout the GMEs undertaken to date and are likely to reflect natural background concentrations at the DTC.
- PFAS concentrations (PFOS and PFOA) were detected above the laboratory LOR however below the nominated trigger values for samples collected from both GME 18 and GME 19.
- TRH and BTEXN were below the laboratory LOR for the post-application GME 19.
- Two field duplicates were submitted to ALS for analysis. RPD values are below the nominated data quality for all analytes, suggesting the results collected are reliable.

Air quality

- The air quality monitoring was carried out on 11 September 2023, coinciding with the application of refined waste oil mixture to the track. The air quality monitoring program returned no detectable concentrations of BTEXN at any of the air quality monitoring locations.
- This indicates that there is low risk to residents in relation to the air quality during the oil application and tilling practices within the vicinity of the Darwin Turf Club. This is as expected as during the oil application, the wind direction was north north easterly, facing away from the residential properties.

Oil sampling

Waste oil analysis was undertaken to assess its composition prior to track application. Results indicated concentrations of all analytes tested (PCBs and PFAS) were below the laboratory LOR .

11. Discussion

Groundwater monitoring and air monitoring were undertaken in September 2023 for the oil application event in accordance with EPL-218-02 and the EMP (GHD, 2023). Locations MW01 and MW05 were not sampled due to the lack of water in well casing and no recharge during purging.

Generally, the field parameters remained at similar levels between GME 18 and GME 19. Some minor differences observed for DO between GME 18 and GME 19, although there was no consistent change indicating significant impact from the oil application.

Field pH and temperature measurements were consistent with those of Top End groundwater and are likely to reflect natural groundwater conditions. Turbidity ranged from high to low across the monitoring wells, but this is due to natural variations rather than the application of oil.

Heavy metal concentrations across the site were generally lower compared to the previous GMEs. In particular copper concentrations during the two previous GMEs (GME 16 and 17) exceeded the applied trigger values at all locations. Whereas copper concentrations were only detected at MW02 and MW04 above the laboratory LOR during GME 18 and GME 19, exceeding the trigger values at MW02.

Concentrations of copper, lead, nickel, zinc and arsenic were detected above the trigger values. Given the relative consistency of the range of concentrations across all GMEs at the site, the metal concentrations are considered to be representative of natural groundwater conditions. Therefore, there is no obvious evidence to suggest the changes are due to the oil application and the levels do not pose a significant threat to human and ecological health on the site.

Concentrations of BTEXN, TRH and PCBs were below the laboratory LOR during the post application GME at all sampling locations. Other contaminants of concern including PFAS were detected above the laboratory LOR during both GMEs in a portion of sampling locations. However, there were no detections above the PFAS NEMP 2.0 trigger values.

Air quality monitoring results indicates the oil application events are not posing a significant risk to on site and surrounding receptors to the site, considering all air quality monitoring locations showed no results above laboratory LOR.

Results from the analysis of the waste oil applied to the track showed that all the CoPCs were below the laboratory LORs.

12. Conclusions and recommendations

12.1 Conclusion

The groundwater monitoring and air quality monitoring undertaken during the September 2023 reporting period has generally met the requirements of the EMP (GHD, 2023) and EPL 218-02.

The GME and AQME results from this reporting period indicated that the track conditioning activity undertaken at the DTC, under EPL 218-02, has not contributed hydrocarbon contamination to the surrounding environment, nor is there evidence that it has materially impacted the quality of groundwater.

While exceedances of some parameters have been noted, these have been consistently reported in previous GMEs and both before and after oil application. This suggests that the exceedance concentrations are within naturally occurring ranges.

The groundwater and air monitoring results indicate that the track conditioning activity undertaken at the Darwin Turf Club approved under EPL 218-02 does not pose a significant health risk to the surrounding receptors.

As per EPL requirements, DTC is required to notify NT EPA of specific non-compliances with the EPL. These are listed in this report (Table 7 and Table 8 in Section 7.2). However, it is likely that trigger values exceedances reflect natural background conditions and responses to climatic effects rather than the application of oil.

12.2 Recommendations

Considering the results of this monitoring report and that of previous monitoring activities, the following recommendations are proposed:

- Although the surrounding environment exhibits minimal to no impact from the track conditioning activities, groundwater and air quality monitoring should continue to be undertaken as per NT EPA and EMP requirements.
- Based on the lack of water encountered in MW01, it is recommended this bore is re-developed to clear the bore casing of built up sediment.

13. References

Australia and New Zealand Guidelines (ANZG), 2018. Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Australian and New Zealand Governments and Australian state and territory governments, Canberra, ACT, Australia. Accessed 25 September 2023. Available from <https://www.waterquality.gov.au/anz-guidelines>

Department of Climate Change, Energy, the Environment and Water 2020. Heads of EPAs of Australia and New Zealand PFAS National Environmental Management Plan 2.0 (NEMP). Accessed 25 September 2023. Available from [**PFAS National Environmental Management Plan 2.0 - DCCEEW**](#)

Department of Primary Industry and Resources (DPIR), 2016. Methodology for the Sampling of Groundwater. Northern Territory Government. Accessed 19 May 2022. Available from [**https://nt.gov.au/__data/assets/pdf_file/0014/203360/aa7-024-methodology-for-the-sampling-of-groundwater-advisory-note.pdf**](https://nt.gov.au/__data/assets/pdf_file/0014/203360/aa7-024-methodology-for-the-sampling-of-groundwater-advisory-note.pdf)

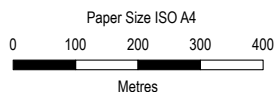
GHD (2023) *Environmental Management Plan for the Application of Used Oil*.

National Environment Protection Council (NEPC)2013. *The National Environment Protection (Air Toxics) Measure*. Australian Government. Accessed 25 September 2023. Available from [**National Environment Protection \(Air Toxics\) Measure \(legislation.gov.au\)**](#)

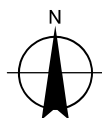
Appendices

Appendix A

Figures



Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 52



Darwin Turf Club Inc
EPL Monitoring

Site Location -
Darwin Turf Club,
Fannie Bay Racecourse

Project No. 12618429
Revision No. B
Date 21/09/2023

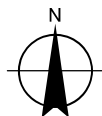
FIGURE 1





Paper Size ISO A4
0 25 50 75 100
Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 52



Darwin Turf Club Inc
EPL Monitoring

Project No. 12618429
Revision No. A
Date 04/09/2023

Air Quality Sampling Locations

FIGURE 3

Appendix B

EPL218-02

ENVIRONMENT PROTECTION LICENCE(Pursuant to section 34 of the *Waste Management and Pollution Control Act*)

Licensee	Darwin Turf Club Inc.
Licence Number	EPL218 - 02
Registered Business Address	Darwin Turf Club Inc. 20 Dick Ward Drive Fannie Bay NT 0820
ABN	21 373 066 193
Premises Address	Lot 05298 Town of Darwin plan(s) S 79/109 20 DICK WARD DR, FANNIE BAY
Anniversary Date:	01 September
Commencement Date:	01/09/2022
Expiry Date:	31/08/2024
Scheduled Activity	Collecting, transporting, storing, re-cycling, treating or disposing of a listed waste (as per Table 1) on a commercial or fee for service basis, other than in or for the purpose of a sewage treatment plant. Operating premises, other than a sewage treatment plant, associated with collecting, transporting, storing, re-cycling, treating or disposing of a listed waste (as per Table 1) on a commercial or fee for service basis.
Description	Application of <i>waste mixtures</i> , or <i>waste emulsions</i> , of <i>oil and water or hydrocarbon and water</i> by disposal to Darwin Turf Club, Fannie Bay Racecourse for the purpose of conditioning the track twice yearly.

Table 1 - Listed Wastes Authorised to be Handled

Listed Waste	Collection	Transport	Storage	Treatment	Recycling	Disposal
Waste mixtures, or waste emulsions, of oil and water or hydrocarbon and water	✗	✗	✗	✗	✗	✓

✓ Activity authorised by this licence

✗ Activity not authorised by this licence

ENVIRONMENT PROTECTION LICENCE 218 - 02

TABLE OF CONTENTS

INFORMATION ABOUT THIS LICENCE	4
RULES FOR INTERPRETING THE CONDITIONS OF THIS LICENCE	6
LICENCE CONDITIONS	7
GENERAL	7
EARLY SURRENDER OF LICENCE	8
OPERATIONAL	8
DISCHARGES AND EMISSIONS	9
MONITORING	9
RECORDING AND REPORTING	10
DEFINITIONS	14

ATTACHMENTS

- 1 12526136-REP-0_Environmental Management Plan for the Application of Used Oil.pdf_11568393.pdf

ENVIRONMENT PROTECTION LICENCE 218 - 02

INFORMATION ABOUT THIS LICENCE

- This licence does not in any way relieve the licence holder from its obligations to comply with the *Waste Management and Pollution Control Act* (WMPC Act), including the general environmental duty in section 12 of the WMPC Act and the duty to notify of incidents causing or threatening to cause pollution under section 14 of the WMPC Act.

Duration of a licence (section 40, 43 and 45 of the WMPC Act)

- A licence will remain in force until its expiry date or until it is surrendered by the licensee or is suspended or cancelled in accordance with the WMPC Act.
- The licensee must notify the Northern Territory Environment Protection Authority (NT EPA) within 14 days after ceasing to conduct the activity.
- The licensee may, with the approval of the NT EPA, surrender the licence to the NT EPA.

Amendment or Revocation of a licence (section 37 of the WMPC Act)

- The licensee may apply to amend or revoke a condition of this licence.
- A fee applies and the application must be made using the designated form via NT EPA Online.
- The NT EPA may also amend or revoke a condition of this licence as set out in section 38 of the WMPC Act.

Transfer of a licence (section 46 of the WMPC Act)

- The licensee can apply to transfer their licence to another person.

Renewal of a licence (section 40 of the WMPC Act and section 3 of the Regulations)

- The licensee may apply for the renewal of their licence not earlier than 90 days, and not later than 30 days, before their licence expires.
- A fee applies and the application must be made via NT EPA Online.

Public Register

- A copy of environment protection licences and any plans for environmental management, reports, submissions or documents required as a condition of an environment protection licence, will be placed on a register in accordance with section 9 of the WMPC Act.
- A copy of the Annual Return will be placed on the register.
- The NT EPA makes this register freely available from the NT EPA website.

Environment Protection Objectives (Part 4 of the WMPC Act), and Water Quality Standards (section 73 of the *Water Act*)

- An Environment Protection Objective (EPO) is a statutory instrument to establish principles on which:
 - a. environmental quality is to be maintained, enhanced, managed or protected;
 - b. pollution, or environmental harm resulting from pollution, is to be assessed, prevented, reduced, controlled, rectified or cleaned up; and
 - c. effective waste management is to be implemented or evaluated.
- In accordance with section 18 of the WMPC Act a beneficial use, quality standard, criteria or objective declared under section 73 of the *Water Act* and in force is an environment protection objective for the purposes of the WMPC Act.

ENVIRONMENT PROTECTION LICENCE 218 - 02

- The following EPOs and Beneficial Use Declarations (BUDs) are relevant to this licence:
 - Darwin Harbour Region: Aquaculture, environment, cultural, rural stock and domestic

Environmental Interests

- This section highlights sensitivity of the surrounding land use and environment associated with the location of the approved activity.
- Sites of Conservation Significance
- Ramsar Wetland

Cultural Interests

- It is the licensee's responsibility to contact the Aboriginal Areas Protection Authority, appropriate land council or other governing body and ensure that any Authority Certificates required as a result of conducting the licenced activity are obtained and complied with.

ENVIRONMENT PROTECTION LICENCE 218 - 02

RULES FOR INTERPRETING THE CONDITIONS OF THIS LICENCE

- Where there is a discrepancy between the conditions of this licence and any plan, standard, guideline or other document referred to in this licence, the conditions of this licence prevail to the extent of the inconsistency.
- Any reference to any standard (Australian or international) in this licence means the relevant parts of the current version of that standard.
- A reference to any guideline or code of practice (or to the relevant parts of any guideline or code of practice) in this licence means the current version of the guideline or code of practice.
- Under section 39 of the WMPC Act, any contravention of or failure to comply with this licence by the licensee may be an offence.
- In determining whether the licensee has committed an offence, the licensee may be liable for the conduct of its directors, employees or agents.
- The licensee should ensure that each of its directors, employees, contractors or agents are aware of, and comply with, this licence.
- In this licence, unless the contrary intention appears, words that are defined in the WMPC Act are intended to have the meaning given to them in that Act.

ENVIRONMENT PROTECTION LICENCE 218 - 02

LICENCE CONDITIONS

GENERAL

- 1 The licensee must ensure the contact details recorded in NT EPA Online for this licence are correct at all times.
- 2 The licensee must at all times have a 24 hour emergency contact.
- 3 The licensee must notify the NT EPA prior to making any operational change that will cause, or is likely to cause, an increase in the potential for environmental harm.
- 4 The licensee must pay via NT EPA Online the annual fee calculated in accordance with the method prescribed in the Regulations within 10 business days of the anniversary date of this licence, for each year or part of a year that this licence is in force.
- 5 The licensee must cause clear and legible signage, in English, to be displayed in a prominent location at each public entrance to the premises that includes the following details:
 - 5.1 environment protection licence number issued under the WMPC Act; and
 - 5.2 24 hour emergency contact details.
- 6 The licensee must cause a copy of this licence to be available for inspection by any person, in hard copy form, at the premises.
- 7 The licensee must provide to the NT EPA, within 10 business days of a request, a copy of any document, monitoring data or other information in relation to the activity, in the format requested by the NT EPA.
- 8 All notices, reports, documents or other correspondence required to be provided as a condition of this licence, unless otherwise specified as a condition of this licence, must be provided in electronic form by uploading the document via NT EPA Online (or by emailing waste@nt.gov.au).
- 9 The licensee must implement, maintain and follow the documents listed in Table 2.
Table 2 - Documents Relevant to the Licenced Activity

Document Ref.	Document Name
12526136	Fannie Bay Racecourse Environmental Management Plan (EMP) for the Application of Used Oil, Rev 0, 21 January 2022
- 10 Within 10 business days of any amendment being made to a document listed in Table 2 the licensee must provide the amended document to the NT EPA, along with:
 - 10.1 a tabulated summary of the amendment(s) with document references;
 - 10.2 reasons for the amendment(s); and
 - 10.3 an assessment of environmental risk associated with the amendment(s).
- 11 The NT EPA may require the licensee to revise or amend and resubmit any amended document. Where the NT EPA requires a document to be resubmitted, the licensee must submit it to the NT EPA by the date specified by the NT EPA.
- 12 The licensee must, for the duration of this licence, implement, maintain and follow a Consultation and Communication Plan which includes a strategy for communicating with persons who are likely to have a real interest in, or be affected by, the activity.

ENVIRONMENT PROTECTION LICENCE 218 - 02

- 13 The licensee must operate and maintain a community feedback number.
- 14 The licensee must display the community feedback number:
 - 14.1 where the licensee has a website, in a prominent location on the licensee's website;
 - 14.2 in the Consultation and Communication Plan; and
 - 14.3 in other publicly available documents relating to the activity.
- 15 The licensee must maintain a Complaint Log for all complaints received by the licensee in relation to the activity.
- 16 The licensee must ensure that the Complaint Log includes, for each complaint received by the licensee, the following information:
 - 16.1 the person to whom the complaint was made;
 - 16.2 the person responsible for managing the complaint;
 - 16.3 the date and time the complaint was reported;
 - 16.4 the date and time of the event(s) that led to the complaint;
 - 16.5 the contact details of the complainant if known, or where no details are provided a note to that effect;
 - 16.6 the nature of the complaint;
 - 16.7 the nature of event(s) giving rise to the complaint;
 - 16.8 prevailing weather conditions at the time (where relevant to the complaint);
 - 16.9 the action taken in relation to the complaint, including any follow-up contact with the complainant; and
 - 16.10 if no action was taken, why no action was taken.
- 17 The licensee must implement, maintain and follow an Emergency Response Plan that addresses procedures for responding to emergencies associated with the activity that may cause environmental harm.

EARLY SURRENDER OF LICENCE

- 18 Any reports, records or other information required or able to be provided by the licensee under this licence must be submitted to the NT EPA prior to the licensee surrendering the licence. If the date on which a report, record or other information is required falls after the date the licensee requests to surrender this licence, the licensee must provide the report, record or information as far as possible using data available to the licensee up to and including the date the request to surrender the licence is made.

OPERATIONAL

- 19 The licensee must, without limiting any other condition of this licence, in conducting the activity, do all things reasonable and practicable to ensure the activity does not adversely affect the Declared Beneficial Uses and Objectives as declared from time to time, including those applying to:
- *Darwin Harbour Region*

ENVIRONMENT PROTECTION LICENCE 218 - 02

- 20 The licensee must not collect, transport, store, recycle, treat or dispose of listed waste other than the listed waste specified in Table 1.
- 21 The licensee must ensure any plant and equipment used by the licensee in conducting the activity:
- 21.1 is reasonably fit for the purpose and use to which it is put;
 - 21.2 is maintained;
 - 21.3 is operated by a person trained to use the plant and equipment; and
- 22 The licensee must ensure that wastewater generated from washing plant and equipment associated with the activity does not cause pollution.
- 23 The licensee must ensure that all listed waste being transported to the premises is transported by a person licenced under section 30 of the WMPC Act to transport the listed waste.
- 24 The licensee must notify the NT EPA, two weeks in advance, of the proposed dates for the application of listed waste to the track at the premises.

DISCHARGES AND EMISSIONS

- 25 The licensee must not allow a contaminant or waste, which causes or may cause environmental harm, to enter water.
- 26 The licensee must ensure there is no migration or overflow of a contaminant or waste, which causes or may cause environmental harm, beyond the boundary of the land on which the premises are located. (For the avoidance of doubt, this condition is not intended to authorise the discharge of a contaminant or waste to any land or water which discharge has not been specifically authorised by another condition of this licence.)
- 27 The licensee must ensure that stormwater does not come into contact with a contaminant or waste, which causes or may cause environmental harm.
- 28 The licensee must ensure that discharges from the premises do not:
- 28.1 contain any floating debris, oil, grease, petroleum hydrocarbon sheen, scum, litter or other objectionable matter;
 - 28.2 cause or generate odours which would adversely affect the use of surrounding waters;
 - 28.3 cause visible change in the behaviour of fish or other aquatic organisms in the receiving water;
 - 28.4 cause algal blooms in the receiving water;
 - 28.5 cause mortality of fish or other aquatic organisms; or
 - 28.6 cause adverse impacts on plants.
- 29 The activity must not cause or release, beyond the boundary of the premises offensive odour.

MONITORING

- 30 The licensee must conduct air and groundwater monitoring in accordance with section 9 of the EMP referred to in Table 2.

ENVIRONMENT PROTECTION LICENCE 218 - 02

- 31 The licensee must conduct surface water and soil monitoring in accordance with the programs developed under conditions 32 and 33.
- 32 The licensee must develop a surface water quality monitoring program to monitor for total recoverable hydrocarbons and benzene, toluene, ethylbenzene and xylene (BTEX) in surface water leaving the premises. A copy of the surface water quality program must be submitted to the NT EPA by 30 September 2022.
- 33 The licensee must develop a soil monitoring program and provide it to the NT EPA by 30 September 2022.
- 34 Prior to the application of listed waste (per Table 1) to the Fannie Bay Racecourse, the licensee must analyse a representative sample of the listed waste to be applied. The sample must:
- 34.1 be representative to the extent practicable; and
 - 34.2 test for other listed waste, including polychlorinated biphenyls (PCBs) and per-and polyfluoroalkyl substances (PFAS).
- 35 The licensee must provide the results of the sampling taken under condition 34 to the NT EPA within two business days of receipt.
- 36 The licensee must ensure any samples collected in accordance with the Monitoring Plan or in connection with the activity or this licence, are obtained by, or under the supervision of a qualified sampler.
- 37 The licensee must ensure that all monitoring samples are analysed at a laboratory with current NATA accreditation or equivalent, for the parameters to be measured.
- 38 The licensee must ensure that, for each sample collected in accordance with the Monitoring Plan or the activity the following information must be recorded and retained:
- 38.1 the date on which the sample was collected;
 - 38.2 the time at which the sample was collected;
 - 38.3 the location at which the sample was collected;
 - 38.4 the name of the person who collected the sample;
 - 38.5 the chain of custody forms relating to the sample;
 - 38.6 the field measurements (if any) and analytical results (if any) relating to the sample; and
 - 38.7 laboratory quality assurance and quality control documentation.
- 39 The NT EPA may require the licensee to revise or amend and resubmit the Monitoring Plan. Where the NT EPA requires the Monitoring Plan to be resubmitted, the licensee must submit it to the NT EPA by the date specified by the NT EPA.
- 40 The licensee must ensure that any proposed revisions to the Monitoring Plan (other than typographical changes or revisions to formatting or referencing) are:
- 40.1 reviewed by a suitably qualified professional;
 - 40.2 submitted to the NT EPA with justification for revisions; and
 - 40.3 submitted to the NT EPA, in electronic form (with a complete copy of the qualified professional's written review), 20 business days prior to the proposed implementation date.

ENVIRONMENT PROTECTION LICENCE 218 - 02

RECORDING AND REPORTING

- 41 The licensee must keep and maintain records relating to the activity undertaken and the listed waste handled by the licensee in each successive 12 month period following the commencement of this licence, which include:
- 41.1 the date of collection;
 - 41.2 the source of the listed waste;
 - 41.3 the name of the transport company, if not the licensee;
 - 41.4 the vehicle registration;
 - 41.5 a description of the listed waste;
 - 41.6 the quantity of the listed waste;
 - 41.7 the final destination of the listed waste; and
 - 41.8 whether the listed waste was stored, recycled, treated or disposed of.
- 42 The licensee must retain records relating to waste, including listed waste, as required by the conditions of this licence, for a period of 2 years after the end of the 12 month period to which the record relates.
- 43 The licensee must keep records of all non-compliances with this licence. These records must be adequate to enable the licensee to comply with the non-compliance notification conditions of this licence.
- 44 The licensee must notify the NT EPA of any non-compliance with this licence by completing the Non-Compliance Notification via NT EPA Online (or by emailing waste@nt.gov.au), as soon as practicable after (and in any case within 24 hours after) first becoming aware of the non-compliance.
- 45 The licensee must include in the notification of non-compliance the following information:
- 45.1 when the non-compliance was detected and by whom;
 - 45.2 the date and time of the non-compliance;
 - 45.3 the actual and potential causes and contributing factors to the non-compliance;
 - 45.4 the risk of environmental harm arising from the non-compliance;
 - 45.5 the action(s) that have or will be undertaken to mitigate any environmental harm arising from the non-compliance;
 - 45.6 corrective actions that have or will be undertaken to ensure the non-compliance does not reoccur;
 - 45.7 if no action was taken, why no action was taken; and
 - 45.8 a date when an incident investigation report will be submitted to the NT EPA.
- 46 A non-compliance with this licence includes:
- 46.1 an exceedance of a trigger value specified in Attachment 1 on three consecutive sampling occasions; or
 - 46.2 an exceedance of a trigger value specified in Attachment 1 on a single occasion where the parameter measures greater than or equal to three times or more the trigger value.

