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Project 71021.18
3 February 2023
R.002.Rev0
KDP:jl

Attention: Jason Lee

Email: Jason.lee@lionco.com

December 2022 Groundwater Monitoring
Tooheys Brewery
29 Nyrang Street, Lidcombe

1. Introduction

This letter report by Douglas Partners Pty Ltd (DP) provides the laboratory results and a brief discussion of the December 2022 round of Groundwater Monitoring at the Tooheys Brewery Site at 29 Nyrang Street, Lidcombe.

The objectives of the groundwater monitoring programme are to assess whether any groundwater contamination identified on site in 2006 is migrating off site and to address the conditions of approval for groundwater monitoring set by the NSW Department of Planning as part of the approval for the upgrade and continued operation of the site under Part 3A of the *Environmental Planning and Assessment Act 1979*. It is understood that no further rounds of monitoring were required as of 2014. However, Tooheys has requested continued monitoring until such time as their licencing conditions are changed. The ongoing monitoring frequency is therefore biannual with rounds completed in May and November of each year, as instructed by the client.

As stated in DP's report *First Round of 2011 Groundwater Monitoring, Tooheys Brewery - 29 Nyrang Street, Lidcombe,* 7 June 2011, ref: 71021.03, a Phase 1 contamination assessment was conducted by DP in 2006. The results of the soil sampling and analysis conducted by DP in November and December 2006 indicated elevated total recoverable hydrocarbon (TRH) concentrations in samples collected from boreholes adjacent to the fuel underground storage tanks (USTs) for the former boiler (the former boiler USTs). Elevated TRH and toluene concentrations were detected in groundwater samples collected from the well adjacent to the former boiler USTs (BH6C). Elevated concentrations of TRH were also detected in the groundwater samples collected from the well adjacent to the refuelling USTs (BH1).

Four additional groundwater wells were installed at the boundary of the site in order to determine whether the identified contamination was migrating off-site (DP report on *Field Investigation Phase 1 Contamination Assessment, 29 Nyrang Street, Lidcombe,* March 2007, ref: 44359). Further rounds of groundwater monitoring have been undertaken by DP as listed in Section 8.

2. Site Information

The brewery is located at 29 Nyrang Street, Lidcombe, within the Local Government Area of Cumberland City Council and comprises a roughly rectangular area of approximately 6.2 hectares (ha). The site is contained within Lot 110, DP 1141813. It is Zoned 4(a) Industrial Enterprise and is surrounded by industrial sites to the north, west and south and a residential area to the east.

Haslams Creek is located to the immediate west of the site and flows in approximately