ENVIRONMENT PROTECTION LICENCE 218 - 02

- 47 The licensee must keep records of all exceedances of trigger values specified in Attachment 1. These records must be adequate to enable the licensee to comply with the exceedance notification conditions of this licence.
- 48 The licensee must submit a completed Annual Return form to waste@nt.gov.au within 10 business days after each anniversary date of this licence, which relates to the preceding 12 month period.
- 49 The licensee must complete and provide to the NT EPA a Monitoring Report, as prescribed by this licence, within 10 business days after each anniversary date of this licence.
- 50 The licensee must ensure that each Monitoring Report:
- 50.1 is prepared in accordance with the requirements of the NT EPA 'Guideline for Reporting on Environmental Monitoring';
 - 50.2 includes a tabulation of all monitoring data required as a condition of this licence and any additional data used as part of the analysis and interpretation undertaken in the report, to be submitted in electronic Microsoft® Excel® format;
 - 50.3 includes long term trend analysis of monitoring data to demonstrate any environmental impact associated with the activity over a minimum period of three years (where the data is available). Data used in this analysis must be provided electronically in Microsoft® Excel® format; and
 - 50.4 includes an assessment of environmental impact from the activity.
- 51 The NT EPA may require the licensee to revise or amend and resubmit any Monitoring Report. Where the NT EPA requires the Monitoring Report to be resubmitted, the licensee must submit it to the NT EPA by the date specified by the NT EPA.

END OF LICENCE CONDITIONS

This licence is not valid unless signed below:



Peter Vasel
Director Environmental Operations
Delegate of the Northern Territory
Environment Protection Authority
Dated: 23/08/2022

ENVIRONMENT PROTECTION LICENCE 218 - 02

DEFINITIONS

All terms in the Licence which are defined in the *Waste Management and Pollution Control Act* have the meaning given in that Act unless otherwise or further defined in this section.

DEFINITION	In this licence, unless a contrary intention appears:
24 hour emergency contact	the phone number of a person who can be contacted at any time and be capable of responding to and providing information about any incident associated with the activity.
Activity	the Scheduled activity as described on the covering page of this licence.
Air	includes any layer of the atmosphere.
Annual fee	yearly fee payable in respect of the activity as specified in the WMPC Act and the Regulations.
Annual Return	an NT EPA prescribed format for demonstrating and reporting compliance with the conditions of this licence and providing information on waste volumes for the preceding 12 month period.
ANZECC/ARMCANZ	Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand, 2000: National Water Quality Management Strategy: Australian Guidelines for Water Quality Monitoring and Reporting.
Asbestos containing material	any material that contains asbestos.
Business days	a day not Saturday, Sunday or a public holiday, in the Northern Territory.
Community feedback number	a telephone number enabling members of the public to contact, at any time, a person or voice mail system that can accept, on behalf of the licensee, enquiries or complaints about the activity, and to which the licensee must respond.
Complaint Log	a register of complaints to be maintained by the Licensee that records the details of each complaint received in relation to the activity.
Consultation and Communication Plan	a written plan documenting proposed consultation and communications for the activity before, during and after the activity which includes a strategy for communicating with members of the public who are likely to have a real interest in, or be affected by, the activity.
Contact details	includes the 24 hour emergency contact, and name, position title and phone number of a representative of the licensee who can be contacted about the licence and activity.
Contaminant	a solid, liquid or gas or any combination of such substances and includes: (a) noise, odour, heat and electromagnetic radiation; (b) a prescribed substance or prescribed class of substances; and (c) a substance having a prescribed property or prescribed class of properties.
Discharges	allow a liquid, gas or other substance to flow out from where it has been confined.
Disposal schedule	a plan for disposing of asbestos containing material such that asbestos containing material is not stored in perpetuity.

ENVIRONMENT PROTECTION LICENCE 218 - 02

Emergency Response Plan	a written plan documenting the licensee's procedures for responding to emergencies caused by, resulting from or associated with the activity and that may cause environmental harm.
Environmental audit	has the meaning given in section 47 of the WMPC Act.
Environmental harm	(a) any harm to or adverse effect on the environment; or (b) any potential harm (including the risk of harm and future harm) to or potential adverse effect on the environment, of any degree or duration and includes environmental nuisance.
Environmental nuisance	means: (a) an adverse effect on the amenity of an area that: (i) is caused by noise, smoke, dust, fumes or odour; and (ii) unreasonably interferes with or is likely to unreasonably interfere with the enjoyment of the area by persons who occupy a place within the area or are otherwise lawfully in the area; or (b) an unsightly or offensive condition caused by contaminants or waste.
Incident	includes: (a) an accident, emergency or malfunction; and (b) a deliberate action, whether or not that action was taken by the person conducting the activity in the course of which the incident occurred.
Land	includes water and air on, above or under land.
Landfill cell	a purpose built area for the disposal of waste within a landfill.
Landfill Closure and Post Closure Plan	a written plan which specifies the landfill closure and post-closure activities as set out in the NT EPA Guidelines for the Siting, Design and Management of Solid Waste Disposal Sites in the Northern Territory.
Leachate	any liquid produced by the action of water percolating through waste, and that contains contaminants.
Listed waste	a waste included under Schedule 2 of the Regulations.
Litter	litter, garbage, rubbish, refuse or waste matter, and includes the body of a dead animal.
Maintain	kept in a manner that it does not present or cause a risk of environmental harm or a hazard to persons or property or, for the purposes of documents including plans, a process of reviewing and amending documentation to ensure it is relevant.
Material environmental harm	environmental harm that: (a) is not trivial or negligible in nature; (b) consists of an environmental nuisance of a high impact or on a wide scale; (c) results, or is likely to result, in not more than \$50,000 or the prescribed amount (whichever is greater) being spent in taking appropriate action to prevent or minimise the environmental harm or rehabilitate the environment; or (d) results in actual or potential loss or damage to the value of not more than \$50,000 or the prescribed amount (whichever is greater).
Monitoring Plan	the monitoring programs required by conditions 30 and 31.
NATA	National Association of Testing Authorities, Australia.
Non-compliance	failure or refusal to comply, whether by act or omission, with obligations or requirements and includes any exceedance of a licence limit.

ENVIRONMENT PROTECTION LICENCE 218 - 02

Non-compliance notification	an NT EPA prescribed format for notifying the NT EPA of a non-compliance.
NT EPA Online	online system for Environment Protection Licence (EPL), Environment Protection Approval (EPA) and Waste Discharge Licence (WDL) lodgement and maintenance.
NT EPA Online Vehicle Register	the vehicle register found at NT EPA Online.
Plant and equipment	all material items used in association with the activity, including (but not limited to) storage vessels and containers, pipe work and hosing, vehicles (including vessels), tools, and measuring equipment.
Point source discharge	means any discernible, confined or discrete conveyance from which contaminants or waste are or may be discharged.
Pollute	(a) emit, discharge, deposit, or disturb, directly or indirectly, a contaminant or waste; or (b) cause, permit, or fail to prevent, directly or indirectly, the emission, discharge, deposition, disturbance or escape of a contaminant or waste.
Pollution	(a) a contaminant or waste that is emitted, discharged, deposited or disturbed or that escapes; or (b) a contaminant or waste, effect or phenomenon, that is present in the environment as a consequence of an emission, discharge, deposition, escape or disturbance or a contaminant or waste.
Premises	the premises identified in this licence which includes equipment, plant and structures, whether stationary or portable, and the land on which premises are situated.
Public entrance	access to the premises that is utilised by the public.
Putrescible waste	the component of the waste stream liable to become putrid. For example, organic matter that has the potential to decompose with the formation of malodorous substances, usually refers to vegetative, food and animal products.
Qualified person	a person registered under Section 68 of the WMPC Act.
Qualified sampler	a person who has training and experience in obtaining samples from the relevant environmental medium.
Regulations	<i>Waste Management and Pollution Control (Administration) Regulations.</i>
Rehabilitation Plan	a written plan to ensure that the objectives of rehabilitation are achieved as set out in the NT EPA Guidelines for the Siting, Design and Management of Solid Waste Disposal Sites in the Northern Territory.
Serious environmental harm	environmental harm that is more serious than material environmental harm and includes environmental harm that: (a) is irreversible or otherwise of a high impact or on a wide scale; (b) damages an aspect of the environment that is of a high conservation value, high cultural value or high community value or is of special significance; (c) results or is likely to result in more than \$50,000 or the prescribed amount (whichever is greater) being spent in taking appropriate action to prevent or minimise the environmental harm or rehabilitate the environment; or (d) results in actual or potential loss or damage to the value of more than \$50,000 or the prescribed amount (whichever is greater).

ENVIRONMENT PROTECTION LICENCE 218 - 02

Solid inert waste	solid waste that has no active chemical or biological properties. These wastes do not undergo environmentally significant physical, chemical or biological transformation.
Stormwater	water flowing over ground surfaces, in natural streams and drains as a direct result of rainfall over a catchment and consists primarily of rainfall runoff.
Trigger values	assigned value for each indicator used to assess the risk to an environmental value, a value that initiates some type of pre-defined management action.
Waste	(a) a solid, a liquid or a gas; or (b) a mixture of such substances, that is or are left over, surplus or an unwanted by-product from any activity (whether or not the substance is of value) and includes a prescribed substance or class of substances.
Waste transport certificate	the NT EPA waste tracking documentation used to track listed waste being transported interstate as required in accordance with the National Environment Protection (Movement of Controlled Waste Between States and Territories) Measure.
Wastewater	water that contains a contaminant or waste.
Water	includes: (a) surface water, ground water and tidal waters; (b) coastal waters of the Territory, within the meaning of the <i>Coastal Waters (Northern Territory Powers) Act 1980</i> of the Commonwealth; and (c) water containing an impurity.
WMPC Act	the Northern Territory <i>Waste Management and Pollution Control Act</i> .

Appendix C

Field Results

Purging and Sampling Record

Bore ID: MUC1

Job Information		Sampling Information		Bore Information	
Client: DTC		Purge Method: <u>24</u>		SWL(mbTOC): <u>No water</u>	m Logic Check: <u> </u>
Project: DTC		Sample Method: <u> </u>		Screen: From <u> </u> to <u> </u>	m Stick Up: <u> </u> m
Proj No: 12618429		WQ Meter Type: <u> </u>		NAPL Check: <u> </u>	Bore Diam: <u> </u> mm
Sampler: <u>KG</u>		Flow Cell: Y ☒ N	Pump Depth: <u> </u> m	Ref.datum: <u> </u>	Well Cap Secure? <u>X</u>
Date: <u>5/9/23</u>		WLevel Meter Type: <u> </u>	☒ Dip / ☐ Fox / ☐ Int Fce / ☐ Gge	Bore Depth: <u>2.94</u>	m
Round: <u>1</u>		Field Filtered? Y / ☒ N (filter vessel, disposable filter/syringe)			

[illegible]

Field QA Checks:

Air bubbles in vials? Y / N Any violent reactions? Y / N
Decontamination as per GHD procedure? Y / N
Was sampling equipment pre-cleaned? Y / N
COC updated? Y / N

[illegible]

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc
Well good condition. No water. No sample taken.

Purge Volumes

Casing Int. Dia (mm)	50	100	150
Vol (L/m of casing)	2.0	7.9	17.7

*Double for gravel pack

<i>Purge Volumes</i>			
Casing Int. Dia (mm)	50	100	150
Vol (L/m of casing)	2.0	7.9	17.7
*Double for gravel pack			



Job Information Client: <u>DTC</u> Project: <u>DTC</u> Proj. No.: Sampler: <u>KG</u> Date: <u>8/9/23</u> Round: <u>1</u>		Sampling Information Purge Method: <u>Pc</u> Sample Method: WQ Meter Type: Flow Cell: <u>Y / N</u> Pump Depth: WLevel Meter Type: <u>Dip / Fox / Int.Fce / Gge</u> Field Filtered? <u>Y</u> N (filter vessel, disposable filter/syringe)		Bore Information SWL(mbTOC): <u>2.87</u> m Logic Check: Screen: From: to: m Stick Up: m NAPL Check: Bore Diam.: mm Ref.datum: Well Cap Secure? <u>Y</u> Bore Depth: <u>25.09</u> m	
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[illegible]

Field QA Checks:
 Air bubbles in vials? Y / N Any violent reactions? Y / N
 Decontamination as per GHD procedure? Y / N
 Was sampling equipment pre-cleaned? Y / N
 CQC updated? Y / N

[illegible]

Comments Duplicate samples collected, bottles used, access, condition of headworks etc

well good condition

Purge Volumes

Casing Int. Dia (mm)	50	100	150
Vol (L/m of casing)	2.0	7.9	17.7

*Double for gravel pack

Bore ID: MWOS

Job Information		Sampling Information		Bore Information	
Client: <u>DTC</u>		Purge Method: <u>Peri</u>		SWL(mbTOC): <u>5:22</u>	m Logic Check:
Project: <u>DTC</u>		Sample Method:		Screen: From:	to: m Stick Up: m
Proj. No.:		WQ Meter Type:		NAPL Check:	Bore Diam.: mm
Sampler: <u>KG</u>		Flow Cell: Y / <u>N</u>	Pump Depth: m	Ref.datum:	Well Cap Secure? <u>Y</u>
Date: <u>8/9/23</u>		WLevel Meter Type: <u>Dip</u> / Fox / Int.Fce / Gge		Bore Depth: <u>5853</u>	m
Round: <u>1</u>		Field Filtered? <u>Y</u> / N (filter vessel, disposable filter/syringe)			

[illegible]

Field QA Checks:

Air bubbles in vials? Y / N Any violent reactions? Y / N

Decontamination as per GHD procedure? Y / N

Was sampling equipment pre-cleaned? Y / N

COC updated? Y / N

[illegible]

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc

Well good condition

Purge Volumes

Casing Int. Dia (mm)	50	100	150
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Casing ID (mm)	89	100	100
Vol (L/m of casing)	2.0	7.9	17.7

*Double for gravel pack

Purging and Sampling Record

Bore ID: MWC6

Job Information		Sampling Information		Bore Information	
Client: <u>DTC</u>	Purge Method: <u>Peri</u>	SWL(mbTOC): <u>4.36</u>		m	Logic Check:
Project: <u>DTC</u>	Sample Method:	Screen: From:	to:	m	Stick Up: m
Proj. No.:	WQ Meter Type:	NAPL Check:			Bore Diam.: mm
Sampler: <u>Kieran G</u>	Flow Cell: <u>PN</u>	Pump Depth:	m	Ref. datum:	Well Cap Secure? <u>Yes</u>
Date: <u>8/9/23</u>	WLevel Meter Type: <u>Dip</u>	Fox / Int.Fce / Gge		Bore Depth: <u>6.64</u>	m
Round: <u>1</u>	Field Filtered? Y / N (filter vessel, disposable filter/syringe)				

[illegible]

Field QA Checks:

Air bubbles in vials? Y / N Any violent reactions? Y / N

Decontamination as per GHD procedure? Y / N

Was sampling equipment pre-cleaned? Y / N

COC updated? Y / N

[illegible]

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc

Well good condition

/ no odor

Purge Volumes

Casing Int. Dia (mm)	50	100	150
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Vol (L/m of casing)	2.0	7.9	17.7
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*Double for gravel pack



Purging and Sampling Record

Bore ID: ~~A1A~~

Job Information		Sampling Information		Bore Information	
Client: <u>DTC</u> Project: <u>DTC</u> Proj. No.: <u> </u> Sampler: <u>KE</u> Date: <u>8/9/23</u> Round: <u>1</u>	Purge Method: <u>Peri</u> Sample Method: <u> </u> WQ Meter Type: <u> </u> Flow Cell: <u>Y / N</u> Pump Depth: <u> </u> m WLevel Meter Type: <u>Dip / Fox / Int.Fce / Gge</u> Field Filtered? <u>N</u> (filter vessel, disposable filter/syringe)	SWL(mbTOC): <u>3.73</u> m Screen: From: <u> </u> to: <u> </u> m NAPL Check: <u> </u> Ref.datum: <u> </u> Bore Depth: <u>6.03</u> m	Logic Check: <u> </u> Stick Up: <u> </u> m Bore Diam.: <u> </u> mm Well Cap Secure? <u>Y</u>		

Time (.....)	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (.....)	Dis.Oxygen (.....%)	Ox-Red Pt. (± mV)	SWL (m TOC)	(.....)	Comment:
Stable when (3 consecutive readings):		-	+/- 0.05 pH	+/- 3%	+/- 10%	+/- 10 mV	stable		Colour, turbidity, sediment load, sheen, odour, flow rate, purged dry?
11:05		30.6	6.01	134.2	83%		3.99		PID-0 Clear
11:07		30.8	4.91	118.4	36%		3.99		
11:09		30.8	4.84	116.5	27%		4.06		clear.
11:11		30.9	4.84	100.3	29%		4.13		
11:13		31.2	4.84	101.6	24.1%		4.16		Clear
11:15		31.1	4.84	100.7	21.9%		4.17		Sampled
									Final Depth - 4.42 m

Field QA Checks: Air bubbles in vials? Y / N Any violent reactions? Y / N Decontamination as per GHD procedure? Y / N Was sampling equipment pre-cleaned? Y / N COC updated? Y / N	<table border="1" style="width:100%; border-collapse: collapse; font-size: small;"> <tr> <th style="width:15%;">Parameters</th> <th style="width:5%;">BTEX</th> <th style="width:5%;">TPH</th> <th style="width:5%;">PAH</th> <th style="width:5%;">CHC</th> <th style="width:5%;">PCB</th> <th style="width:5%;">OCP</th> <th style="width:5%;">OPP</th> <th style="width:10%;">Tot. Metal</th> <th style="width:5%;">Biol.</th> <th style="width:5%;"></th> <th style="width:5%;"></th> <th style="width:5%;"></th> <th style="width:5%;"></th> </tr> <tr> <td>Preservatives</td> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> </table>	Parameters	BTEX	TPH	PAH	CHC	PCB	OCP	OPP	Tot. Metal	Biol.					Preservatives													
Parameters	BTEX	TPH	PAH	CHC	PCB	OCP	OPP	Tot. Metal	Biol.																				
Preservatives																													

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc <u>FD-01 taken. No odour, good well condition.</u>	Purge Volumes Casing Int. Dia (mm) 50 100 150 Vol (L/m of casing) 2.0 7.9 17.7 *Double for gravel pack
--	--

Purging and Sampling Record

Bore ID: 11 NW 2

Job Information		Sampling Information		Bore Information	
Client: <u>DTC</u>	Purge Method: <u>Bailer</u>	SWL(mbTOC): <u>3.08</u>	m	Logic Check:	
Project: <u>DTC</u>	Sample Method: <u>Grab</u>	Screen: From: to: m		Stick Up: m	
Proj. No.:	WQ Meter Type:	NAPL Check:		Bore Diam.: mm	
Sampler: <u>LCF</u>	Flow Cell: <u>Y</u> / ☒ Pump Depth: m	Ref. datum:		Well Cap Secure? <u>Y</u>	
Date: <u>2/09/23</u>	WLevel Meter Type: ☒ / Fox / Int.Fce / Gge	Bore Depth: <u>4.28</u>	m		
Round: <u>2</u>	Field Filtered? ☒ / N (filter vessel, disposable filter/syringe)				
Time	Volume				

[illegible]

Field QA Checks:

Air bubbles in vials? Y / N Any violent reactions? Y / N

Decontamination as per GHD procedure? Y / N

Was sampling equipment pre-cleaned? Y / N

COC updated? Y / N

[illegible]

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc

PID-0.2

Purge Volumes

Large Volumes			
Casing Int. Dia (mm)	50	100	150
Vol (L/m of casing)	2.0	7.9	17.7

*Double for gravel pack

Purging and Sampling Record

Bore ID: Much

Job Information Client: <u>DTC</u> Project: _____ Proj. No.: _____ Sampler: <u>UG</u> Date: <u>12/9/23</u> Round: <u>2</u>		Sampling Information Purge Method: <u>Perc</u> Sample Method: _____ WQ Meter Type: _____ Flow Cell: <u>Y / N</u> Pump Depth: _____m WLevel Meter Type: <u>Dip</u> / Fox / Int.Fce / Gge Field Filtered? <u>Y</u> / N (filter vessel, disposable filter/syringe)		Bore Information SWL(mbTOC): <u>2.89</u> m Logic Check: _____ Screen: From: _____ to: _____ m Stick Up: _____ m NAPL Check: _____ Bore Diam.: _____ mm Ref.datum: _____ Well Cap Secure? <u>Y</u> Bore Depth: <u>5.80</u> m	
--	--	---	--	--	--

[illegible]

Field QA Checks:

Air bubbles in vials? Y / N Any violent reactions? Y / N
Decontamination as per GHD procedure? Y / N
Was sampling equipment pre-cleaned? Y / N
COC updated? Y / N

[illegible]

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc

PID-0.7

Purge Volumes

Casing Int. Dia (mm)	50	100	150
Vol (L/m of casing)	2.0	7.9	17.7

*Double for gravel pack

Bore ID: MMWOS

Job Information Client: <u>DTC</u> Project: <u>DTC</u> Proj. No.: <u>~~004~~</u> Sampler: <u>EG</u> Date: <u>12/9/23</u> Round: <u>2</u>		Sampling Information Purge Method: <u>Boiler</u> Sample Method: <u>Curb</u> WQ Meter Type: _____ Flow Cell: Y / <u>N</u> Pump Depth: _____m WLevel Meter Type: <u>Dip</u> / Fox / Int.Fce / Gge Field Filtered? Y / N (filter vessel, disposable filter/syringe)		Bore Information SWL(mbTOC): <u>5.19</u> _____ m Logic Check: _____ Screen: From: _____ to: _____ m Stick Up: _____ m NAPL Check: _____ Bore Diam.: _____ mm Ref.datum: _____ Well Cap Secure? <u>X</u> Bore Depth: <u>5.48</u> _____ m	
--	--	---	--	---	--

[illegible]

Field QA Checks:
Air bubbles in vials? Y / N Any violent reactions? Y / N
Decontamination as per GHD procedure? Y / N
Was sampling equipment pre-cleaned? Y / N
COC updated? Y / N

[illegible]

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc

PID-0.1

Purge Volumes			
Casing Int. Dia (mm)	50	100	150
Vol (L/m of casing)	2.0	7.9	17.7

*Double for gravel pack

Bore ID: 11W06

Job Information Client: <u>DTC</u> Project: <u>DTC</u> Proj. No.: _____ Sampler: <u>KG</u> Date: <u>12/9/23</u> Round: <u>2</u>		Sampling Information Purge Method: <u>Bailer</u> Sample Method: <u>Grab</u> WQ Meter Type: _____ Flow Cell: <u>Y</u> / <u>(N)</u> Pump Depth: _____ m WLevel Meter Type: <u>(Dip)</u> / Fox / Int.Fce / Gge Field Filtered? <u>(N)</u> (filter vessel, disposable filter/syringe)		Bore Information SWL(mbTOC): <u>5.50</u> m Logic Check: _____ Screen: From: _____ to: _____ m Stick Up: _____ m NAPL Check: _____ Bore Diam.: _____ mm Ref.datum: _____ Well Cap Secure? <u>X</u> Bore Depth: <u>6.67</u> m	
--	--	--	--	---	--

[illegible]

Field QA Checks:														
Air bubbles in vials? Y / N Any violent reactions? Y / N	Parameters	BTEX	TPH	PAH	CHC	PCB	OCP	OPP	Tot. Metal	Biol.				
Decontamination as per GHD procedure? Y / N	Preservatives													
Was sampling equipment pre-cleaned? Y / N														
COC updated? Y / N														

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc

PID-0

Purge Volumes			
Casing Int. Dia (mm)	50	100	150
Vol (L/m of casing)	2.0	7.9	17.7
*Double for gravel pack			

Bore ID: MW07

Job Information				Sampling Information		Bore Information	
Client:	OTC			Purge Method:	Per	SWL(mbTOC):	3.73
Project:	OTC			Sample Method:		Screen: From:	to:
Proj. No.:				WQ Meter Type:		Stick Up:	
Sampler:	V5			Flow Cell:	Y / ☒	NAPL Check:	☒
Date:	12/9/23			Pump Depth:		Bore Diam.:	
Round:	2			WLevel Meter Type:	☒ Dip / ☐ Fox / ☐ Int.Fce / ☐ Gge	Ref.datum:	
				Field Filtered?	☒ Y / ☐ N (filter vessel, disposable filter/syringe)	Bore Depth:	6.02
						Well Cap Secure?	Y

[illegible]

Field QA Checks:

contamination as per GHD procedure? ☒ Y / ☐ N

[illegible]

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc

~~0.4~~ 0.4 (PID) FD-02 collected.

Purge Volumes

Large volumes			
Casing Int. Dia (mm)	50	100	150

Casing Int. Dia. (mm)	50	100	150
Vol (L/m of casing)	2.0	7.9	17.7

*Double for gravel pack

Appendix D

Laboratory Results



CHAIN OF CUSTODY

ALS Laboratory:
please tick →

BRISBANE 22 Shand Street Stafford QLD 4053 Ph: 07 3243 7222 E: samples.brisbane@alsglobal.com
CARLEPLACE 21 Burns Road Proserpine QLD 4870 Ph: 08 8369 0880 E: adelaide@alsglobal.com
GLADSTONE 46 Callamondah Drive Clinton QLD 4680 Ph: 07 4746 0600 E: gladstone@alsglobal.com
MACKAY 76 Harbour Road Mackay QLD 4740 Ph: 08 8369 0880 E: mackay@alsglobal.com
MELBOURNE 2-4 Westall Road Stoneyale VIC 3171 Ph: 03 8549 9000 E: samples.melbourne@alsglobal.com
NEWCASTLE 5705 Midland Rd Mayfield West NSW 1504 Ph: 02 4014 2500 E: samples.newcastle@alsglobal.com
PERTH 10 Hood Way Malaga WA 6000 Ph: 08 9209 7555 E: samples.perth@alsglobal.com
SYDNEY 277-289 Woodpark Road Smithfield NSW 2104 Ph: 02 8784 8555 E: samples.sydney@alsglobal.com
TOWNSVILLE 14-15 Deanna Court Robina QLD 4816 Ph: 07 4746 0600 E: townsville@alsglobal.com
WOLLONGONG 99 Kenny Street Wollongong NSW 2500 Ph: 02 8228 3126 E: wollongong@alsglobal.com

CLIENT: GHD Pty Ltd	TURNAROUND REQUIREMENTS: ☐ Standard TAT (List due date): ☐ Non Standard or urgent TAT (List due date):		FOR LABORATORY USE ONLY (Circle) Custody Seal Intact? Yes No N/A Free ice / frozen ice bricks present upon receipt? Yes No N/A Random Sample Temperature on Receipt: °C Other comment:	
OFFICE: Level 7, 24 Mitchell St	(Standard TAT may be longer for some tests e.g. Ultra Trace Organics)			
PROJECT: 12618429	ALS QUOTE NO.: *Attached	COC SEQUENCE NUMBER (Circle) COC: 1 2 3 4 5 6 7 OF: 1 2 3 4 5 6 7		
ORDER NUMBER: 12618429				
PROJECT MANAGER: Jo Lavers	CONTACT PH: +61 457 472 439			
SAMPLER: Kieran Gurung	SAMPLER MOBILE: 0431311229			
COC emailed to ALS? NO	EDD FORMAT (or default):			
Email Reports to (will default to PM if no other addresses are listed): jo.lavers@ghd.com, Melissa.Luisa.Estrada@ghd.com, GHDIalreports@ghd.com	RELINQUISHED BY: Kieran Gurung		RECEIVED BY: Lane sis	
Email Invoice to (will default to PM if no other addresses are listed): jo.lavers@ghd.com, accounts.payableAU@ghd.com	DATE/TIME: 12/09/2023 1:36pm		DATE/TIME: 12-09-23	
		RELINQUISHED BY:		RECEIVED BY: Jonathan
		DATE/TIME:		DATE/TIME: 13/6/23 0830

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

All metals containers were field filtered

ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION				ANALYSIS REQUIRED (including Suites) (NB. Suite Codes must be listed to attract suite price) Where (metals) are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).										Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS	TRH(C8-C40)/STEXAS Dissolved Metals	PCB Total - Standard level	PFAS - Short Suite (12 analytes)										Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
1	MW01																	Not sampled.
2	MW02	8/9/2023	W	Ice	8	x	x	x										
3	MW03	8/9/2023	W	Ice	8	x	x	x										
4	MW04	8/9/2023	W	Ice	8	x	x	x										
5	MW06	11/9/23	W	Ice	8	x	x	x										Not sampled.
6	MW07	8/9/2023	W	Ice	8	x	x	x										
7	FD_01	8/9/2023	W	Ice	8	x	x	x										
8	MW02_B	12/9/23	W	Ice	8	x	x	x										Not sampled.
9	MW03_B	12/9/23	W	Ice	8	x	x	x										
10	MW04_B	12/9/23	W	Ice	8	x	x	x										
11	MW06_B	12/9/23	W	Ice	8	x	x	x										Not sampled.
12	MW07_B	12/9/23	W	Ice	8	x	x	x										
13	FD_02		W	Ice	8	x	x	x										
TOTAL																		

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP = Airfreight Unpreserved; V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial; SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Solids; B = Unpreserved Bag.

Environmental Division
Sydney
Work Order Reference
ES2331067



Telephone: +61-2-8784 8555



SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **ES2331067**

Client : **GHD PTY LTD**
Contact : **JO LAVERS**
Address : **Level 7 24 Mitchell Street
DARWIN NT, AUSTRALIA 0800**

E-mail : **jo.lavers@ghd.com**
Telephone : **----**
Facsimile : **----**

Project : **12618429**
Order number : **12618429**
C-O-C number : **----**
Site : **----**
Sampler : **KIERAN GURUNG**

Laboratory : **Environmental Division Sydney**
Contact : **Sarah Mathew**
Address : **277-289 Woodpark Road Smithfield
NSW Australia 2164**

E-mail : **sarah.mathew@alsglobal.com**
Telephone : **+61-2-8784 8555**
Facsimile : **+61-2-8784 8500**

Page : **1 of 3**
Quote number : **EB2020GHDSE0038 (EN/005)**
QC Level : **NEPM 2013 B3 & ALS QC Standard**

Dates

Date Samples Received : **13-Sep-2023 08:30**
Client Requested Due : **19-Sep-2023**
Date : **----**

Issue Date : **13-Sep-2023**
Scheduled Reporting Date : **19-Sep-2023**

Delivery Details

Mode of Delivery : **Client Drop Off**
No. of coolers/boxes : **1**
Receipt Detail : **----**

Security Seal : **Not Available**
Temperature : **3.8°C - Ice Bricks present**
No. of samples received / analysed : **14 / 12**

General Comments

- This report contains the following information:
 - Sample Container(s)/Preservation Non-Compliances
 - Summary of Sample(s) and Requested Analysis
 - Proactive Holding Time Report
 - Requested Deliverables
- **Samples 1-6 and trip blanks all glass broken. Analysis logged where possible.**
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The laboratory will process these samples unless instructions are received from you indicating you do not wish to proceed. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**
- Please direct any queries you have regarding this work order to the above ALS laboratory contact.
- Analytical work for this work order will be conducted at ALS Sydney.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months ± 1 week) from receipt of samples.
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.



Sample Container(s)/Preservation Non-Compliances

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

- No sample container / preservation non-compliance exists.

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	(On Hold) WATER No analysis requested	WATER - EP231 PFAS - Short Suite (12 analytes)	WATER - W-02 8 Metals	WATER - W-05 TRH/BTEXN/8 Metals
ES2331067-001	08-Sep-2023 00:00	MW02		✓	✓	
ES2331067-002	08-Sep-2023 00:00	MW03		✓	✓	
ES2331067-003	08-Sep-2023 00:00	MW04		✓	✓	
ES2331067-004	11-Sep-2023 00:00	MW06		✓	✓	
ES2331067-005	08-Sep-2023 00:00	MW07		✓	✓	
ES2331067-006	08-Sep-2023 00:00	FD_01		✓	✓	
ES2331067-007	12-Sep-2023 00:00	MW02_B		✓		✓
ES2331067-008	12-Sep-2023 00:00	MW03_B		✓		✓
ES2331067-009	12-Sep-2023 00:00	MW04_B		✓		✓
ES2331067-010	12-Sep-2023 00:00	MW06_B		✓		✓
ES2331067-011	12-Sep-2023 00:00	MW07_B		✓		✓
ES2331067-012	12-Sep-2023 00:00	FD_02		✓		✓
ES2331067-013	13-Sep-2023 00:00	Trip Blank A	✓			
ES2331067-014	13-Sep-2023 00:00	Trip Blank B	✓			

Proactive Holding Time Report

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

ACCOUNTS PAYABLE

- Email accountspayableAU@ghd.com

Email accountspayableAU@ghd.com

[illegible][illegible][illegible]



CERTIFICATE OF ANALYSIS

Work Order : **ES2331067**
Client : **GHD PTY LTD**
Contact : **JO LAVERS**
Address : **Level 7 24 Mitchell Street**
DARWIN NT, AUSTRALIA 0800
Telephone : **----**
Project : **12618429**
Order number : **12618429**
C-O-C number : **----**
Sampler : **KIERAN GURUNG**
Site :
Quote number : **EN/005**
No. of samples received : **14**
No. of samples analysed : **12**

Page : **1 of 9**
Laboratory : **Environmental Division Sydney**
Contact : **Sarah Mathew**
Address : **277-289 Woodpark Road Smithfield NSW Australia 2164**
Telephone : **+61-2-8784 8555**
Date Samples Received : **13-Sep-2023 08:30**
Date Analysis Commenced : **14-Sep-2023**
Issue Date : **19-Sep-2023 16:34**



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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

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

Signatories

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

Signatories	Position	Accreditation Category
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

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

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

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

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

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.

LOR = Limit of reporting

^ = This result is computed from individual analyte detections at or above the level of reporting

ø = ALS is not NATA accredited for these tests.

~ = Indicates an estimated value.

- EP231X - Per- and Polyfluoroalkyl Substances (PFAS): Samples received in 20ml or 125ml bottles have been tested in accordance with the QSM5.3 compliant, NATA accredited method. 60mL or 250mL bottles have been tested to the legacy QSM 5.1 aligned, NATA accredited method.
- EP080: Where reported, Total Xylenes is the sum of the reported concentrations of m&p-Xylene and o-Xylene at or above the LOR.
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				MW02	MW03	MW04	MW06	MW07
Sampling date / time				08-Sep-2023 00:00	08-Sep-2023 00:00	08-Sep-2023 00:00	11-Sep-2023 00:00	08-Sep-2023 00:00
Compound	CAS Number	LOR	Unit	ES2331067-001	ES2331067-002	ES2331067-003	ES2331067-004	ES2331067-005
				Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.005	<0.001	0.003
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	0.0001
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	0.002	<0.001	<0.001	0.001	<0.001
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	0.082	0.002	0.003
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.164	0.010	0.006
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.01	µg/L	0.01	<0.01	<0.01	<0.01	<0.01
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	0.02	0.02	<0.01	<0.01	<0.01
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.15	<0.02	<0.02	0.03
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.07	<0.02	<0.02	0.02
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.03	<0.02	<0.02	<0.02
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums								
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	0.03	0.02	<0.01	<0.01	<0.01
Sum of PFAS (WA DER List)	----	0.01	µg/L	0.03	0.27	<0.01	<0.01	0.05



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	MW02	MW03	MW04	MW06	MW07
Sampling date / time					08-Sep-2023 00:00	08-Sep-2023 00:00	08-Sep-2023 00:00	11-Sep-2023 00:00	08-Sep-2023 00:00
Compound	CAS Number	LOR	Unit		ES2331067-001	ES2331067-002	ES2331067-003	ES2331067-004	ES2331067-005
					Result	Result	Result	Result	Result
EP231P: PFAS Sums - Continued									
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		103	101	102	102	105
13C8-PFOA	----	0.02	%		103	104	106	99.0	99.7



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				FD_01	MW02_B	MW03_B	MW04_B	MW06_B
Sampling date / time				08-Sep-2023 00:00	12-Sep-2023 00:00	12-Sep-2023 00:00	12-Sep-2023 00:00	12-Sep-2023 00:00
Compound	CAS Number	LOR	Unit	ES2331067-006	ES2331067-007	ES2331067-008	ES2331067-009	ES2331067-010
				Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	0.001	<0.001	<0.001	0.005	<0.001
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	0.0002	<0.0001
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	<0.001	0.003	<0.001	0.001	<0.001
Nickel	7440-02-0	0.001	mg/L	0.002	<0.001	<0.001	0.135	0.003
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	0.001	<0.001
Zinc	7440-66-6	0.005	mg/L	<0.005	0.008	<0.005	0.339	0.011
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	----	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L	----	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L	----	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L	----	<50	<50	<50	<50
^ C10 - C36 Fraction (sum)	----	50	µg/L	----	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	20	µg/L	----	<20	<20	<20	<20
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L	----	<20	<20	<20	<20
>C10 - C16 Fraction	----	100	µg/L	----	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L	----	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L	----	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	100	µg/L	----	<100	<100	<100	<100
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L	----	<100	<100	<100	<100
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	----	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L	----	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L	----	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	----	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L	----	<2	<2	<2	<2
^ Total Xylenes	----	2	µg/L	----	<2	<2	<2	<2
^ Sum of BTEX	----	1	µg/L	----	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L	----	<5	<5	<5	<5



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	FD_01	MW02_B	MW03_B	MW04_B	MW06_B
Sampling date / time					08-Sep-2023 00:00	12-Sep-2023 00:00	12-Sep-2023 00:00	12-Sep-2023 00:00	12-Sep-2023 00:00
Compound	CAS Number	LOR	Unit		ES2331067-006	ES2331067-007	ES2331067-008	ES2331067-009	ES2331067-010
					Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.01	µg/L		0.02	0.01	<0.01	<0.01	<0.01
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		<0.01	0.02	0.01	<0.01	<0.01
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L		<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		0.03	<0.02	0.07	<0.02	<0.02
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		0.02	<0.02	0.04	<0.02	<0.02
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	<0.01
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums									
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		0.02	0.03	0.01	<0.01	<0.01
Sum of PFAS (WA DER List)	----	0.01	µg/L		0.07	0.03	0.12	<0.01	<0.01
EP080S: TPH(V)/BTEX Surrogates									
1,2-Dichloroethane-D4	17060-07-0	2	%		----	95.2	94.3	96.2	92.0
Toluene-D8	2037-26-5	2	%		----	97.4	97.9	98.2	100
4-Bromofluorobenzene	460-00-4	2	%		----	109	109	111	108
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		106	93.9	101	98.8	101
13C8-PFOA	----	0.02	%		101	98.4	101	99.9	102



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				MW07_B	FD_02	----	----	----
Sampling date / time				12-Sep-2023 00:00	12-Sep-2023 00:00	----	----	----
Compound	CAS Number	LOR	Unit	ES2331067-011	ES2331067-012	-----	-----	-----
				Result	Result	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	0.002	0.002	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	0.0002	0.0002	----	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	----	----	----
Copper	7440-50-8	0.001	mg/L	<0.001	0.001	----	----	----
Nickel	7440-02-0	0.001	mg/L	0.004	0.005	----	----	----
Lead	7439-92-1	0.001	mg/L	0.004	0.004	----	----	----
Zinc	7440-66-6	0.005	mg/L	0.006	0.009	----	----	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	<20	----	----	----
C10 - C14 Fraction	----	50	µg/L	<50	<50	----	----	----
C15 - C28 Fraction	----	100	µg/L	<100	<100	----	----	----
C29 - C36 Fraction	----	50	µg/L	<50	<50	----	----	----
^ C10 - C36 Fraction (sum)	----	50	µg/L	<50	<50	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	----	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L	<20	<20	----	----	----
>C10 - C16 Fraction	----	100	µg/L	<100	<100	----	----	----
>C16 - C34 Fraction	----	100	µg/L	<100	<100	----	----	----
>C34 - C40 Fraction	----	100	µg/L	<100	<100	----	----	----
^ >C10 - C40 Fraction (sum)	----	100	µg/L	<100	<100	----	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L	<100	<100	----	----	----
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	<1	----	----	----
Toluene	108-88-3	2	µg/L	<2	<2	----	----	----
Ethylbenzene	100-41-4	2	µg/L	<2	<2	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	----	----	----
ortho-Xylene	95-47-6	2	µg/L	<2	<2	----	----	----
^ Total Xylenes	----	2	µg/L	<2	<2	----	----	----
^ Sum of BTEX	----	1	µg/L	<1	<1	----	----	----
Naphthalene	91-20-3	5	µg/L	<5	<5	----	----	----



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				MW07_B	FD_02	----	----	----
Sampling date / time				12-Sep-2023 00:00	12-Sep-2023 00:00	----	----	----
Compound	CAS Number	LOR	Unit	ES2331067-011	ES2331067-012	-----	-----	-----
				Result	Result	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.01	µg/L	<0.01	0.01	----	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	0.01	0.01	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	0.03	0.03	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	0.02	0.02	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	----	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	----	----	----
EP231P: PFAS Sums								
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	0.01	0.02	----	----	----
Sum of PFAS (WA DER List)	-----	0.01	µg/L	0.06	0.07	----	----	----
EP080S: TPH(V)/BTEX Surrogates								
1,2-Dichloroethane-D4	17060-07-0	2	%	96.8	96.4	----	----	----
Toluene-D8	2037-26-5	2	%	101	98.8	----	----	----
4-Bromofluorobenzene	460-00-4	2	%	110	107	----	----	----
EP231S: PFAS Surrogate								
13C4-PFOS	-----	0.02	%	111	107	----	----	----
13C8-PFOA	-----	0.02	%	102	103	----	----	----



Surrogate Control Limits

Sub-Matrix: **WATER**

		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP080S: TPH(V)/BTEX Surrogates			
1,2-Dichloroethane-D4	17060-07-0	72	143
Toluene-D8	2037-26-5	75	131
4-Bromofluorobenzene	460-00-4	73	137
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120



QUALITY CONTROL REPORT

Work Order : **ES2331067**

Page : 1 of 6

Client : **GHD PTY LTD**

Contact : **JO LAVERS**

Address : Level 7 24 Mitchell Street
DARWIN NT, AUSTRALIA 0800

Telephone : ----

Project : 12618429

Order number : 12618429

C-O-C number : ----

Sampler : **KIERAN GURUNG**

Site :

Quote number : EN/005

No. of samples received : 14

No. of samples analysed : 12

Laboratory : Environmental Division Sydney

Contact : Sarah Mathew

Address : 277-289 Woodpark Road Smithfield NSW Australia 2164

Telephone : +61-2-8784 8555

Date Samples Received : 13-Sep-2023

Date Analysis Commenced : 14-Sep-2023

Issue Date : 19-Sep-2023



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

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

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

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

Signatories	Position	Accreditation Category
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

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

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

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

Laboratory Duplicate (DUP) Report

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

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EG020F: Dissolved Metals by ICP-MS (QC Lot: 5297547)									
ES2331067-001	MW02	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	0.002	0.002	0.0	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.0	No Limit
ES2331080-001	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	0.005	0.005	0.0	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	0.002	0.002	0.0	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.011	0.012	0.0	0% - 50%
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.044	0.043	0.0	No Limit
EG035F: Dissolved Mercury by FIMS (QC Lot: 5297548)									
ES2331067-002	MW03	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
ES2331067-010	MW06_B	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 5295622)									
ES2331044-001	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.0	No Limit
ES2331067-010	MW06_B	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 5295622)									
ES2331044-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.0	No Limit
ES2331067-010	MW06_B	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.0	No Limit

Page : 3 of 6
 Work Order : ES2331067
 Client : GHD PTY LTD
 Project : 12618429



Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP080: BTEXN (QC Lot: 5295622)									
ES2331044-001	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.0	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3	2	µg/L	<2	<2	0.0	No Limit
			106-42-3						
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.0	No Limit
ES2331067-010	MW06_B	EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.0	No Limit
		EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.0	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3	2	µg/L	<2	<2	0.0	No Limit
			106-42-3						
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.0	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.0	No Limit

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

Method Blank (MB) Report	Laboratory Control Spike (LCS) Report				
	Spike Concentration	Spike Recovery (%)	Acceptable Limits (%)		
		LCS	Low	High	
Result					
<0.001	0.1 mg/L	99.0	85.0	114	
<0.0001	0.1 mg/L	98.2	84.0	110	
<0.001	0.1 mg/L	95.4	85.0	111	
<0.001	0.1 mg/L	96.4	81.0	111	
<0.001	0.1 mg/L	97.5	83.0	111	
<0.001	0.1 mg/L	95.2	82.0	112	
<0.005	0.1 mg/L	95.7	81.0	117	
<0.0001	0.01 mg/L	96.0	83.0	105	
<50	400 µg/L	82.2	53.7	97.0	
<100	600 µg/L	92.0	63.3	107	
<50	400 µg/L	78.9	58.3	120	
<20	260 µg/L	99.5	75.0	127	
<100	500 µg/L	75.4	53.9	95.5	
<100	700 µg/L	93.0	57.8	110	
<100	300 µg/L	87.3	50.5	115	
<20	310 µg/L	100	75.0	127	
<1	10 µg/L	97.5	68.3	119	
<2	10 µg/L	112	73.5	120	
<2	10 µg/L	105	73.8	122	
<2	10 µg/L	116	73.0	122	
<2	10 µg/L	120	76.4	123	
<5	10 µg/L	101	75.5	124	



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Acceptable Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 5296379) - continued								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	80.7	72.0	130
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.01	µg/L	<0.01	0.25 µg/L	75.3	68.0	131
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	91.9	65.0	140
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 5296379)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	85.4	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	89.5	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	86.5	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	89.5	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	92.5	71.0	133
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 5296379)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	87.7	63.0	143
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.25 µg/L	86.9	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.25 µg/L	98.1	67.0	138
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.25 µg/L	74.6	71.4	144

Matrix Spike (MS) Report

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

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 5297547)							
ES2331067-002	MW03	EG020A-F: Arsenic	7440-38-2	1 mg/L	96.3	70.0	130
		EG020A-F: Cadmium	7440-43-9	0.25 mg/L	101	70.0	130
		EG020A-F: Chromium	7440-47-3	1 mg/L	99.7	70.0	130
		EG020A-F: Copper	7440-50-8	1 mg/L	101	70.0	130
		EG020A-F: Lead	7439-92-1	1 mg/L	98.5	70.0	130
		EG020A-F: Nickel	7440-02-0	1 mg/L	99.1	70.0	130
		EG020A-F: Zinc	7440-66-6	1 mg/L	101	70.0	130
EG035F: Dissolved Mercury by FIMS (QCLot: 5297548)							
ES2331067-001	MW02	EG035F: Mercury	7439-97-6	0.01 mg/L	89.9	70.0	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 5295622)							
ES2331044-001	Anonymous	EP080: C6 - C9 Fraction	----	325 µg/L	115	70.0	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 5295622)							
ES2331044-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	375 µg/L	112	70.0	130



Sub-Matrix: WATER				Matrix Spike (MS) Report			
Laboratory sample ID		Sample ID		Spike	SpikeRecovery(%)	Acceptable Limits (%)	
		Method: Compound	CAS Number	Concentration	MS	Low	High
EP080: BTEXN (QCLot: 5295622)							
ES2331044-001	Anonymous	EP080: Benzene	71-43-2	25 µg/L	110	70.0	130
		EP080: Toluene	108-88-3	25 µg/L	116	70.0	130
		EP080: Ethylbenzene	100-41-4	25 µg/L	115	70.0	130
		EP080: meta- & para-Xylene	108-38-3	25 µg/L	127	70.0	130
			106-42-3				
		EP080: ortho-Xylene	95-47-6	25 µg/L	130	70.0	130
		EP080: Naphthalene	91-20-3	25 µg/L	110	70.0	130



QA/QC Compliance Assessment to assist with Quality Review

Work Order	: ES2331067	Page	: 1 of 6
Client	: GHD PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: JO LAVERS	Telephone	: +61-2-8784 8555
Project	: 12618429	Date Samples Received	: 13-Sep-2023
Site	:	Issue Date	: 19-Sep-2023
Sampler	: KIERAN GURUNG	No. of samples received	: 14
Order number	: 12618429	No. of samples analysed	: 12

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

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

Summary of Outliers

Outliers : Quality Control Samples

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

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

Outliers : Analysis Holding Time Compliance

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

Outliers : Frequency of Quality Control Samples

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



Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type Method	Count		Rate (%)		Quality Control Specification
	QC	Regular	Actual	Expected	
	0				
Laboratory Duplicates (DUP)					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	0	12	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	0	13	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	0	12	0.00	5.00	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	0	13	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

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

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

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

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

Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EG020F: Dissolved Metals by ICP-MS							
Clear Plastic Bottle - Filtered; Lab-acidified (EG020A-F) MW02, MW04, FD_01 MW03, MW07,	08-Sep-2023	----	----	----	14-Sep-2023	06-Mar-2024	✓
Clear Plastic Bottle - Filtered; Lab-acidified (EG020A-F) MW06	11-Sep-2023	----	----	----	14-Sep-2023	09-Mar-2024	✓
Clear Plastic Bottle - Filtered; Lab-acidified (EG020A-F) MW02_B, MW04_B, MW07_B, MW03_B, MW06_B, FD_02	12-Sep-2023	----	----	----	14-Sep-2023	10-Mar-2024	✓
EG035F: Dissolved Mercury by FIMS							
Clear Plastic Bottle - Filtered; Lab-acidified (EG035F) MW02, MW04, FD_01 MW03, MW07,	08-Sep-2023	----	----	----	15-Sep-2023	06-Oct-2023	✓
Clear Plastic Bottle - Filtered; Lab-acidified (EG035F) MW06	11-Sep-2023	----	----	----	15-Sep-2023	09-Oct-2023	✓
Clear Plastic Bottle - Filtered; Lab-acidified (EG035F) MW02_B, MW04_B, MW07_B, MW03_B, MW06_B, FD_02	12-Sep-2023	----	----	----	15-Sep-2023	10-Oct-2023	✓



Matrix: **WATER** Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis			
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EP080/071: Total Petroleum Hydrocarbons								
Amber Glass Bottle - Unpreserved (EP071) MW02_B, MW04_B, MW07_B, MW03_B, MW06_B, FD_02	12-Sep-2023	14-Sep-2023	19-Sep-2023	✔	19-Sep-2023	24-Oct-2023	✔	
Amber VOC Vial - Sulfuric Acid (EP080) MW02_B, MW04_B, MW07_B, MW03_B, MW06_B, FD_02	12-Sep-2023	18-Sep-2023	26-Sep-2023	✔	18-Sep-2023	26-Sep-2023	✔	
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
Amber Glass Bottle - Unpreserved (EP071) MW02_B, MW04_B, MW07_B, MW03_B, MW06_B, FD_02	12-Sep-2023	14-Sep-2023	19-Sep-2023	✔	19-Sep-2023	24-Oct-2023	✔	
Amber VOC Vial - Sulfuric Acid (EP080) MW02_B, MW04_B, MW07_B, MW03_B, MW06_B, FD_02	12-Sep-2023	18-Sep-2023	26-Sep-2023	✔	18-Sep-2023	26-Sep-2023	✔	
EP080: BTEXN								
Amber VOC Vial - Sulfuric Acid (EP080) MW02_B, MW04_B, MW07_B, MW03_B, MW06_B, FD_02	12-Sep-2023	18-Sep-2023	26-Sep-2023	✔	18-Sep-2023	26-Sep-2023	✔	
EP231A: Perfluoroalkyl Sulfonic Acids								
HDPE (no PTFE) (EP231X) MW02, MW04, FD_01, MW03, MW07,	08-Sep-2023	14-Sep-2023	06-Mar-2024	✔	15-Sep-2023	06-Mar-2024	✔	
HDPE (no PTFE) (EP231X) MW06	11-Sep-2023	14-Sep-2023	09-Mar-2024	✔	15-Sep-2023	09-Mar-2024	✔	
HDPE (no PTFE) (EP231X) MW02_B, MW04_B, MW07_B, MW03_B, MW06_B, FD_02	12-Sep-2023	14-Sep-2023	10-Mar-2024	✔	15-Sep-2023	10-Mar-2024	✔	



Matrix: WATER Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis			
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EP231B: Perfluoroalkyl Carboxylic Acids								
HDPE (no PTFE) (EP231X) MW02, MW04, FD_01	MW03, MW07,	08-Sep-2023	14-Sep-2023	06-Mar-2024	✓	15-Sep-2023	06-Mar-2024	✓
HDPE (no PTFE) (EP231X) MW06		11-Sep-2023	14-Sep-2023	09-Mar-2024	✓	15-Sep-2023	09-Mar-2024	✓
HDPE (no PTFE) (EP231X) MW02_B, MW04_B, MW07_B,	MW03_B, MW06_B, FD_02	12-Sep-2023	14-Sep-2023	10-Mar-2024	✓	15-Sep-2023	10-Mar-2024	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
HDPE (no PTFE) (EP231X) MW02, MW04, FD_01	MW03, MW07,	08-Sep-2023	14-Sep-2023	06-Mar-2024	✓	15-Sep-2023	06-Mar-2024	✓
HDPE (no PTFE) (EP231X) MW06		11-Sep-2023	14-Sep-2023	09-Mar-2024	✓	15-Sep-2023	09-Mar-2024	✓
HDPE (no PTFE) (EP231X) MW02_B, MW04_B, MW07_B,	MW03_B, MW06_B, FD_02	12-Sep-2023	14-Sep-2023	10-Mar-2024	✓	15-Sep-2023	10-Mar-2024	✓
EP231P: PFAS Sums								
HDPE (no PTFE) (EP231X) MW02, MW04, FD_01	MW03, MW07,	08-Sep-2023	14-Sep-2023	06-Mar-2024	✓	15-Sep-2023	06-Mar-2024	✓
HDPE (no PTFE) (EP231X) MW06		11-Sep-2023	14-Sep-2023	09-Mar-2024	✓	15-Sep-2023	09-Mar-2024	✓
HDPE (no PTFE) (EP231X) MW02_B, MW04_B, MW07_B,	MW03_B, MW06_B, FD_02	12-Sep-2023	14-Sep-2023	10-Mar-2024	✓	15-Sep-2023	10-Mar-2024	✓



Quality Control Parameter Frequency Compliance

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

Matrix: **WATER**

Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Dissolved Mercury by FIMS	EG035F	2	20	10.00	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	20	10.00	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	0	12	0.00	10.00	✖	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	13	0.00	10.00	✖	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	20	10.00	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Dissolved Mercury by FIMS	EG035F	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	12	8.33	5.00	✔	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	13	7.69	5.00	✔	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Dissolved Mercury by FIMS	EG035F	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	12	8.33	5.00	✔	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	13	7.69	5.00	✔	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Dissolved Mercury by FIMS	EG035F	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	0	12	0.00	5.00	✖	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	13	0.00	5.00	✖	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard



Brief Method Summaries

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

Analytical Methods	Method	Matrix	Method Descriptions
Dissolved Metals by ICP-MS - Suite A	EG020A-F	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. Samples are 0.45µm filtered prior to analysis. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Dissolved Mercury by FIMS	EG035F	WATER	In house: Referenced to APHA 3112 Hg - B (Flow-injection (SnCl ₂)(Cold Vapour generation) AAS) Samples are 0.45µm filtered prior to analysis. FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the filtered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl ₂ which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM Schedule B(3).
TRH - Semivolatile Fraction	EP071	WATER	In house: Referenced to USEPA SW 846 - 8015 The sample extract is analysed by Capillary GC/FID and quantification is by comparison against an established 5 point calibration curve of n-Alkane standards. This method is compliant with the QC requirements of NEPM Schedule B(3)
TRH Volatiles/BTEX	EP080	WATER	In house: Referenced to USEPA SW 846 - 8260 Water samples are directly purged prior to analysis by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. Alternatively, a sample is equilibrated in a headspace vial and a portion of the headspace determined by GCMS analysis. This method is compliant with the QC requirements of NEPM Schedule B(3)
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	WATER	In-house: Analysis of fresh and saline waters by Solid Phase Extraction (SPE) followed by LC-Electrospray-MS-MS, Negative Mode using MRM and internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.
Preparation Methods	Method	Matrix	Method Descriptions
Separatory Funnel Extraction of Liquids	ORG14	WATER	In house: Referenced to USEPA SW 846 - 3510 100 mL to 1L of sample is transferred to a separatory funnel and serially extracted three times using DCM for each extract. The resultant extracts are combined, dehydrated and concentrated for analysis. This method is compliant with NEPM Schedule B(3) . ALS default excludes sediment which may be resident in the container.
Volatiles Water Preparation	ORG16-W	WATER	A 5 mL aliquot or 5 mL of a diluted sample is added to a 40 mL VOC vial for purging.
Solid Phase Extraction (SPE) for PFAS in water	ORG72	WATER	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.



CHAIN OF CUSTODY RECORD

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Company		GHD Pty Ltd NT		Project No		12592142 - Darwin Turf Club		Project Manager		Jo Lavers		Sampler(s)		Cleanaway					
Address		Level 7, 24 Mitchell Street, Darwin NT 0800 Australia		Project Name		12592142 - Darwin Turf Club		EDD Format		ESDAT		Facility Code		Handed over by		Kieran Gurung			
Contact Name		Jo Lavers		Analyses Where results are inaccurate please specify 'Trace' or 'Flavour' S/NITE code must be used to attract GHD's pricing		Oil - PCBs Polychlorinated Biphenyls in Oils & Greases PFAS - PFAS Per- and Polyfluoroalkyl Substances (PFASs)								Email for Invoice		accountspayableAU@ghd.com , jo.lavers@ghd.com			
Phone No		61 457 472 439												Email for Results		jo.lavers@ghd.com , kieran.gurung@ghd.com			
Special Directions																			
Purchase Order																			
Quote ID No		230703GHDNT																	
No	Client Sample ID	Sampled Date/Time day/month/year	Matrix Solid (S) Water (W)	Containers Change container type & size if necessary												Required Turnaround Time (TAT) Default will be 5 days if not ticked			
				500mL Plastic 250mL Plastic 125mL Plastic 200mL Amber Glass 40mL VOA vial 500mL PFAS Bottle Jar (Glass or HDPE) Other (Asbestos AS4884, WA Guidelines) ☐ Overnight (reporting by 9am) * ☐ Same day ♦ ☐ 2 days ♦ ☒ 5 days (Standard) ☐ Other ()												Sample Comments / Dangerous Goods Hazard Warning			
1	Tank 2	31/08/23	Oil	X	X														
2																			
3																			
4																			
5																			
6																			
7																			
8																			
9																			
10																			
Add Rows				Total Counts		1	1												
Method of Shipment		☐ Courier (#) ☐ Hand Delivered		☐ Postal		Name		Signature		Vierang		Date		6/09/2023		Time		04:12pm	
Laboratory Use Only		Received By		Donna Ceba		SYD BNE MEL PER ADL NTL DRW		Signature		Rat		Date		7.9.23		Time		9:55	
		Received By				SYD BNE MEL PER ADL NTL DRW		Signature				Date				Time		Report No	

Submission of samples to the laboratory will be deemed as acceptance of Eurofins | mgf Standard Terms and Conditions unless agreed otherwise. A copy of Eurofins | mgf Standard Terms and Conditions is available on request.



1

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Auckland	Christchurch	Tauranga
35 O'Rourke Road Penrose, Auckland 1061 Tel: +64 9 526 4551 IANZ# 1327	43 Detroit Drive Rolleston, Christchurch 7675 Tel: +64 3 343 5201 IANZ# 1290	1277 Cameron Road, Gate Pa, Tauranga 3112 Tel: +64 9 525 0568 IANZ# 1402

Sample Receipt Advice

Company name:	GHD Pty Ltd NT
Contact name:	Jo Lavers
Project name:	12592142 - Darwin Turf Club
Project ID:	12592142 - Darwin Turf Club
Turnaround time:	5 Day
Date/Time received	Sep 7, 2023 9:55 AM
Eurofins reference	1023868

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.
- ✓ Sample containers for volatile analysis received with zero headspace.
- ✗ Split sample sent to requested external lab.
- ✗ Some samples have been subcontracted.
- N/A Custody Seals intact (if used).

Notes

Contact

If you have any questions with respect to these samples, please contact your Analytical Services Manager:

Harry Bacalis on phone : +61 3 8564 5064 or by email: HarryBacalis@eurofins.com

Results will be delivered electronically via email to Jo Lavers - jo.lavers@ghd.com.

Note: A copy of these results will also be delivered to the general GHD Pty Ltd NT email address.



web: www.eurofins.com.au
email: EnviroSales@eurofins.com

Eurofins Environment Testing Australia Pty Ltd

ABN: 50 005 085 521

Melbourne	Geelong	Sydney	Canberra	Brisbane	Newcastle
6 Monterey Road Dandenong South VIC 3175 Tel: +61 3 8564 5000 NATA# 1261 Site# 1254	19/8 Lewalan Street Grovedale VIC 3216 Tel: +61 3 8564 5000 NATA# 1261 Site# 25403	179 Magowar Road Girraween NSW 2145 Tel: +61 2 9900 8400 NATA# 1261 Site# 18217	Unit 1,2 Dacre Street Mitchell ACT 2911 Tel: +61 2 6113 8091 NATA# 1261 Site# 25466	1/21 Smallwood Place Murarrie QLD 4172 Tel: +61 7 3902 4600 NATA# 1261 Site# 20794	1/2 Frost Drive Mayfield West NSW 2304 Tel: +61 2 4968 8448 NATA# 1261 Site# 25079 & 25289

Eurofins ARL Pty Ltd

ABN: 91 05 0159 898

Perth
46-48 Banksia Road Welshpool WA 6106 Tel: +61 8 6253 4444 NATA# 2377 Site# 2370

Eurofins Environment Testing NZ Ltd

NZBN: 9429046024954

Auckland	Christchurch	Tauranga
35 O'Rorke Road Penrose, Auckland 1061 Tel: +64 9 526 4551 IANZ# 1327	43 Detroit Drive Rolleston, Christchurch 7675 Tel: +64 3 343 5201 IANZ# 1290	1277 Cameron Road, Gate Pa, Tauranga 3112 Tel: +64 9 525 0568 IANZ# 1402

Company Name: GHD Pty Ltd NT
Address: Level 7, 24 Mitchell Street
Darwin
NT 0800

Project Name: 12592142 - Darwin Turf Club
Project ID: 12592142 - Darwin Turf Club

Order No.:
Report #: 1023868
Phone: 08 8982 0100
Fax: 08 8981 1075

Received: Sep 7, 2023 9:55 AM
Due: Sep 14, 2023
Priority: 5 Day
Contact Name: Jo Lavers

Eurofins Analytical Services Manager : Harry Bacalis

Sample Detail						Polychlorinated Biphenyls in Oils & Greases	Per- and Polyfluoroalkyl Substances (PFASs)
Melbourne Laboratory - NATA # 1261 Site # 1254						X	X
External Laboratory							
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID		
1	Tank 2	Aug 31, 2023		Oil	M23-Se0013541	X	X
Test Counts						1	1

GHD Pty Ltd NT
Level 7, 24 Mitchell Street
Darwin
NT 0800



NATA Accredited
Accreditation Number 1261
Site Number 1254

Accredited for compliance with ISO/IEC 17025 – Testing
NATA is a signatory to the ILAC Mutual Recognition
Arrangement for the mutual recognition of the
equivalence of testing, medical testing, calibration,
inspection, proficiency testing scheme providers and
reference materials producers reports and certificates.

Attention: **Jo Lavers**

Report **1023868-S**
Project name **12592142 - Darwin Turf Club**
Project ID **12592142 - Darwin Turf Club**
Received Date **Sep 07, 2023**

Client Sample ID			Tank 2
Sample Matrix			Oil
Eurofins Sample No.			M23-
Date Sampled			Se0013541
Test/Reference	LOR	Unit	Aug 31, 2023
Polychlorinated Biphenyls in Oils & Greases			
Aroclor-1016	1	mg/kg	< 1
Aroclor-1221	1	mg/kg	< 1
Aroclor-1232	1	mg/kg	< 1
Aroclor-1242	1	mg/kg	< 1
Aroclor-1248	1	mg/kg	< 1
Aroclor-1254	1	mg/kg	< 1
Aroclor-1260	1	mg/kg	< 1
Total PCB*	1	mg/kg	< 1
Decachlorobiphenyl (surr.)	1	%	91
Perfluoroalkyl carboxylic acids (PFCAs)			
Perfluorobutanoic acid (PFBA) ^{N11}	5	ug/kg	< 5
Perfluoropentanoic acid (PFPeA) ^{N11}	5	ug/kg	< 5
Perfluorohexanoic acid (PFHxA) ^{N11}	5	ug/kg	< 5
Perfluoroheptanoic acid (PFHpA) ^{N11}	5	ug/kg	< 5
Perfluorooctanoic acid (PFOA) ^{N11}	5	ug/kg	< 5
Perfluorononanoic acid (PFNA) ^{N11}	5	ug/kg	< 5
Perfluorodecanoic acid (PFDA) ^{N11}	5	ug/kg	< 5
Perfluoroundecanoic acid (PFUnDA) ^{N11}	5	ug/kg	< 5
Perfluorododecanoic acid (PFDoDA) ^{N11}	5	ug/kg	< 5
Perfluorotridecanoic acid (PFTTrDA) ^{N15}	5	ug/kg	< 5
Perfluorotetradecanoic acid (PFTeDA) ^{N11}	5	ug/kg	< 5
13C4-PFBA (surr.)	1	%	107
13C5-PFPeA (surr.)	1	%	55
13C5-PFHxA (surr.)	1	%	72
13C4-PFHpA (surr.)	1	%	80
13C8-PFOA (surr.)	1	%	58
13C5-PFNA (surr.)	1	%	133
13C6-PFDA (surr.)	1	%	59
13C2-PFUnDA (surr.)	1	%	116
13C2-PFDoDA (surr.)	1	%	58
13C2-PFTeDA (surr.)	1	%	58

Client Sample ID			Tank 2
Sample Matrix			Oil
Eurofins Sample No.			M23-Se0013541
Date Sampled			Aug 31, 2023
Test/Reference	LOR	Unit	
Perfluoroalkyl sulfonamido substances			
Perfluorooctane sulfonamide (FOSA) ^{N11}	5	ug/kg	< 5
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA) ^{N11}	5	ug/kg	< 5
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA) ^{N11}	5	ug/kg	< 5
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol(N-MeFOSE) ^{N11}	5	ug/kg	< 5
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol(N-EtFOSE) ^{N11}	5	ug/kg	< 5
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA) ^{N11}	10	ug/kg	< 10
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA) ^{N11}	10	ug/kg	< 10
13C8-FOSA (surr.)	1	%	104
D3-N-MeFOSA (surr.)	1	%	91
D5-N-EtFOSA (surr.)	1	%	35
D7-N-MeFOSE (surr.)	1	%	131
D9-N-EtFOSE (surr.)	1	%	113
D5-N-EtFOSAA (surr.)	1	%	181
D3-N-MeFOSAA (surr.)	1	%	137
Perfluoroalkyl sulfonic acids (PFASs)			
Perfluorobutanesulfonic acid (PFBS) ^{N11}	5	ug/kg	< 5
Perfluorononanesulfonic acid (PFNS) ^{N15}	5	ug/kg	< 5
Perfluoropropanesulfonic acid (PFPrS) ^{N15}	5	ug/kg	< 5
Perfluoropentanesulfonic acid (PFPeS) ^{N15}	5	ug/kg	< 5
Perfluorohexanesulfonic acid (PFHxS) ^{N11}	5	ug/kg	< 5
Perfluoroheptanesulfonic acid (PFHpS) ^{N15}	5	ug/kg	< 5
Perfluorooctanesulfonic acid (PFOS) ^{N11}	5	ug/kg	< 5
Perfluorodecanesulfonic acid (PFDS) ^{N15}	5	ug/kg	< 5
13C3-PFBS (surr.)	1	%	57
18O2-PFHxS (surr.)	1	%	85
13C8-PFOS (surr.)	1	%	50
n:2 Fluorotelomer sulfonic acids (n:2 FTSA)			
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA) ^{N11}	5	ug/kg	< 5
1H.1H.2H.2H-perfluorooctanesulfonic acid(6:2 FTSA) ^{N11}	10	ug/kg	< 10
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA) ^{N11}	5	ug/kg	< 5
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA) ^{N11}	5	ug/kg	< 5
13C2-4:2 FTSA (surr.)	1	%	28
13C2-6:2 FTSA (surr.)	1	%	58
13C2-8:2 FTSA (surr.)	1	%	162
13C2-10:2 FTSA (surr.)	1	%	64
PFASs Summations			
Sum (PFHxS + PFOS)*	5	ug/kg	< 5
Sum of US EPA PFAS (PFOS + PFOA)*	5	ug/kg	< 5
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	5	ug/kg	< 5
Sum of WA DWER PFAS (n=10)*	10	ug/kg	< 10
Sum of PFASs (n=30)*	50	ug/kg	< 50

Sample History

Where samples are submitted/analysed over several days, the last date of extraction is reported.

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
Polychlorinated Biphenyls in Oils & Greases - Method: LTM-ORG-2080 PCBs in Oil (USEPA 8082 and Vic EPA 6013)	Melbourne	Sep 07, 2023	14 Days
Per- and Polyfluoroalkyl Substances (PFASs)			
Perfluoroalkyl carboxylic acids (PFCAs) - Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)	Melbourne	Sep 07, 2023	28 Days
Perfluoroalkyl sulfonamido substances - Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)	Melbourne	Sep 07, 2023	28 Days
Perfluoroalkyl sulfonic acids (PFSAs) - Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)	Melbourne	Sep 07, 2023	28 Days
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs) - Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)	Melbourne	Sep 07, 2023	28 Days
PFASs Summations - Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)	Melbourne	Sep 07, 2023	

Melbourne	Geelong	Sydney	Canberra	Brisbane	Newcastle
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Perth
46-48 Banksia Road Welshpool WA 6106 Tel: +61 8 6253 4444 NATA# 2377 Site# 2370

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35 O'Rorke Road Penrose, Auckland 1061 Tel: +64 9 526 4551 IANZ# 1327	43 Detroit Drive Rolleston, Christchurch 7675 Tel: +64 3 343 5201 IANZ# 1290	1277 Cameron Road, Gate Pa, Tauranga 3112 Tel: +64 9 525 0568 IANZ# 1402

Company Name: GHD Pty Ltd NT
Address: Level 7, 24 Mitchell Street
 Darwin
 NT 0800

Project Name: 12592142 - Darwin Turf Club
Project ID: 12592142 - Darwin Turf Club

Order No.:
Report #: 1023868
Phone: 08 8982 0100
Fax: 08 8981 1075

Received: Sep 7, 2023 9:55 AM
Due: Sep 14, 2023
Priority: 5 Day
Contact Name: Jo Lavers

Eurofins Analytical Services Manager : Harry Bacalis

Sample Detail

Polychlorinated Biphenyls in Oils & Greases

Per- and Polyfluoroalkyl Substances (PFASs)

Melbourne Laboratory - NATA # 1261 Site # 1254

External Laboratory

No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID		
1	Tank 2	Aug 31, 2023		Oil	M23-Se0013541	X	X
Test Counts						1	1

Internal Quality Control Review and Glossary

General

- Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013 and are included in this QC report where applicable. Additional QC data may be available on request.
- All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
- All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
- Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
- Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
- SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
- Samples were analysed on an 'as received' basis.
- Information identified on this report with blue colour, indicates data provided by customer that may have an impact on the results.
- This report replaces any interim results previously issued.

Holding Times

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

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

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

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

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

Units

mg/kg: milligrams per kilogram	mg/L: milligrams per litre	µg/L: micrograms per litre
ppm: parts per million	ppb: parts per billion	%: Percentage
org/100 mL: Organisms per 100 millilitres	NTU: Nephelometric Turbidity Units	MPN/100 mL: Most Probable Number of organisms per 100 millilitres
CFU: Colony forming unit		

Terms

APHA	American Public Health Association
COC	Chain of Custody
CP	Client Parent - QC was performed on samples pertaining to this report
CRM	Certified Reference Material (ISO17034) - reported as percent recovery.
Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
LOR	Limit of Reporting.
LCS	Laboratory Control Sample - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
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.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
SRA	Sample Receipt Advice
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
TBTO	Tributyltin oxide (<i>bis</i> -tributyltin oxide) - individual tributyltin compounds cannot be identified separately in the environment however free tributyltin was measured and its values were converted stoichiometrically into tributyltin oxide for comparison with regulatory limits.
TCLP	Toxicity Characteristic Leaching Procedure
TEQ	Toxic Equivalency Quotient or Total Equivalence
QSM	US Department of Defense Quality Systems Manual Version 5.4
US EPA	United States Environmental Protection Agency
WA DWER	Sum of PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC - Acceptance Criteria

The acceptance criteria should be used as a guide only and may be different when site specific Sampling Analysis and Quality Plan (SAQP) have been implemented

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%

NOTE: pH duplicates are reported as a range not as RPD

Surrogate Recoveries: Recoveries must lie between 20-130% for Speciated Phenols & 50-150% for PFAS. SVOCs recoveries 20 – 150%

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.4 where no positive PFAS results have been reported have been reviewed and no data was affected.

QC Data General Comments

- 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.
- 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.
- 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.
- Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of recovery the term "INT" appears against that analyte.
- For Matrix Spikes and LCS results a dash "-" in the report means that the specific analyte was not added to the QC sample.
- 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							
Polychlorinated Biphenyls in Oils & Greases							
Aroclor-1016	mg/kg	< 1			1	Pass	
Aroclor-1221	mg/kg	< 1			1	Pass	
Aroclor-1232	mg/kg	< 1			1	Pass	
Aroclor-1242	mg/kg	< 1			1	Pass	
Aroclor-1248	mg/kg	< 1			1	Pass	
Aroclor-1254	mg/kg	< 1			1	Pass	
Aroclor-1260	mg/kg	< 1			1	Pass	
Total PCB*	mg/kg	< 1			1	Pass	
Method Blank							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	ug/kg	< 5			5	Pass	
Perfluoropentanoic acid (PFPeA)	ug/kg	< 5			5	Pass	
Perfluorohexanoic acid (PFHxA)	ug/kg	< 5			5	Pass	
Perfluoroheptanoic acid (PFHpA)	ug/kg	< 5			5	Pass	
Perfluorooctanoic acid (PFOA)	ug/kg	< 5			5	Pass	
Perfluorononanoic acid (PFNA)	ug/kg	< 5			5	Pass	
Perfluorodecanoic acid (PFDA)	ug/kg	< 5			5	Pass	
Perfluoroundecanoic acid (PFUnDA)	ug/kg	< 5			5	Pass	
Perfluorododecanoic acid (PFDoDA)	ug/kg	< 5			5	Pass	
Perfluorotridecanoic acid (PFTTrDA)	ug/kg	< 5			5	Pass	
Perfluorotetradecanoic acid (PFTeDA)	ug/kg	< 5			5	Pass	
Method Blank							
Perfluoroalkyl sulfonamido substances							
Perfluorooctane sulfonamide (FOSA)	ug/kg	< 5			5	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	ug/kg	< 5			5	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	ug/kg	< 5			5	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol(N-MeFOSE)	ug/kg	< 5			5	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol(N-EtFOSE)	ug/kg	< 5			5	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	ug/kg	< 10			10	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	ug/kg	< 10			10	Pass	
Method Blank							
Perfluoroalkyl sulfonic acids (PFSA's)							
Perfluorobutanesulfonic acid (PFBS)	ug/kg	< 5			5	Pass	
Perfluorononanesulfonic acid (PFNS)	ug/kg	< 5			5	Pass	
Perfluoropropanesulfonic acid (PFPrS)	ug/kg	< 5			5	Pass	
Perfluoropentanesulfonic acid (PFPeS)	ug/kg	< 5			5	Pass	
Perfluorohexanesulfonic acid (PFHxS)	ug/kg	< 5			5	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	ug/kg	< 5			5	Pass	
Perfluorooctanesulfonic acid (PFOS)	ug/kg	< 5			5	Pass	
Perfluorodecanesulfonic acid (PFDS)	ug/kg	< 5			5	Pass	
Method Blank							
n:2 Fluorotelomer sulfonic acids (n:2 FTSA's)							
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	ug/kg	< 5			5	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid(6:2 FTSA)	ug/kg	< 10			10	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	ug/kg	< 5			5	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	ug/kg	< 5			5	Pass	
LCS - % Recovery							
Polychlorinated Biphenyls in Oils & Greases							
Aroclor-1260	%	105			70-130	Pass	

Test				Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
LCS - % Recovery										
Perfluoroalkyl carboxylic acids (PFCAs)										
Perfluorobutanoic acid (PFBA)		%	95				50-150	Pass		
Perfluoropentanoic acid (PFPeA)		%	102				50-150	Pass		
Perfluorohexanoic acid (PFHxA)		%	90				50-150	Pass		
Perfluoroheptanoic acid (PFHpA)		%	97				50-150	Pass		
Perfluorooctanoic acid (PFOA)		%	92				50-150	Pass		
Perfluorononanoic acid (PFNA)		%	91				50-150	Pass		
Perfluorodecanoic acid (PFDA)		%	108				50-150	Pass		
Perfluoroundecanoic acid (PFUnDA)		%	119				50-150	Pass		
Perfluorododecanoic acid (PFDoDA)		%	106				50-150	Pass		
Perfluorotridecanoic acid (PFTrDA)		%	91				50-150	Pass		
Perfluorotetradecanoic acid (PFTeDA)		%	110				50-150	Pass		
LCS - % Recovery										
Perfluoroalkyl sulfonamido substances										
Perfluorooctane sulfonamide (FOSA)		%	102				50-150	Pass		
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)		%	108				50-150	Pass		
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)		%	85				50-150	Pass		
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol(N-MeFOSE)		%	94				50-150	Pass		
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol(N-EtFOSE)		%	104				50-150	Pass		
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)		%	92				50-150	Pass		
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)		%	93				50-150	Pass		
LCS - % Recovery										
Perfluoroalkyl sulfonic acids (PFSAs)										
Perfluorobutanesulfonic acid (PFBS)		%	88				50-150	Pass		
Perfluorononanesulfonic acid (PFNS)		%	109				50-150	Pass		
Perfluoropropanesulfonic acid (PFPrS)		%	78				50-150	Pass		
Perfluoropentanesulfonic acid (PFPeS)		%	90				50-150	Pass		
Perfluorohexanesulfonic acid (PFHxS)		%	96				50-150	Pass		
Perfluoroheptanesulfonic acid (PFHpS)		%	102				50-150	Pass		
Perfluorooctanesulfonic acid (PFOS)		%	108				50-150	Pass		
Perfluorodecanesulfonic acid (PFDS)		%	124				50-150	Pass		
LCS - % Recovery										
n:2 Fluorotelomer sulfonic acids (n:2 FTSA)										
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)		%	101				50-150	Pass		
1H.1H.2H.2H-perfluorooctanesulfonic acid(6:2 FTSA)		%	100				50-150	Pass		
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)		%	105				50-150	Pass		
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)		%	97				50-150	Pass		
Test		Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery										
Polychlorinated Biphenyls in Oils & Greases					Result 1					
Aroclor-1260		M23-Se0013541	CP	%	86			70-130	Pass	
Spike - % Recovery										
Perfluoroalkyl carboxylic acids (PFCAs)					Result 1					
Perfluorobutanoic acid (PFBA)		M23-Se0016247	NCP	%	90			50-150	Pass	
Perfluoropentanoic acid (PFPeA)		M23-Se0016247	NCP	%	104			50-150	Pass	
Perfluorohexanoic acid (PFHxA)		M23-Se0016247	NCP	%	85			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)		M23-Se0016247	NCP	%	96			50-150	Pass	
Perfluorooctanoic acid (PFOA)		M23-Se0016247	NCP	%	91			50-150	Pass	
Perfluorononanoic acid (PFNA)		M23-Se0016247	NCP	%	93			50-150	Pass	
Perfluorodecanoic acid (PFDA)		M23-Se0016247	NCP	%	105			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)		M23-Se0016247	NCP	%	109			50-150	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Perfluorododecanoic acid (PFDoDA)	M23-Se0016247	NCP	%	106			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	M23-Se0016247	NCP	%	97			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	M23-Se0016247	NCP	%	107			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonamido substances				Result 1					
Perfluorooctane sulfonamide (FOSA)	M23-Se0016247	NCP	%	90			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	M23-Se0016247	NCP	%	99			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	M23-Se0016247	NCP	%	79			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol(N-MeFOSE)	M23-Se0016247	NCP	%	101			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol(N-EtFOSE)	M23-Se0016247	NCP	%	99			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	M23-Se0016247	NCP	%	95			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	M23-Se0016247	NCP	%	80			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1					
Perfluorobutanesulfonic acid (PFBS)	M23-Se0016247	NCP	%	83			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)	M23-Se0014836	NCP	%	114			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)	M23-Se0016247	NCP	%	67			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	M23-Se0016247	NCP	%	87			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	M23-Se0016247	NCP	%	95			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	M23-Se0014836	NCP	%	122			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	M23-Se0016247	NCP	%	96			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	M23-Se0014836	NCP	%	135			50-150	Pass	
Spike - % Recovery									
n:2 Fluorotelomer sulfonic acids (n:2 FTSA)				Result 1					
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	M23-Se0016247	NCP	%	104			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid(6:2 FTSA)	M23-Se0016247	NCP	%	105			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	M23-Se0016247	NCP	%	100			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	M23-Se0016247	NCP	%	90			50-150	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
Polychlorinated Biphenyls in Oils & Greases				Result 1	Result 2	RPD			
Aroclor-1016	M23-Se0013541	CP	mg/kg	< 1	< 1	<1	30%	Pass	
Aroclor-1221	M23-Se0013541	CP	mg/kg	< 1	< 1	<1	30%	Pass	
Aroclor-1232	M23-Se0013541	CP	mg/kg	< 1	< 1	<1	30%	Pass	
Aroclor-1242	M23-Se0013541	CP	mg/kg	< 1	< 1	<1	30%	Pass	
Aroclor-1248	M23-Se0013541	CP	mg/kg	< 1	< 1	<1	30%	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1	Result 2	RPD	Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
Polychlorinated Biphenyls in Oils & Greases				Result 1	Result 2	RPD			
Aroclor-1254	M23-Se0013541	CP	mg/kg	< 1	< 1	<1	30%	Pass	
Aroclor-1260	M23-Se0013541	CP	mg/kg	< 1	< 1	<1	30%	Pass	
Total PCB*	M23-Se0013541	CP	mg/kg	< 1	< 1	<1	30%	Pass	
Duplicate									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1	Result 2	RPD			
Perfluorobutanoic acid (PFBA)	M23-Se0014851	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoropentanoic acid (PFPeA)	M23-Se0014851	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorohexanoic acid (PFHxA)	M23-Se0014851	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoroheptanoic acid (PFHpA)	M23-Se0014851	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorooctanoic acid (PFOA)	M23-Se0014851	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorononanoic acid (PFNA)	M23-Se0014851	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorodecanoic acid (PFDA)	M23-Se0014851	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoroundecanoic acid (PFUnDA)	M23-Se0014851	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorododecanoic acid (PFDoDA)	M23-Se0014851	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorotridecanoic acid (PFTriDA)	M23-Se0014851	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorotetradecanoic acid (PFTeDA)	M23-Se0014851	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Duplicate									
Perfluoroalkyl sulfonamido substances				Result 1	Result 2	RPD			
Perfluorooctane sulfonamide (FOSA)	M23-Se0014851	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	M23-Se0014851	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	M23-Se0014851	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol(N-MeFOSE)	M23-Se0014851	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol(N-EtFOSE)	M23-Se0014851	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	M23-Se0014851	NCP	ug/kg	< 10	< 10	<1	30%	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	M23-Se0014851	NCP	ug/kg	< 10	< 10	<1	30%	Pass	
Duplicate									
Perfluoroalkyl sulfonic acids (PFSA's)				Result 1	Result 2	RPD			
Perfluorobutanesulfonic acid (PFBS)	M23-Se0014851	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorononanesulfonic acid (PFNS)	M23-Se0014851	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoropropanesulfonic acid (PFPrS)	M23-Se0014851	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoropentanesulfonic acid (PFPeS)	M23-Se0014851	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorohexanesulfonic acid (PFHxS)	M23-Se0014851	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	M23-Se0014851	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorooctanesulfonic acid (PFOS)	M23-Se0014851	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorodecanesulfonic acid (PFDS)	M23-Se0014851	NCP	ug/kg	< 5	< 5	<1	30%	Pass	

Duplicate								
n:2 Fluorotelomer sulfonic acids (n:2 FTSA)				Result 1	Result 2	RPD		
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	M23-Se0014851	NCP	ug/kg	< 5	< 5	<1	30%	Pass
1H.1H.2H.2H-perfluorooctanesulfonic acid(6:2 FTSA)	M23-Se0014851	NCP	ug/kg	< 10	< 10	<1	30%	Pass
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	M23-Se0014851	NCP	ug/kg	< 5	< 5	<1	30%	Pass
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	M23-Se0014851	NCP	ug/kg	< 5	< 5	<1	30%	Pass

Comments

Sample Integrity

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

Qualifier Codes/Comments

Code	Description
N11	Isotope dilution is used for calibration of each native compound for which an exact labelled analogue is available (Isotope Dilution Quantitation). The isotopically labelled analogues allow identification and recovery correction of the concentration of the associated native PFAS compounds.
N15	Where the native PFAS compound does not have labelled analogue then the quantification is made using the Extracted Internal Standard Analyte with the closest retention time to the analyte and no recovery correction has been made (Internal Standard Quantitation).

Authorised by:

Harry Bacalis	Analytical Services Manager
Joseph Edouard	Senior Analyst-PFAS
Joseph Edouard	Senior Analyst-Organic



Glenn Jackson
Managing Director

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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CHAIN OF CUSTODY RECORD

Eurofins ; Environmental Testing ABN 50 005 095 621

Sydney Laboratory
179 Magow Road Glen
02 9900 8400 Enquiries

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Brisbane Laboratory
Unit 1 21 Sandwood Place Marooch QLD 4172
07 3902 4800 Email: Samples@bdl.com.au

Perth Laboratory
46-48 Banksia Road West Perth WA 6106
06 6253 4444 Sample@APLgroup.com.au

Melbourne Laboratory
5 Montefiore Road Dandenong South VIC 3175
03 8564 5000 EnviroSampleV@searling.com

Company		GHD Pty Ltd NT		Projective		12592142 - Darwin Turf Club		Project Manager		Jo Lawes		Sample(s)		Cleanaway (Citi) GHD (A/C)	
Address		Level 7, 24 Mitchell Street, Darwin NT 0800 Australia		Project Name		12592142 - Darwin Turf Club		EOD Format (Leave Blank)		ESDAT		Facility Code		Kieran Gurrig	
Contact Name		Jo Lawes		Analyses		PFASfull - PFASfull : Per- and Polyfluoroalkyl Substances (PFAS)		Oil - PCB Oil : Polychlorinated Biphenyls in Oils & Greases				Email for Invoice		accounts@ghd.com.au, k.gurrig@ghd.com	
Phone No.		61 457 472 439		Matrix What is the Matrix?		Oil		Oil				Email for Results		jo.lawes@ghd.com, kieran.gurrig@ghd.com	
Special Directions				Sampled Date (Time) Accession No.		31/08/23		11/09/23							
Purchase Order				Client Sample ID		Tank 2		Oil 1							
Quote ID No.		2307030HONT													
As															
1															
2															
3															
4															
5															
6															
7															
8															
9															
10															
Add Rows				Total Counts		2		2		3					
Method of Shipment		Courier (if)		Hand Delivered		Postal		Name		Signature		Date		Time	
Laboratory Use Only		Received By		Donna Ceba		Signature		Date		Time		Temperature		Report No	
		Received By				Signature		Date		Time		Temperature		Report No	

Eurofins Environment Testing Australia Pty Ltd

intention) of samples to the laboratory will be deemed an acceptance of Eurofins' Inq Standard Terms and Conditions unless agreed otherwise. A copy of Eurofins' Inq Standard Terms and Conditions is available on request.

**Eurofins Environment Testing Australia Pty Ltd**

ABN: 50 005 085 521

Melbourne	Geelong	Sydney	Canberra	Brisbane	Newcastle
6 Monterey Road Dandenong South VIC 3175 Tel: +61 3 8564 5000 NATA# 1261 Site# 1254	19/8 Lewalan Street Grovedale VIC 3216 Tel: +61 3 8564 5000 NATA# 1261 Site# 25403	179 Magowar Road Girraween NSW 2145 Tel: +61 2 9900 8400 NATA# 1261 Site# 18217	Unit 1,2 Dacre Street Mitchell ACT 2911 Tel: +61 2 6113 8091 NATA# 1261 Site# 25466	1/21 Smallwood Place Murarrie QLD 4172 Tel: +61 7 3902 4600 NATA# 1261 Site# 20794	1/2 Frost Drive Mayfield West NSW 2304 Tel: +61 2 4968 8448 NATA# 1261 Site# 25079 & 25289

Eurofins ARL Pty Ltd

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web: www.eurofins.com.au
email: EnviroSales@eurofins.com

Company Name: GHD Pty Ltd NT
Address: Level 7, 24 Mitchell Street
Darwin
NT 0800

Project Name: 12592142 - Darwin Turf club
Project ID: 12592142 - Darwin Turf club

Order No.:
Report #: 1025154
Phone: 08 8982 0100
Fax: 08 8981 1075

Received: Sep 12, 2023 1:45 PM
Due: Sep 19, 2023
Priority: 5 Day
Contact Name: Jo Lavers

Eurofins Analytical Services Manager : Harry Bacalis

Sample Detail						CANCELLED	Canister Certification and Supply fee	Dilution Factor	Final Pressure (psi)	Receipt Vac./Pressure (in Hg)	Polychlorinated Biphenyls in Oils & Greases	Per- and Polyfluoroalkyl Substances (PFASs)	BTEXN (TO15)
Melbourne Laboratory - NATA # 1261 Site # 1254						X					X	X	
Brisbane Laboratory - NATA # 1261 Site # 20794							X	X	X	X			X
External Laboratory													
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID								
1	Tank 2	Aug 31, 2023		Oil	M23-Se0025192	X							
2	Oil 1	Sep 11, 2023		Oil	M23-Se0025193						X	X	
3	AQM01	Sep 11, 2023		6L Passivated Canister	M23-Se0025194		X	X	X	X			X
4	AQM02	Sep 12, 2023		6L Passivated Canister	M23-Se0025195		X	X	X	X			X
5	AQM03	Sep 11, 2023		6L Passivated Canister	M23-Se0025196		X	X	X	X			X
Test Counts						1	3	3	3	3	1	1	3

Eurofins Environment Testing Australia Pty Ltd

ABN: 50 005 085 521

Melbourne	Geelong	Sydney	Canberra	Brisbane	Newcastle
6 Monterey Road Dandenong South VIC 3175 Tel: +61 3 8564 5000 NATA# 1261 Site# 1254	19/8 Lewalan Street Grovedale VIC 3216 Tel: +61 3 8564 5000 NATA# 1261 Site# 25403	179 Magowar Road Girraween NSW 2145 Tel: +61 2 9900 8400 NATA# 1261 Site# 18217	Unit 1,2 Dacre Street Mitchell ACT 2911 Tel: +61 2 6113 8091 NATA# 1261 Site# 25466	1/21 Smallwood Place Murarrie QLD 4172 Tel: +61 7 3902 4600 NATA# 1261 Site# 20794	1/2 Frost Drive Mayfield West NSW 2304 Tel: +61 2 4968 8448 NATA# 1261 Site# 25079 & 25289

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Sample Receipt Advice

Company name:	GHD Pty Ltd NT
Contact name:	Jo Lavers
Project name:	12592142 - Darwin Turf club
Project ID:	12592142 - Darwin Turf club
Turnaround time:	5 Day
Date/Time received	Sep 12, 2023 1:45 PM
Eurofins reference	1025154

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.
- ✓ Sample containers for volatile analysis received with zero headspace.
- ✗ Split sample sent to requested external lab.
- ✗ Some samples have been subcontracted.
- N/A Custody Seals intact (if used).

Notes

Contact

If you have any questions with respect to these samples, please contact your Analytical Services Manager:

Harry Bacalis on phone : +61 3 8564 5064 or by email: HarryBacalis@eurofins.com

Results will be delivered electronically via email to Jo Lavers - jo.lavers@ghd.com.

Note: A copy of these results will also be delivered to the general GHD Pty Ltd NT email address.

GHD Pty Ltd NT
Level 7, 24 Mitchell Street
Darwin
NT 0800



NATA Accredited
Accreditation Number 1261
Site Number 1254

Accredited for compliance with ISO/IEC 17025 – Testing
NATA is a signatory to the ILAC Mutual Recognition
Arrangement for the mutual recognition of the
equivalence of testing, medical testing, calibration,
inspection, proficiency testing scheme providers and
reference materials producers reports and certificates.

Attention: **Jo Lavers**

Report **1025154-S**
Project name **12592142 - Darwin Turf club**
Project ID **12592142 - Darwin Turf club**
Received Date **Sep 12, 2023**

Client Sample ID			Oil 1
Sample Matrix			Oil
Eurofins Sample No.			M23-
Date Sampled			Se0025193
Test/Reference	LOR	Unit	Sep 11, 2023
Polychlorinated Biphenyls in Oils & Greases			
Aroclor-1016	1	mg/kg	< 1
Aroclor-1221	1	mg/kg	< 1
Aroclor-1232	1	mg/kg	< 1
Aroclor-1242	1	mg/kg	< 1
Aroclor-1248	1	mg/kg	< 1
Aroclor-1254	1	mg/kg	< 1
Aroclor-1260	1	mg/kg	< 1
Total PCB*	1	mg/kg	< 1
Decachlorobiphenyl (surr.)	1	%	85
Perfluoroalkyl carboxylic acids (PFCAs)			
Perfluorobutanoic acid (PFBA) ^{N11}	5	ug/kg	< 5
Perfluoropentanoic acid (PFPeA) ^{N11}	5	ug/kg	< 5
Perfluorohexanoic acid (PFHxA) ^{N11}	5	ug/kg	< 5
Perfluoroheptanoic acid (PFHpA) ^{N11}	5	ug/kg	< 5
Perfluorooctanoic acid (PFOA) ^{N11}	5	ug/kg	< 5
Perfluorononanoic acid (PFNA) ^{N11}	5	ug/kg	< 5
Perfluorodecanoic acid (PFDA) ^{N11}	5	ug/kg	< 5
Perfluoroundecanoic acid (PFUnDA) ^{N11}	5	ug/kg	< 5
Perfluorododecanoic acid (PFDoDA) ^{N11}	5	ug/kg	< 5
Perfluorotridecanoic acid (PFTTrDA) ^{N15}	5	ug/kg	< 5
Perfluorotetradecanoic acid (PFTeDA) ^{N11}	5	ug/kg	< 5
13C4-PFBA (surr.)	1	%	123
13C5-PFPeA (surr.)	1	%	86
13C5-PFHxA (surr.)	1	%	96
13C4-PFHpA (surr.)	1	%	102
13C8-PFOA (surr.)	1	%	88
13C5-PFNA (surr.)	1	%	126
13C6-PFDA (surr.)	1	%	64
13C2-PFUnDA (surr.)	1	%	93
13C2-PFDoDA (surr.)	1	%	117
13C2-PFTeDA (surr.)	1	%	169

Client Sample ID			Oil 1
Sample Matrix			Oil
Eurofins Sample No.			M23-Se0025193
Date Sampled			Sep 11, 2023
Test/Reference	LOR	Unit	
Perfluoroalkyl sulfonamido substances			
Perfluorooctane sulfonamide (FOSA) ^{N11}	5	ug/kg	< 5
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA) ^{N11}	5	ug/kg	< 5
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA) ^{N11}	5	ug/kg	< 5
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol(N-MeFOSE) ^{N11}	5	ug/kg	< 5
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol(N-EtFOSE) ^{N11}	5	ug/kg	< 5
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA) ^{N11}	10	ug/kg	< 10
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA) ^{N11}	10	ug/kg	< 10
13C8-FOSA (surr.)	1	%	112
D3-N-MeFOSA (surr.)	1	%	20
D5-N-EtFOSA (surr.)	1	%	15
D7-N-MeFOSE (surr.)	1	%	16
D9-N-EtFOSE (surr.)	1	%	13
D5-N-EtFOSAA (surr.)	1	%	112
D3-N-MeFOSAA (surr.)	1	%	155
Perfluoroalkyl sulfonic acids (PFASs)			
Perfluorobutanesulfonic acid (PFBS) ^{N11}	5	ug/kg	< 5
Perfluorononanesulfonic acid (PFNS) ^{N15}	5	ug/kg	< 5
Perfluoropropanesulfonic acid (PFPrS) ^{N15}	5	ug/kg	< 5
Perfluoropentanesulfonic acid (PFPeS) ^{N15}	5	ug/kg	< 5
Perfluorohexanesulfonic acid (PFHxS) ^{N11}	5	ug/kg	< 5
Perfluoroheptanesulfonic acid (PFHpS) ^{N15}	5	ug/kg	< 5
Perfluorooctanesulfonic acid (PFOS) ^{N11}	5	ug/kg	< 5
Perfluorodecanesulfonic acid (PFDS) ^{N15}	5	ug/kg	< 5
13C3-PFBS (surr.)	1	%	107
18O2-PFHxS (surr.)	1	%	101
13C8-PFOS (surr.)	1	%	90
n:2 Fluorotelomer sulfonic acids (n:2 FTSA)			
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA) ^{N11}	5	ug/kg	< 5
1H.1H.2H.2H-perfluorooctanesulfonic acid(6:2 FTSA) ^{N11}	10	ug/kg	< 10
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA) ^{N11}	5	ug/kg	< 5
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA) ^{N11}	5	ug/kg	< 5
13C2-4:2 FTSA (surr.)	1	%	42
13C2-6:2 FTSA (surr.)	1	%	50
13C2-8:2 FTSA (surr.)	1	%	62
13C2-10:2 FTSA (surr.)	1	%	98
PFASs Summations			
Sum (PFHxS + PFOS)*	5	ug/kg	< 5
Sum of US EPA PFAS (PFOS + PFOA)*	5	ug/kg	< 5
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	5	ug/kg	< 5
Sum of WA DWER PFAS (n=10)*	10	ug/kg	< 10
Sum of PFASs (n=30)*	50	ug/kg	< 50

Sample History

Where samples are submitted/analysed over several days, the last date of extraction is reported.

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
Polychlorinated Biphenyls in Oils & Greases - Method: LTM-ORG-2080 PCBs in Oil (USEPA 8082 and Vic EPA 6013)	Melbourne	Sep 12, 2023	14 Days
Per- and Polyfluoroalkyl Substances (PFASs)			
Perfluoroalkyl carboxylic acids (PFCAs) - Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)	Melbourne	Sep 15, 2023	28 Days
Perfluoroalkyl sulfonamido substances - Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)	Melbourne	Sep 15, 2023	28 Days
Perfluoroalkyl sulfonic acids (PFSAs) - Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)	Melbourne	Sep 15, 2023	28 Days
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs) - Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)	Melbourne	Sep 15, 2023	28 Days
PFASs Summations - Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)	Melbourne	Sep 12, 2023	

Melbourne	Geelong	Sydney	Canberra	Brisbane	Newcastle
6 Monterey Road Dandenong South VIC 3175 Tel: +61 3 8564 5000 NATA# 1261 Site# 1254	19/8 Lewalan Street Grovedale VIC 3216 Tel: +61 3 8564 5000 NATA# 1261 Site# 25403	179 Magowar Road Girraween NSW 2145 Tel: +61 2 9900 8400 NATA# 1261 Site# 18217	Unit 1,2 Dacre Street Mitchell ACT 2911 Tel: +61 2 6113 8091 NATA# 1261 Site# 25466	1/21 Smallwood Place Murarrie QLD 4172 Tel: +61 7 3902 4600 NATA# 1261 Site# 20794	1/2 Frost Drive Mayfield West NSW 2304 Tel: +61 2 4968 8448 NATA# 1261 Site# 25079 & 25289

Perth
46-48 Banksia Road Welshpool WA 6106 Tel: +61 8 6253 4444 NATA# 2377 Site# 2370

Auckland	Christchurch	Tauranga
35 O'Rorke Road Penrose, Auckland 1061 Tel: +64 9 526 4551 IANZ# 1327	43 Detroit Drive Rolleston, Christchurch 7675 Tel: +64 3 343 5201 IANZ# 1290	1277 Cameron Road, Gate Pa, Tauranga 3112 Tel: +64 9 525 0568 IANZ# 1402

Company Name: GHD Pty Ltd NT
Address: Level 7, 24 Mitchell Street
Darwin
NT 0800

Project Name: 12592142 - Darwin Turf club
Project ID: 12592142 - Darwin Turf club

Order No.:
Report #: 1025154
Phone: 08 8982 0100
Fax: 08 8981 1075

Received: Sep 12, 2023 1:45 PM
Due: Sep 19, 2023
Priority: 5 Day
Contact Name: Jo Lavers

Eurofins Analytical Services Manager : Harry Bacalis

Sample Detail						CANCELLED	Canister Certification and Supply fee	Dilution Factor	Final Pressure (psi)	Receipt Vac./Pressure (in Hg)	Polychlorinated Biphenyls in Oils & Greases	Per- and Polyfluoroalkyl Substances (PFASs)	BTEXN (TO15)
Melbourne Laboratory - NATA # 1261 Site # 1254						X					X	X	
Brisbane Laboratory - NATA # 1261 Site # 20794							X	X	X	X			X
External Laboratory													
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID								
1	Tank 2	Aug 31, 2023		Oil	M23-Se0025192	X							
2	Oil 1	Sep 11, 2023		Oil	M23-Se0025193						X	X	
3	AQM01	Sep 11, 2023		6L Passivated Canister	M23-Se0025194		X	X	X	X			X
4	AQM02	Sep 12, 2023		6L Passivated Canister	M23-Se0025195		X	X	X	X			X
5	AQM03	Sep 11, 2023		6L Passivated Canister	M23-Se0025196		X	X	X	X			X
Test Counts						1	3	3	3	3	1	1	3

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013 and are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. Information identified on this report with blue colour, indicates data provided by customer that may have an impact on the results.
9. This report replaces any interim results previously issued.

Holding Times

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

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

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

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

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

Units

mg/kg: milligrams per kilogram	mg/L: milligrams per litre	µg/L: micrograms per litre
ppm: parts per million	ppb: parts per billion	%: Percentage
org/100 mL: Organisms per 100 millilitres	NTU: Nephelometric Turbidity Units	MPN/100 mL: Most Probable Number of organisms per 100 millilitres
CFU: Colony forming unit		

Terms

APHA	American Public Health Association
COC	Chain of Custody
CP	Client Parent - QC was performed on samples pertaining to this report
CRM	Certified Reference Material (ISO17034) - reported as percent recovery.
Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
LOR	Limit of Reporting.
LCS	Laboratory Control Sample - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
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.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
SRA	Sample Receipt Advice
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
TBTO	Tributyltin oxide (<i>bis</i> -tributyltin oxide) - individual tributyltin compounds cannot be identified separately in the environment however free tributyltin was measured and its values were converted stoichiometrically into tributyltin oxide for comparison with regulatory limits.
TCLP	Toxicity Characteristic Leaching Procedure
TEQ	Toxic Equivalency Quotient or Total Equivalence
QSM	US Department of Defense Quality Systems Manual Version 5.4
US EPA	United States Environmental Protection Agency
WA DWER	Sum of PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC - Acceptance Criteria

The acceptance criteria should be used as a guide only and may be different when site specific Sampling Analysis and Quality Plan (SAQP) have been implemented

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%

NOTE: pH duplicates are reported as a range not as RPD

Surrogate Recoveries: Recoveries must lie between 20-130% for Speciated Phenols & 50-150% for PFAS. SVOCs recoveries 20 – 150%

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.4 where no positive PFAS results have been reported have been reviewed and no data was affected.

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. 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.
4. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of recovery the term "INT" appears against that analyte.
5. For Matrix Spikes and LCS results a dash "-" in the report means that the specific analyte was not added to the QC sample.
6. 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								
Polychlorinated Biphenyls in Oils & Greases								
Aroclor-1016			mg/kg	< 1		1	Pass	
Aroclor-1221			mg/kg	< 1		1	Pass	
Aroclor-1232			mg/kg	< 1		1	Pass	
Aroclor-1242			mg/kg	< 1		1	Pass	
Aroclor-1248			mg/kg	< 1		1	Pass	
Aroclor-1254			mg/kg	< 1		1	Pass	
Aroclor-1260			mg/kg	< 1		1	Pass	
Total PCB*			mg/kg	< 1		1	Pass	
Method Blank								
Perfluoroalkyl carboxylic acids (PFCAs)								
Perfluorooctanoic acid (PFOA)			ug/kg	< 5		5	Pass	
Method Blank								
Perfluoroalkyl sulfonic acids (PFSA's)								
Perfluorohexanesulfonic acid (PFHxS)			ug/kg	< 5		5	Pass	
Perfluorooctanesulfonic acid (PFOS)			ug/kg	< 5		5	Pass	
Method Blank								
n:2 Fluorotelomer sulfonic acids (n:2 FTSA's)								
1H.1H.2H.2H-perfluorooctanesulfonic acid(6:2 FTSA)			ug/kg	< 10		10	Pass	
LCS - % Recovery								
Polychlorinated Biphenyls in Oils & Greases								
Aroclor-1260			%	109		70-130	Pass	
LCS - % Recovery								
Perfluoroalkyl carboxylic acids (PFCAs)								
Perfluorooctanoic acid (PFOA)			%	80		50-150	Pass	
LCS - % Recovery								
Perfluoroalkyl sulfonic acids (PFSA's)								
Perfluorohexanesulfonic acid (PFHxS)			%	88		50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)			%	86		50-150	Pass	
LCS - % Recovery								
n:2 Fluorotelomer sulfonic acids (n:2 FTSA's)								
1H.1H.2H.2H-perfluorooctanesulfonic acid(6:2 FTSA)			%	88		50-150	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1		Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery								
Polychlorinated Biphenyls in Oils & Greases				Result 1				
Aroclor-1260	M23-Se0013541	NCP	%	86		70-130	Pass	
Spike - % Recovery								
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1				
Perfluorooctanoic acid (PFOA)	M23-Se0026819	NCP	%	82		50-150	Pass	
Spike - % Recovery								
Perfluoroalkyl sulfonic acids (PFSA's)				Result 1				
Perfluorohexanesulfonic acid (PFHxS)	M23-Se0026819	NCP	%	82		50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	M23-Se0026819	NCP	%	99		50-150	Pass	
Spike - % Recovery								
n:2 Fluorotelomer sulfonic acids (n:2 FTSA's)				Result 1				
1H.1H.2H.2H-perfluorooctanesulfonic acid(6:2 FTSA)	M23-Se0026819	NCP	%	87		50-150	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1	Result 2	RPD	Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
Polychlorinated Biphenyls in Oils & Greases				Result 1	Result 2	RPD			
Aroclor-1016	B23-Au0069526	NCP	mg/kg	< 5	< 5	<1	30%	Pass	
Aroclor-1221	B23-Au0069526	NCP	mg/kg	< 5	< 5	<1	30%	Pass	
Aroclor-1232	B23-Au0069526	NCP	mg/kg	< 5	< 5	<1	30%	Pass	
Aroclor-1242	B23-Au0069526	NCP	mg/kg	< 5	< 5	<1	30%	Pass	
Aroclor-1248	B23-Au0069526	NCP	mg/kg	< 5	< 5	<1	30%	Pass	
Aroclor-1254	B23-Au0069526	NCP	mg/kg	< 5	< 5	<1	30%	Pass	
Aroclor-1260	B23-Au0069526	NCP	mg/kg	< 5	< 5	<1	30%	Pass	
Total PCB*	B23-Au0069526	NCP	mg/kg	< 5	< 5	<1	30%	Pass	
Duplicate									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1	Result 2	RPD			
Perfluorooctanoic acid (PFOA)	M23-Se0026818	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Duplicate									
Perfluoroalkyl sulfonic acids (PFSA's)				Result 1	Result 2	RPD			
Perfluorohexanesulfonic acid (PFHxS)	M23-Se0026818	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorooctanesulfonic acid (PFOS)	M23-Se0026818	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Duplicate									
n:2 Fluorotelomer sulfonic acids (n:2 FTSA's)				Result 1	Result 2	RPD			
1H,1H,2H,2H-perfluorooctanesulfonic acid(6:2 FTSA)	M23-Se0026818	NCP	ug/kg	< 10	< 10	<1	30%	Pass	

Comments

Sample Integrity

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

Qualifier Codes/Comments

Code	Description
N11	Isotope dilution is used for calibration of each native compound for which an exact labelled analogue is available (Isotope Dilution Quantitation). The isotopically labelled analogues allow identification and recovery correction of the concentration of the associated native PFAS compounds.
N15	Where the native PFAS compound does not have labelled analogue then the quantification is made using the Extracted Internal Standard Analyte with the closest retention time to the analyte and no recovery correction has been made (Internal Standard Quantitation).

Authorised by:

Harry Bacalis	Analytical Services Manager
Edward Lee	Senior Analyst-Organic
Joseph Edouard	Senior Analyst-PFAS



Glenn Jackson
Managing Director

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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GHD Pty Ltd NT
Level 7, 24 Mitchell Street
Darwin
NT 0800



NATA Accredited
Accreditation Number 1261
Site Number 20794

Accredited for compliance with ISO/IEC 17025 – Testing
NATA is a signatory to the ILAC Mutual Recognition
Arrangement for the mutual recognition of the
equivalence of testing, medical testing, calibration,
inspection, proficiency testing scheme providers and
reference materials producers reports and certificates.

Attention: **Jo Lavers**

Report **1025154-TO**
Project name **12592142 - Darwin Turf club**
Project ID **12592142 - Darwin Turf club**
Received Date **Sep 12, 2023**

Client Sample ID			AQM01	AQM02	AQM03
Sample Matrix			6L Passivated Canister	6L Passivated Canister	6L Passivated Canister
Eurofins Sample No.			M23-Se0025194	M23-Se0025195	M23-Se0025196
Date Sampled			Sep 11, 2023	Sep 12, 2023	Sep 11, 2023
Receipt Vac./Pressure (inHg)			7.6	6.6	6.8
Final Pressure (psi)			5.2	5.2	5.2
Test/Reference	LOR	Unit			
Dilution Factor	0.1		1.8	1.7	1.8
BTEXN (TO15)					
Benzene	1.6	ug/m3	< 3	< 3	< 3
Ethylbenzene	2.2	ug/m3	< 4	< 4	< 4
m,p-Xylene	4.4	ug/m3	< 8	< 7	< 8
o-Xylene	2.2	ug/m3	< 4	< 4	< 4
Toluene	7.5	ug/m3	< 14	< 13	< 14
Naphthalene	10.5	ug/m3	< 19	< 18	< 19
4-Bromofluorobenzene (surr.)	1	%	99	100	95

Sample History

Where samples are submitted/analysed over several days, the last date of extraction is reported.

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

BTEXN (TO15)

Testing Site

BrisbaneAir

Extracted

Sep 13, 2023

Holding Time

30 Days

- Method: SOP #6 Analysis of Volatile Organic Compounds in Summa Polished Canisters EPA Method TO-15 And Modified EPA Method TO-14A

Melbourne	Geelong	Sydney	Canberra	Brisbane	Newcastle
6 Monterey Road Dandenong South VIC 3175 Tel: +61 3 8564 5000 NATA# 1261 Site# 1254	19/8 Lewalan Street Grovedale VIC 3216 Tel: +61 3 8564 5000 NATA# 1261 Site# 25403	179 Magowar Road Girraween NSW 2145 Tel: +61 2 9900 8400 NATA# 1261 Site# 18217	Unit 1,2 Dacre Street Mitchell ACT 2911 Tel: +61 2 6113 8091 NATA# 1261 Site# 25466	1/21 Smallwood Place Murarrie QLD 4172 Tel: +61 7 3902 4600 NATA# 1261 Site# 20794	1/2 Frost Drive Mayfield West NSW 2304 Tel: +61 2 4968 8448 NATA# 1261 Site# 25079 & 25289

Perth
46-48 Banksia Road Welshpool WA 6106 Tel: +61 8 6253 4444 NATA# 2377 Site# 2370

Auckland	Christchurch	Tauranga
35 O'Rorke Road Penrose, Auckland 1061 Tel: +64 9 526 4551 IANZ# 1327	43 Detroit Drive Rolleston, Christchurch 7675 Tel: +64 3 343 5201 IANZ# 1290	1277 Cameron Road, Gate Pa, Tauranga 3112 Tel: +64 9 525 0568 IANZ# 1402

Company Name:	GHD Pty Ltd NT	Order No.:		Received:	Sep 12, 2023 1:45 PM
Address:	Level 7, 24 Mitchell Street Darwin NT 0800	Report #:	1025154	Due:	Sep 19, 2023
		Phone:	08 8982 0100	Priority:	5 Day
		Fax:	08 8981 1075	Contact Name:	Jo Lavers
Project Name:	12592142 - Darwin Turf club				
Project ID:	12592142 - Darwin Turf club				

Eurofins Analytical Services Manager : Harry Bacalis

Sample Detail						CANCELLED	Canister Certification and Supply fee	Dilution Factor	Final Pressure (psi)	Receipt Vac./Pressure (in Hg)	Polychlorinated Biphenyls in Oils & Greases	Per- and Polyfluoroalkyl Substances (PFASs)	BTEXN (TO15)
Melbourne Laboratory - NATA # 1261 Site # 1254						X					X	X	
Brisbane Laboratory - NATA # 1261 Site # 20794							X	X	X	X			X
External Laboratory													
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID								
1	Tank 2	Aug 31, 2023		Oil	M23-Se0025192	X							
2	Oil 1	Sep 11, 2023		Oil	M23-Se0025193						X	X	
3	AQM01	Sep 11, 2023		6L Passivated Canister	M23-Se0025194		X	X	X	X			X
4	AQM02	Sep 12, 2023		6L Passivated Canister	M23-Se0025195		X	X	X	X			X
5	AQM03	Sep 11, 2023		6L Passivated Canister	M23-Se0025196		X	X	X	X			X
Test Counts						1	3	3	3	3	1	1	3

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. Dilutions are performed on samples due to the presence of high level target species or the presence of high level non-target species.
3. Results are uncorrected for surrogate recoveries.
4. All QC limit exceedances and affected sample results are noted by flags. Each qualifying flag is defined below in section entitled 'Definition of Data Qualifying Flags' and additionally on individual sample results (where relevant).
5. "100% certification" is defined as evaluating the sampling system with humid zero air/N₂ and humid calibration gases that pass through all active components of the sampling system. The system is "100% certified" if no significant additions or deletions (less than 0.2 ppbv each of target compounds) have occurred when challenged with the test gas stream.
6. The conversion equation from ppbv to g/m³ uses a temperature of 25 °C and an ambient sea level atmospheric pressure of 1 atmosphere (101.325 kPa) is assumed.
7. All canister samples are only analysed once temperature equilibrium with the laboratory has been achieved.
8. Safe Sampling Volume (SSV) - calculated by taking two-thirds of the breakthrough volume (direct method) and Appendix 1 of Method T0-17.
9. Samples were analysed on an 'as received' basis.
10. Information identified on this report with blue colour, indicates data provided by customer, that may have an impact on the results.
11. This report replaces any interim results previously issued.

Definition of Data Qualifying Flags

Qualifiers may have been used on the data analysis sheets and indicates as follows:

- A01 Compound present in laboratory blank greater than reporting limit (background subtraction not performed).
- A02 Estimated value.
- A03 Exceeds instrument calibration range.
- A04 Saturated peak.
- A05 Exceeds quality control limits.
- A06 Compound analysed for but not detected above the Limit of Reporting (LOR). See data page for project specific U-flag definition.
- A07 Non-detected compound associated with low bias in the CCV.
- A08 The identification is based on presumptive evidence.
- A09 SSV has been exceeded for this compound. It is likely that this compound has been underestimated.
- A10 LORs cited do not take into account sample dilution due to canister pressurisation.
- A11 Naphthalene elutes outside the >C10-C12 range on the system used for sample analysis. As a result, >C10-C12 TRH value is equivalent to the modified F2 value.

Holding Times

Under conditions of normal usage for sampling ambient air, most Volatile Organic Compounds (VOCs) can be recovered from canisters near their original concentrations after storage times of up to thirty days. For thermal desorption tubes (TDT) samples should be refrigerated at <4°C in a clean environment during storage and analysed within 30 days of sample collection (within one week for limonene, carene, bis-chloromethyl ether and labile sulfur or nitrogen containing volatiles).

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.

Units

ppbv: parts per billion by volume

kPa: kilopascal

ug/m³: micrograms per cubic metre

psig: pounds per square inch gauge

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
BTEXN (TO15)							
Benzene	ug/m3	< 1.6			1.6	Pass	
Ethylbenzene	ug/m3	< 2.2			2.2	Pass	
m,p-Xylene	ug/m3	< 4.4			4.4	Pass	
o-Xylene	ug/m3	< 2.2			2.2	Pass	
Toluene	ug/m3	< 7.5			7.5	Pass	
Naphthalene	ug/m3	< 10.5			10.5	Pass	
LCS - % Recovery							
BTEXN (TO15)							
Benzene	%	97			70-130	Pass	
Ethylbenzene	%	115			70-130	Pass	
m,p-Xylene	%	117			70-130	Pass	
o-Xylene	%	120			70-130	Pass	
Toluene	%	105			70-130	Pass	
Naphthalene	%	124			70-130	Pass	

Comments
Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	No
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:

Harry Bacalis	Analytical Services Manager
Jonathon Angell	Senior Analyst-Air
Sarah McCallion	Senior Analyst-Air



Glenn Jackson
Managing Director

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 E

Results Tables



	BTEXN					
	Benzene	Toluene	Ethylbenzene	Xylene (o)	Xylene (m & p)	Naphthalene
	mg/m3	mg/m3	mg/m3	mg/m3	mg/m3	mg/m3
EQL	0.0016	0.0075	0.0022	0.0022	0.0044	0.0105
Environment Protection Licence Trigger Levels (EPL218) - Appendix C (2018-2020)	0.01	3.766		1.085	2.17	

Location Code	Date	Field ID	Lab Report Number						
AQM01	11 Sep 2023	AQM01	1025154	<0.003	<0.014	<0.004	<0.004	<0.008	<0.019
AQM02	12 Sep 2023	AQM02	1025154	<0.003	<0.013	<0.004	<0.004	<0.007	<0.018
AQM03	11 Sep 2023	AQM03	1025154	<0.003	<0.014	<0.004	<0.004	<0.008	<0.019

Statistics

Number of Results	3	3	3	3	3	3
Number of Detects	0	0	0	0	0	0
Minimum Concentration	<0.003	<0.013	<0.004	<0.004	<0.007	<0.018
Minimum Detect	ND	ND	ND	ND	ND	ND
Maximum Concentration	<0.003	<0.014	<0.004	<0.004	<0.008	<0.019
Maximum Detect	ND	ND	ND	ND	ND	ND
Average Concentration *	0.0015	0.0068	0.002	0.002	0.0038	0.0093
Geometric Average *	0.0015	0.0068	0.002	0.002	0.0038	0.0093
Median Concentration *	0.0015	0.007	0.002	0.002	0.004	0.0095
Standard Deviation *	0	0.00029	0	0	0.00029	0.00029
Geometric Standard Deviation *	1	1	1	1	1.1	1
95% UCL (Student's-t) *	0.0015	0.00732	0.002	0.002	0.00432	0.00982
% of Detects	0	0	0	0	0	0
% of Non-Detects	100	100	100	100	100	100

* A Non Detect Multiplier of 0.5 has been applied.



Appendix D
Table 2
Groundwater Results

Darwin Turf Club
Darwin Turf Club EPL Management
September 2023 Monitoring Report

	Misc.	Metals								BTEXN						
	Naphthalene (value used in F2 calc)	Arsenic (filtered)	Cadmium (filtered)	Chromium (III+VI) (filtered)	Copper (filtered)	Lead (filtered)	Mercury (filtered)	Nickel (filtered)	Zinc (filtered)	Benzene	Toluene	Ethylbenzene	Xylene (o)	Xylene (m & p)	Xylene Total	BTEX (Sum of Total) - Lab Calc
EQL	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
	0.005	0.001	0.0001	0.001	0.001	0.001	0.0001	0.001	0.005	1	2	2	2	2	2	1
		0.013 ^{#1}	0.0002	0.001 ^{#2}	0.0014	0.0034	0.0006	0.011	0.008	950	180	80	350			

Location Code	GME	Date	Field ID	Lab Report Number														
MW02	GME 18	08 Sep 2023	MW02	ES2331067	-	<0.001	<0.0001	<0.001	0.002	<0.001	<0.0001	<0.001	<0.005	-	-	-	-	-
	GME 19	12 Sep 2023	MW02	ES2331067	<0.005	<0.001	<0.0001	<0.001	0.003	<0.001	<0.0001	<0.001	0.008	<1	<2	<2	<2	<1
MW03	GME 18	08 Sep 2023	MW03	ES2331067	-	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.0001	<0.001	<0.005	-	-	-	-	-
	GME 19	12 Sep 2023	MW03	ES2331067	<0.005	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.0001	<0.001	<0.005	<1	<2	<2	<2	<1
MW04	GME 18	08 Sep 2023	MW04	ES2331067	-	0.005	<0.0001	<0.001	<0.001	<0.001	<0.0001	0.082	0.164	-	-	-	-	-
	GME 19	12 Sep 2023	MW04	ES2331067	<0.005	0.005	0.0002	<0.001	0.001	0.001	<0.0001	0.135	0.339	<1	<2	<2	<2	<1
MW06	GME 18	11 Sep 2023	MW06	ES2331067	-	<0.001	<0.0001	<0.001	0.001	<0.001	<0.0001	0.002	0.010	-	-	-	-	-
	GME 19	12 Sep 2023	MW06	ES2331067	<0.005	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.0001	0.003	0.011	<1	<2	<2	<2	<1
MW07	GME 18	08 Sep 2023	MW07	ES2331067	-	0.003	0.0001	<0.001	<0.001	<0.001	<0.0001	0.003	0.006	-	-	-	-	-
	GME 19	12 Sep 2023	MW07	ES2331067	<0.005	0.002	0.0002	<0.001	<0.001	0.004	<0.0001	0.006	<1	<2	<2	<2	<2	<1

Statistics																	
Number of Results	5	10	10	10	10	10	10	10	10	10	5	5	5	5	5	5	5
Number of Detects	0	4	3	0	4	2	0	6	7	0	0	0	0	0	0	0	0
Minimum Concentration	<0.005	<0.001	0.0001	<0.001	0.001	0.001	<0.0001	<0.001	<0.005	<1	<2	<2	<2	<2	<2	<2	<1
Minimum Detect	ND	0.002	0.0001	ND	0.001	0.001	ND	0.002	0.006	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration	<0.005	0.005	0.0002	<0.001	0.003	0.004	<0.0001	0.135	0.339	<1	<2	<2	<2	<2	<2	<2	<1
Maximum Detect	ND	0.005	0.0002	ND	0.003	0.004	ND	0.135	0.339	ND	ND	ND	ND	ND	ND	ND	ND
Average Concentration *	0.0025	0.0018	0.000085	0.0005	0.001	0.0009	0.00005	0.023	0.055	0.5	1	1	1	1	1	1	0.5
Geometric Average *	0.0025	0.0011	0.000071	0.0005	0.00079	0.00066	0.00005	0.0029	0.011	0.5	1	1	1	1	1	1	0.5
Median Concentration *	0.0025	0.0005	0.00005	0.0005	0.0005	0.0005	0.00005	0.0025	0.007	0.5	1	1	1	1	1	1	0.5
Standard Deviation *	0	0.0019	0.000063	0	0.00085	0.0011	0	0.047	0.11	0	0	0	0	0	0	0	0
Geometric Standard Deviation *	1	2.8	1.8	1	1.9	2	1	7.9	5.6	1	1	1	1	1	1	1	1
95% UCL (Student's-t) *	0.0025	0.00289	0.00012128	0.0005	0.00149	0.00154	0.00005	0.0502	0.12	0.5	1	1	1	1	1	1	0.5
% of Detects	0	40	30	0	40	20	0	60	70	0	0	0	0	0	0	0	0
% of Non-Detects	100	60	70	100	60	80	100	40	30	100	100	100	100	100	100	100	100

* A Non Detect Multiplier of 0.5 has been applied.

Comments
#1 In absence of total As guideline, As (V) guideline has been adopted.
#2 In absence of total Cr guideline, Cr (VI) guideline has been adopted.

Environmental Standards
Department of Agriculture and Water Resources, 2018 updated July 2021, ANZG (2018) - FW - 95% (updated 26 July 2021)
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Freshwater - 95% - slightly to moderately disturbed systems



Appendix D
Table 2
Groundwater Results

EQL	TRH - NEPM 2013							TRH - NEPM 1999					PFAS - Perfluoroalkyl Sulfonic Acids		
	F1 (C6-C10 minus BTEX)	C6-C10 Fraction	F2 (>C10-C16 minus Naphthalene)	>C10-C16 Fraction	F3 (>C16-C34 Fraction)	F4 (>C34-C40 Fraction)	>C10-C40 (Sum of Total)	C6-C9 Fraction	C10-C14 Fraction	C15-C28 Fraction	C29-C36 Fraction	C10-C36 (Sum of Total)	Perfluorobutane sulfonic acid (PFBS)	Perfluorohexane sulfonic acid (PFHxS)	Perfluorooctane sulfonic acid (PFOS)
	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
	20	20	100	100	100	100	100	20	50	100	50	50	0.02	0.01	0.01
ANZG (2018) - FW - 95% (updated 26 July 2021)															
PFAS NEMP 2.0 2020 Freshwater - 95% - slightly to moderately disturbed systems															0.13

Location Code	GME	Date	Field ID														
MW02	GME 18	08 Sep 2023	MW02	-	-	-	-	-	-	-	-	-	-	-	<0.02	0.01	0.02
	GME 19	12 Sep 2023	MW02	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<0.02	0.01	0.02
MW03	GME 18	08 Sep 2023	MW03	-	-	-	-	-	-	-	-	-	-	-	<0.02	<0.01	0.02
	GME 19	12 Sep 2023	MW03	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<0.02	<0.01	0.01
MW04	GME 18	08 Sep 2023	MW04	-	-	-	-	-	-	-	-	-	-	-	<0.02	<0.01	<0.01
	GME 19	12 Sep 2023	MW04	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<0.02	<0.01	<0.01
MW06	GME 18	11 Sep 2023	MW06	-	-	-	-	-	-	-	-	-	-	-	<0.02	<0.01	<0.01
	GME 19	12 Sep 2023	MW06	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<0.02	<0.01	<0.01
MW07	GME 18	08 Sep 2023	MW07	-	-	-	-	-	-	-	-	-	-	-	<0.02	<0.01	<0.01
	GME 19	12 Sep 2023	MW07	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<0.02	<0.01	0.01

Statistics																	
Number of Results	5	5	5	5	5	5	5	5	5	5	5	5	5	10	10	10	
Number of Detects	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	5	
Minimum Concentration	<20	<20	<100	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<0.02	0.01	0.01	
Minimum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01	0.01	
Maximum Concentration	<20	<20	<100	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<0.02	0.01	0.02	
Maximum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01	0.02	
Average Concentration *	10	10	50	50	50	50	50	50	10	25	50	25	25	0.01	0.006	0.01	
Geometric Average *	10	10	50	50	50	50	50	50	10	25	50	25	25	0.01	0.0057	0.0087	
Median Concentration *	10	10	50	50	50	50	50	50	10	25	50	25	25	0.01	0.005	0.0075	
Standard Deviation *	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0021	0.0069	
Geometric Standard Deviation *	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.3	1.9	
95% UCL (Student's-t) *	10	10	50	50	50	50	50	50	10	25	50	25	25	0.01	0.00722	0.0145	
% of Detects	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	50	
% of Non-Detects	100	100	100	100	100	100	100	100	100	100	100	100	100	100	80	50	

* A Non Detect Multiplier of 0.5 has been applied.

Comments
#1 In absence of total As guideline, As (V) guideline has been adopted.
#2 In absence of total Cr guideline, Cr (VI) guideline has been adopted.

Environmental Standards
Department of Agriculture and Water Resources, 2018 updated July 2021, ANZG (2018) - FW - 95%
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Freshwater - 95% - slightly to moderately disturbed systems



Appendix D
Table 2
Groundwater Results

Darwin Turf Club
Darwin Turf Club EPL Management
September 2023 Monitoring Report

EQL	PFAS - Perfluoroalkyl Carboxylic Acids					PFAS - Fluorotelomer Sulfonic Acids				PFAS - Sums	
	Perfluorobutanoic acid (PFBA)	Perfluoropentanoic acid (PFPeA)	Perfluorohexanoic acid (PFHxA)	Perfluorooctanoic acid (PFHpA)	Perfluorooctanoic acid (PFOA)	4:2 Fluorotelomer sulfonic acid (4:2 FTS)	6:2 Fluorotelomer Sulfonate (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	10:2 Fluorotelomer sulfonic acid (10:2 FTS)	Sum of PFHxS and PFOS	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
	0.1	0.02	0.02	0.02	0.01	0.05	0.05	0.05	0.05	0.01	0.01
ANZG (2018) - FW - 95% (updated 26 July 2021)											
PFAS NEMP 2.0 2020 Freshwater - 95% - slightly to moderately disturbed systems					220						

Location Code	GME	Date	Field ID										
MW02	GME 18	08 Sep 2023	MW02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.05	<0.05	<0.05	<0.05	0.03
	GME 19	12 Sep 2023	MW02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.05	<0.05	<0.05	<0.05	0.03
MW03	GME 18	08 Sep 2023	MW03	<0.1	0.15	0.07	0.03	<0.01	<0.05	<0.05	<0.05	<0.05	0.02
	GME 19	12 Sep 2023	MW03	<0.1	0.07	0.04	<0.02	<0.01	<0.05	<0.05	<0.05	<0.05	0.01
MW04	GME 18	08 Sep 2023	MW04	<0.1	<0.02	<0.02	<0.02	<0.01	<0.05	<0.05	<0.05	<0.05	<0.01
	GME 19	12 Sep 2023	MW04	<0.1	<0.02	<0.02	<0.02	<0.01	<0.05	<0.05	<0.05	<0.05	<0.01
MW06	GME 18	11 Sep 2023	MW06	<0.1	<0.02	<0.02	<0.02	<0.01	<0.05	<0.05	<0.05	<0.05	<0.01
	GME 19	12 Sep 2023	MW06	<0.1	<0.02	<0.02	<0.02	<0.01	<0.05	<0.05	<0.05	<0.05	<0.01
MW07	GME 18	08 Sep 2023	MW07	<0.1	0.03	0.02	<0.02	<0.01	<0.05	<0.05	<0.05	<0.05	0.05
	GME 19	12 Sep 2023	MW07	<0.1	0.03	0.02	<0.02	<0.01	<0.05	<0.05	<0.05	<0.05	0.01

Statistics												
Number of Results	10	10	10	10	10	10	10	10	10	10	10	10
Number of Detects	0	4	4	1	0	0	0	0	0	0	5	6
Minimum Concentration	<0.1	<0.02	0.02	<0.02	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05	0.01	<0.01
Minimum Detect	ND	0.03	0.02	0.03	ND	ND	ND	ND	ND	ND	0.01	0.03
Maximum Concentration	<0.1	0.15	0.07	0.03	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05	0.03	0.27
Maximum Detect	ND	0.15	0.07	0.03	ND	ND	ND	ND	ND	ND	0.03	0.27
Average Concentration *	0.05	0.034	0.021	0.012	0.005	0.025	0.025	0.025	0.025	0.025	0.012	0.058
Geometric Average *	0.05	0.02	0.016	0.011	0.005	0.025	0.025	0.025	0.025	0.025	0.0094	0.024
Median Concentration *	0.05	0.01	0.01	0.01	0.005	0.025	0.025	0.025	0.025	0.025	0.0075	0.03
Standard Deviation *	0	0.045	0.02	0.0063	0	0	0	0	0	0	0.01	0.083
Geometric Standard Deviation *	1	2.7	2	1.4	1	1	1	1	1	1	2.1	4.4
95% UCL (Student's-t) *	0.05	0.0601	0.0324	0.0157	0.005	0.025	0.025	0.025	0.025	0.025	0.0185	0.106
% of Detects	0	40	40	10	0	0	0	0	0	0	50	60
% of Non-Detects	100	60	60	90	100	100	100	100	100	100	50	40

* A Non Detect Multiplier of 0.5 has been applied.

Comments
#1 In absence of total As guideline, As (V) guideline has been adopted.
#2 In absence of total Cr guideline, Cr (VI) guideline has been adopted.

Environmental Standards
Department of Agriculture and Water Resources, 2018 updated July 2021, ANZG (2018) - FW - 95%
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Freshwater - 95% - slightly to moderately disturbed systems



Appendix D
Table 3
Oil Results

EQL	PCBs								PFAS - Perfluoroalkyl Sulfonic Acids							
	Arochlor 1016	Arochlor 1221	Arochlor 1232	Arochlor 1242	Arochlor 1248	Arochlor 1254	Arochlor 1260	PCBs (Total)	Perfluoropropanesulfonic acid (PFPrS)	Perfluorobutane sulfonic acid (PFBS)	Perfluoropentane sulfonic acid (PFPeS)	Perfluorohexane sulfonic acid (PFHxS)	Perfluoroheptane sulfonic acid (PFHpS)	Perfluorooctane sulfonic acid (PFOS)	Perfluorodecane sulfonic acid (PFDS)	
	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	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	5	5	5	5	5	5	5	

Date	Field ID	Lab Report Number														
31 Aug 2023	Tank 2	1023868	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<5	<5	<5	<5	<5	<5
11 Sep 2023	Oil 1	1025154	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<5	<5	<5	<5	<5	<5

Statistics																
Number of Results	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Number of Detects	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minimum Concentration	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<5	<5	<5	<5	<5	<5	<5
Minimum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<5	<5	<5	<5	<5	<5	<5
Maximum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Average Concentration *	500	500	500	500	500	500	500	500	500	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Geometric Average *	500	500	500	500	500	500	500	500	500	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Median Concentration *	500	500	500	500	500	500	500	500	500	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Standard Deviation *	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Geometric Standard Deviation *	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
95% UCL (Student's-t) *	500	500	500	500	500	500	500	500	500	2.5	2.5	2.5	2.5	2.5	2.5	2.5
% of Detects	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% of Non-Detects	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

* A Non Detect Multiplier of 0.5 has been applied.



EQL	PFAS - Perfluoroalkyl Carboxylic Acids											PFAS - Perfluoroalkyl Sulfonamide							
	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 (PFTriDA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorooctane sulfonamide (FOSA)	N-Methyl perfluorooctane sulfonamide (MeFOSA)	N-Ethyl perfluorooctane sulfonamide (EtFOSA)	N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	N-Methyl perfluorooctane sulfonamidoethanol (MEFOSE)	N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	
	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	
	5	5	5	5	5	5	5	5	5	5	5	5	5	5	10	5	5	10	

Date	Field ID	Lab Report Number																	
31 Aug 2023	Tank 2	1023868	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<10	<5	<5	<10
11 Sep 2023	Oil 1	1025154	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<10	<5	<5	<10

Statistics																			
Number of Results	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Number of Detects	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minimum Concentration	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<10	<5	<5	<5	<10
Minimum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<10	<5	<5	<5	<10
Maximum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Average Concentration *	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	5	2.5	2.5	2.5	5
Geometric Average *	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	5	2.5	2.5	2.5	5
Median Concentration *	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	5	2.5	2.5	2.5	5
Standard Deviation *	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Geometric Standard Deviation *	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
95% UCL (Student's-t) *	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	5	2.5	2.5	2.5	5
% of Detects	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% of Non-Detects	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

* A Non Detect Multiplier of 0.5 has been applied.



	PFAS - Fluorotelomer Sulfonic Acids				PFAS - Sums					PFAS	
	4:2 Fluorotelomer sulfonic acid (4:2 FTS)	6:2 Fluorotelomer Sulfonate (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	10:2 Fluorotelomer sulfonic acid (10:2 FTS)	Sum of PFHxS and PFOS	Sum of US EPA PFAS (PFOS + PFOA)*	PFAS (Sum of Total)	Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	PFAS (Sum of Total)(WA DER List)	Perfluorononane sulfonate (PFNS)	
	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL	5	10	5	5	5	5	50	5	10	5	

Date	Field ID	Lab Report Number										
31 Aug 2023	Tank 2	1023868	<5	<10	<5	<5	<5	<5	<50	<5	<10	<5
11 Sep 2023	Oil 1	1025154	<5	<10	<5	<5	<5	<5	<50	<5	<10	<5

Statistics											
Number of Results	2	2	2	2	2	2	2	2	2	2	2
Number of Detects	0	0	0	0	0	0	0	0	0	0	0
Minimum Concentration	<5	<10	<5	<5	<5	<5	<50	<5	<10	<5	
Minimum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration	<5	<10	<5	<5	<5	<5	<50	<5	<10	<5	
Maximum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Average Concentration *	2.5	5	2.5	2.5	2.5	2.5	25	2.5	5	2.5	
Geometric Average *	2.5	5	2.5	2.5	2.5	2.5	25	2.5	5	2.5	
Median Concentration *	2.5	5	2.5	2.5	2.5	2.5	25	2.5	5	2.5	
Standard Deviation *	0	0	0	0	0	0	0	0	0	0	
Geometric Standard Deviation *	1	1	1	1	1	1	1	1	1	1	
95% UCL (Student's-t) *	2.5	5	2.5	2.5	2.5	2.5	25	2.5	5	2.5	
% of Detects	0	0	0	0	0	0	0	0	0	0	
% of Non-Detects	100	100	100	100	100	100	100	100	100	100	

* A Non Detect Multiplier of 0.5 has been applied.



Appendix D
Table 4
QAQC Results

Darwin Turf Club
Darwin Turf Club EPL Management
September 2023 Monitoring Report

Location Code	Date	Field ID	Matrix Type	Sample Type	Lab Report Number	MW07			RPD	
						08 Sep 2023		12 Sep 2023		
						MW07	FD_01	MW07_B		FD_02
						Water	Water	Water		Water
						Normal	Field_D	Normal		Field_D
						ES2331067	ES2331067	ES2331067		ES2331067
Unit	EQL									
Misc.										
Naphthalene (value used in F2 calc)	mg/L	0.005	-	-	-	<0.005	<0.005	0		
Metals										
Arsenic (filtered)	mg/L	0.001	0.003	0.001	100	0.002	0.002	0		
Cadmium (filtered)	mg/L	0.0001	0.0001	<0.0001	0	0.0002	0.0002	0		
Chromium (III+VI) (filtered)	mg/L	0.001	<0.001	<0.001	0	<0.001	<0.001	0		
Copper (filtered)	mg/L	0.001	<0.001	<0.001	0	<0.001	0.001	0		
Lead (filtered)	mg/L	0.001	<0.001	<0.001	0	0.004	0.004	0		
Mercury (filtered)	mg/L	0.0001	<0.0001	<0.0001	0	<0.0001	<0.0001	0		
Nickel (filtered)	mg/L	0.001	0.003	0.002	40	0.004	0.005	22		
Zinc (filtered)	mg/L	0.005	0.006	<0.005	18	0.006	0.009	40		
BTEXN										
Benzene	µg/L	1	-	-	-	<1	<1	0		
Toluene	µg/L	2	-	-	-	<2	<2	0		
Ethylbenzene	µg/L	2	-	-	-	<2	<2	0		
Xylene (o)	µg/L	2	-	-	-	<2	<2	0		
Xylene (m & p)	µg/L	2	-	-	-	<2	<2	0		
Xylene Total	µg/L	2	-	-	-	<2	<2	0		
BTEX (Sum of Total) - Lab Calc	µg/L	1	-	-	-	<1	<1	0		
TRH - NEPM 2013										
F1 (C6-C10 minus BTEX)	µg/L	20	-	-	-	<20	<20	0		
C6-C10 Fraction	µg/L	20	-	-	-	<20	<20	0		
F2 (>C10-C16 minus Naphthalene)	µg/L	100	-	-	-	<100	<100	0		
>C10-C16 Fraction	µg/L	100	-	-	-	<100	<100	0		
F3 (>C16-C34 Fraction)	µg/L	100	-	-	-	<100	<100	0		
F4 (>C34-C40 Fraction)	µg/L	100	-	-	-	<100	<100	0		
>C10-C40 (Sum of Total)	µg/L	100	-	-	-	<100	<100	0		
TRH - NEPM 1999										
C6-C9 Fraction	µg/L	20	-	-	-	<20	<20	0		
C10-C14 Fraction	µg/L	50	-	-	-	<50	<50	0		
C15-C28 Fraction	µg/L	100	-	-	-	<100	<100	0		
C29-C36 Fraction	µg/L	50	-	-	-	<50	<50	0		
C10-C36 (Sum of Total)	µg/L	50	-	-	-	<50	<50	0		
PFAS - Perfluoroalkyl Sulfonic Acids										
Perfluorobutane sulfonic acid (PFBS)	µg/L	0.02	<0.02	<0.02	0	<0.02	<0.02	0		
Perfluorohexane sulfonic acid (PFHxS)	µg/L	0.01	<0.01	0.02	67	<0.01	0.01	0		
Perfluorooctane sulfonic acid (PFOS)	µg/L	0.01	<0.01	<0.01	0	0.01	0.01	0		
PFAS - Perfluoroalkyl Carboxylic Acids										
Perfluorobutanoic acid (PFBA)	µg/L	0.1	<0.1	<0.1	0	<0.1	<0.1	0		
Perfluoropentanoic acid (PFPeA)	µg/L	0.02	0.03	0.03	0	0.03	0.03	0		
Perfluorohexanoic acid (PFHxA)	µg/L	0.02	0.02	0.02	0	0.02	0.02	0		
Perfluoroheptanoic acid (PFHpA)	µg/L	0.02	<0.02	<0.02	0	<0.02	<0.02	0		
Perfluorooctanoic acid (PFOA)	µg/L	0.01	<0.01	<0.01	0	<0.01	<0.01	0		
PFAS - Fluorotelomer Sulfonic Acids										
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0		
6:2 Fluorotelomer Sulfonate (6:2 FTS)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0		
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0		
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0		
PFAS - Sums										
Sum of PFHxS and PFOS	µg/L	0.01	<0.01	0.02	67	0.01	0.02	67		
PFAS (Sum of Total)(WA DER List)	µg/L	0.01	0.05	0.07	33	0.06	0.07	15		

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

Appendix F

Calibration Certificates



Calibration Certificate

AirMet Scientific P/L

135 Sydney Street
Mackay
QLD 4740, Australia
Tel: 07 4951 7500
Fax: 07 4951 7575

This document certifies that the instrument detailed has been calibrated to the parameters

Certificate Print Date: 9-Aug-2023

Call ID / Order No: 263907

Calibration Date: 09-Aug-2023

Job No / Pack No: S2639070001

Next Calibration Due: 8-Aug-2024

Customer: ****GHD Pty Ltd***INACTIVE-ID 407213

Serial No: 18A105175

Description: YSI Professional Plus hand held unit only. Includ

Calibration Summary

Frequency: 365 Days

Temp: 0°C

As Found: Out of Tolerance

Result: Pass

Humidity: 0%

Certificate: S2639070001

<u>Desc</u>	<u>As Found</u>		<u>As Left (Cal Status)</u>	
	<u>Actual</u>	<u>Result</u>	<u>Actual</u>	<u>Result</u>
PH4	3.54	Fail	4.0	Pass
PH7	7.65	Fail	7.02	Pass
Specific Conductivity	1468.0	Fail	1413.0	Pass
DO	0.3	Pass	0.0	Pass
Temp (°C)	21.8	Pass	21.8	Pass
ORP (mV)	230.1	Fail	236.04	Pass

<u>Standard Used</u>		<u>Valid Until</u>	<u>Cert</u>
<u>Equip ID</u>	<u>Description</u>		
901	Testo Mini Thermometer	06/07/2024	

Conductivity 1413 - s/n: 398532. pH7 - s/n: 399304. pH4 - s/n: 399527.
ORP - Zobell: A s/n: 406331 / B - s/n: 400268. DO NaSO2 - s/n: 1211.

Completed By: Rael Murray

Signed: 

Appendix G

Historical Field Data

Appendix G
Historical Field Data

Site	Well ID	Sampled Date/Time	Purge Vol L	Purge SWL m bTOC	pH Field pH Units	EC Field µS/cm	DO Field mg/L	DO Field %S	ORP Field mV	Temp Field °C	Turbidity Field NTU
Darwin Turf Club	MW01	20/04/2022 12:30 PM	1.5	3.994	5.66	302.2	1.49	21.2	175	34.2	
Darwin Turf Club	MW01	21/04/2022 12:30 PM	2.5	2.366	5.75	309.6	0.27	3.8	149.5	33.6	
Darwin Turf Club	MW01	24/04/2023 02:13 PM	2.5	3.8	5.09	886	0.28	3.9	148.3	33.2	
Darwin Turf Club	MW01	27/04/2023 11:21 AM	2	2.411	5.09	833	0.29	4	134.1	33.1	
Darwin Turf Club	MW02	17/01/2020 12:59 PM	6.0	0.959	5.86	505	1.87	27.4	11.3	34.8	
Darwin Turf Club	MW02	23/04/2020 11:45 AM	2.5	1.472	5.46	528	0.37	5.6	68.0	34.8	-0.44
Darwin Turf Club	MW02	28/04/2020 11:29 AM	3.0	1.521	5.45	490.1	0.59	8.3	84.1	34.2	-2.69
Darwin Turf Club	MW02	20/04/2022 01:15 PM	1.2	3.988	6.51	436.5	6.63	92.9	164.8	33.2	
Darwin Turf Club	MW02	11/05/2022 01:05 PM	4	2.803	5.58	319.5	0.31	4.4	157.5	33.4	
Darwin Turf Club	MW02	10/10/2022 01:07 PM	6	2.592	4.77	482	0.31	4.2	167.1	33.1	
Darwin Turf Club	MW02	12/10/2022 10:42 AM	5	2.56	4.7	466.1	0.19	2.5	108.3	32.6	
Darwin Turf Club	MW02	24/04/2023 01:40 PM	3	4.71	5.14	873	0.51	7.2	115.4	32.6	
Darwin Turf Club	MW02	27/04/2023 10:25 AM	2.5	2.479	5.1	813	0.92	12.7	146.6	32.7	
Darwin Turf Club	MW02	8/09/2023 11:13 AM	2.5	3.16	5.13			32.4	124.6	32.5	
Darwin Turf Club	MW02	12/09/2023 11:32 AM	1	3.08	5.46			35.5	136.4	32.2	
Darwin Turf Club	MW03	23/04/2020 11:10 AM	2.0	2.158	4.76	582	0.93	13.2	209.4	34.0	20.90
Darwin Turf Club	MW03	28/04/2020 10:36 AM	2.5	2.264	4.67	586	0.36	5.0	236.7	33.8	-3.10
Darwin Turf Club	MW03	4/08/2020 11:46 AM	3.0	2.878	5.02	406.4	0.29	4.0	229.0	32.8	9.56
Darwin Turf Club	MW03	8/09/2020 10:54 AM	7	3.049	4.81	422.8	-3.7	-0.29	202.1		1.00
Darwin Turf Club	MW03	16/09/2020 10:08 AM	2.5	3.085	5.60			-0.30	-0.2		2197
Darwin Turf Club	MW03	20/04/2021 1:15 PM	2.5	4.696	5.22	481.1	0.03	0.5	183.2	32.8	0.79
Darwin Turf Club	MW03	28/04/2021 12:15 PM	3.5	2.793	5.21	491.5	0.06	0.8	204.2	32.8	1.8
Darwin Turf Club	MW03	7/09/2021 11:55 AM	3.5	3.26	5.85	545	0.22	2.9	133.6	32.1	
Darwin Turf Club	MW03	15/09/2021 12:30 PM	3	3.316		487.4	0.2			33.5	
Darwin Turf Club	MW03	20/04/2022 12:00 PM	2	2.314	6.17	324.4	2.3	31.9	154.1	32.9	
Darwin Turf Club	MW03	12/05/2022 01:40 PM	2.5	3.17	4.81	459.9	0.09	1.3	189.9	33	
Darwin Turf Club	MW03	8/09/2022 01:40 PM	2.5	2.58	5.58	333.8	0.11	1.5	140.5	33.5	
Darwin Turf Club	MW03	15/09/2022 12:00 AM	2	3.172	4.86	457.9	0.08	1.1	168.1	33.2	
Darwin Turf Club	MW03	10/10/2022 12:10 PM	4	2.473	5.01	495.1	2.01	28	198.5	33.6	
Darwin Turf Club	MW03	12/10/2022 11:40 AM	5	2.565	5.1	486.1	2.1	28.2	187.7	33.5	
Darwin Turf Club	MW03	24/04/2023 02:47 PM	2.5	2.609	4.9	904	0.26	3.7	189.2	33.3	
Darwin Turf Club	MW03	27/04/2023 12:12 PM	2.5	2.64	4.9	855	0.26	3.6	190.1	33.2	
Darwin Turf Club	MW03	8/09/2023 01:54 PM	2	3.28	4.9			24.7	144.7	33.5	
Darwin Turf Club	MW03	12/09/2023 12:00 PM	1	3.31	5.1			3.31	139.7	32.6	

Appendix G
Historical Field Data

Site	Well ID	Sampled Date/Time	Purge Vol L	Purge SWL m bTOC	pH Field pH Units	EC Field µS/cm	DO Field mg/L	DO Field %S	ORP Field mV	Temp Field °C	Turbidity Field NTU
Darwin Turf Club	MW04	17/01/2020 01:20 PM	11	2.830	5.11	12521	2.06	32.1	193.3	32.3	
Darwin Turf Club	MW04	23/04/2020 12:41 PM	4.0	1.966	5.23	6273	1.41	20.1	213.1	33.6	46.79
Darwin Turf Club	MW04	28/04/2020 12:24 PM	5.5	2.037	5.18	6729	1.04	14.8	229.2	33.3	5.06
Darwin Turf Club	MW04	4/08/2020 12:34 PM	4.0	2.899	5.11	9850	0.80	11.3	302.6	31.9	4.56
Darwin Turf Club	MW04	8/09/2020 11:39 AM	5		4.65	18810	2.81	0.17	247.2	32.5	301.9
Darwin Turf Club	MW04	16/09/2020 11:07 AM	3	3.376	4.52	20888	-2.39		225.9	33.2	63.10
Darwin Turf Club	MW04	20/04/2021 12:20 PM	4	2.280	5.63	7055	1.89	26.8	145.9	33.5	0.83
Darwin Turf Club	MW04	28/04/2021 11:30 AM	4.5	2.408	5.53	8828	1.42	20.2	229.3	33.2	1.63
Darwin Turf Club	MW04	7/09/2021 11:15 AM	1.2			24974			-9.1	32.2	
Darwin Turf Club	MW04	15/09/2021 11:40 AM	2.5	2.13	5.63	22088				32.6	
Darwin Turf Club	MW04	20/04/2022 11:30 PM	1.5	1.74	5.85	17431	2.68	38	42	35.3	
Darwin Turf Club	MW04	11/05/2022 01:35 PM	2.5	2.413	6.02	15605	0.76	11.5	-15	35.2	
Darwin Turf Club	MW04	8/09/2022 12:35 PM	5	3.84	5.11	22092	0.35	5.1	22	32.9	
Darwin Turf Club	MW04	15/09/2022 12:00 AM	3.58	3.428	5.04	21326	0.35	5.1	93.7	33.3	
Darwin Turf Club	MW04	10/10/2022 11:45 AM	6	2.509	5.7	1171	21.1	33.2	144.1	33.2	
Darwin Turf Club	MW04	12/10/2022 11:40 AM	5	2.933	5.47	4661	0.98	11.4	152	33.3	
Darwin Turf Club	MW04	24/04/2023 12:57 PM	3.5	2.24	4.99	11539	0.71	10.4	131.8	34.2	
Darwin Turf Club	MW04	27/04/2023 09:53 AM	3.5	2.295	5.08	9910	0.33	4.7	143.5	33.6	
Darwin Turf Club	MW04	8/09/2023 12:39 PM	2.5	3.59	5.01			21.9	72.4	32.7	
Darwin Turf Club	MW04	12/09/2023 11:06 AM	2.5	3.26	5.01			16.7	149	32.4	
Darwin Turf Club	MW05	17/01/2020 01:50 PM	6.0	4.252	5.93	107.3	4.56	69.3	153.5	31.2	
Darwin Turf Club	MW05	23/04/2020 01:28 PM	2.5	4.151	5.59	95.1	5.92	81.7	205.4	32.5	-0.87
Darwin Turf Club	MW05	28/04/2020 01:14 PM	3.0	4.303	5.67	93.6	6.16	85.3	217.1	32.4	-1.31
Darwin Turf Club	MW05	4/08/2020 01:08 PM	1.50	4.177	6.28	77.4	7.11	95.7	262.4	31.0	2.26
Darwin Turf Club	MW05	16/09/2020 11:46 AM	2.0	4.219	6.04		96.8	6.95	116.9	33.1	1.27
Darwin Turf Club	MW05	8/09/2020 12:11 PM	3	4.323	5.96	112.0	89.1	6.80	171.0	32.3	4.86
Darwin Turf Club	MW05	20/04/2021 11:40 AM	2.5	4.404	4.89	230.5	3.76	51.8	241.4	32.3	1.96
Darwin Turf Club	MW05	28/04/2021 10:50 AM	2.5	4.076	5.66	99.4	5.91	80.7	212.6	31.8	0.67
Darwin Turf Club	MW05	7/09/2021 10:50 AM	1	5.212	6.61	96.6	5.87	78.4	161.2	30.6	
Darwin Turf Club	MW05	15/09/2021 10:55 AM	2		6.39	85.8	6.24	83.6	151.2	31.3	
Darwin Turf Club	MW05	20/04/2022 11:30 PM	1.5	3.556	5.58	145.2	5.48	74.8	147.6	32.1	
Darwin Turf Club	MW05	11/05/2022 02:00 PM	2	4.041	5.75	144.4	4.13	57.4	150.5	32.9	
Darwin Turf Club	MW05	8/09/2022 11:56 AM	2	3.706	5.89	79	7	91.7	192.1	29.4	
Darwin Turf Club	MW05	15/09/2022 12:00 AM	2	3.74	5.91	87.2	6.48	87.2	222.5	30.3	
Darwin Turf Club	MW05	10/10/2022 02:05 PM	4	4.391	5.85	101.1	31.4	81.4	181.2	31.4	
Darwin Turf Club	MW05	12/10/2022 10:22 AM	4	4.211	5.69	97.2	5.81	77.5	178.2	30.7	
Darwin Turf Club	MW05	24/04/2023 12:17 PM	2.5	4.485	3.81	903	3.12	43.1	294.6	32.5	
Darwin Turf Club	MW05	27/04/2023 12:02 AM	2.5	2.496	3.84	847	3.69	50.8	280.7	32.2	

Appendix G
Historical Field Data

Site	Well ID	Sampled Date/Time	Purge Vol L	Purge SWL m bTOC	pH Field pH Units	EC Field µS/cm	DO Field mg/L	DO Field %S	ORP Field mV	Temp Field °C	Turbidity Field NTU
Darwin Turf Club	MW06	17/01/2020 02:30 PM	6.0	3.510	5.05	232.2	4.28	60.0	221.5	32.5	
Darwin Turf Club	MW06	23/04/2020 09:33 AM	3.5	4.382	4.63	353.4	0.34	4.7	208.1	33.0	-0.6
Darwin Turf Club	MW06	28/04/2020 09:11 AM	2.5	4.423	4.69	290.9	0.33	4.6	201.9	32.4	1.56
Darwin Turf Club	MW06	4/08/2020 09:35 AM	1.75	5.763	4.61	109.8	0.42	5.9	283.1	31.7	11.02
Darwin Turf Club	MW06	8/09/2020 12:58 PM	2.5	5.745	4.35	107.9	7.79	0.57	245.1	33.5	7.94
Darwin Turf Club	MW06	20/04/2021 11:08 AM	4	4.410	4.90	355.0	0.52	7.4	215.5	31.6	1.87
Darwin Turf Club	MW06	28/04/2021 9:22 AM	3.0	4.547	4.97	338.3	0.13	1.8	219.9	31.2	2.10
Darwin Turf Club	MW06	7/09/2021 12:40 PM	1.2	6.07	5.6	111.3	1.51	20.8	195.5	32.4	
Darwin Turf Club	MW06	15/09/2021 9:40 AM	4	5.837	5.56		1.63	22.6	181.9	32.3	
Darwin Turf Club	MW06	20/04/2022 03:00 PM	1.5	4.145	5.33	343.8	2.66	36.5	195	32.4	
Darwin Turf Club	MW06	11/05/2022 02:25 PM	2.5	4.42	5.55	170.7	0.19	2.6	170.7	32.2	
Darwin Turf Club	MW06	8/09/2022 09:50 AM	4.5	5.175	4.67	290	1.41	19	208.6	31.4	
Darwin Turf Club	MW06	15/09/2022 11:15 AM	3.5	5.955	4.37	215.8	0.59	8.1	238.3	31.7	
Darwin Turf Club	MW06	10/10/2022 11:08 AM	5	4.811	4.73	316.1	2.83	38.8	250.2	31.1	
Darwin Turf Club	MW06	12/10/2022 09:50 AM	5	4.668	4.58	335	1.3	17.6	185.2	31.6	
Darwin Turf Club	MW06	24/04/2023 10:42 AM	4.5	4.315	4.68	874	0.67	9.2	236.4	32.4	
Darwin Turf Club	MW06	27/04/2023 08:11 AM	2.5	4.395	4.73	817	0.48	6.4	187.3	30.8	
Darwin Turf Club	MW06	11/09/2023 06:00 PM	5	4.36	4.4			25.3	196.3	31.2	
Darwin Turf Club	MW06	12/09/2023 09:15 AM	1	5.72	4.85			42.5	154.2	30.3	
Darwin Turf Club	MW07	23/04/2020 10:17 AM	2.5	2.932	4.24	176.4	2.32	31.3	236.0	31.1	-1.2
Darwin Turf Club	MW07	28/04/2020 09:53 AM	2.5	3.023	4.17	186.4	2.0	28.3	256.7	31.1	-2.97
Darwin Turf Club	MW07	4/08/2020 10:48 AM	3.0	4.264	4.81	1651	0.48	6.5	179.9	30.8	6.66
Darwin Turf Club	MW07	8/09/2020 01:43 PM	2.0	4.121	4.53	2599	1.30		179.0	32.5	35.96
Darwin Turf Club	MW07	16/09/2020 01:26 PM	2.0	4.263	4.07	1710	25.6	1.72		32.7	20.11
Darwin Turf Club	MW07	20/04/2021 10:32 AM	4.5	3.037	4.46	281.8	1.54	20.5	199.9	30.3	2.18
Darwin Turf Club	MW07	28/04/2021 10:10 AM	4.0	3.399	4.45	331.4	2.32	31.6	233.5	30.4	2.14
Darwin Turf Club	MW07	7/09/2021 9:40 AM	1.6	4.361	5.46	2261	0.89	11.9	210.5	30.2	
Darwin Turf Club	MW07	15/09/2021 8:30 AM	6.5	4.405	5.04	1925	1.52		216	31.1	
Darwin Turf Club	MW07	20/04/2022 11:30 AM	1.2	2.64	4.9	149.1	3.27	43.7	225.6	30.7	
Darwin Turf Club	MW07	11/05/2022 02:55 PM	2.5	3.007	5.11	127	2.13	28.7	198.3	31.1	
Darwin Turf Club	MW07	8/09/2022 11:09 AM	5	4.912	4.54	3118	0.18	2.4	140.3	30.7	
Darwin Turf Club	MW07	15/09/2022 10:20 AM	3.5	4.513	4.1	1639	30.5	2.07	296.7	30.5	
Darwin Turf Club	MW07	10/10/2022 11:08 AM	4.5	2.75	4.34	177.9	5.6	76	245.1	31.5	
Darwin Turf Club	MW07	12/10/2022 12:50 PM	5	2.737	4.39	206.1	5.37	72.5	244.9	31.3	
Darwin Turf Club	MW07	24/04/2023 11:33 AM	3.5	3.03	4.31	1074	1.02	13.5	182.1	30.6	
Darwin Turf Club	MW07	27/04/2023 01:22 PM	3	3.05	4.26	813	1.57	21.2	241.5	31.1	
Darwin Turf Club	MW07	8/09/2023 11:13 AM	3	4.42	4.84			21.9	100.7	31.1	
Darwin Turf Club	MW07	12/09/2023 10:00 AM	3	4.705	4.22			20.5	172.9	29.6	



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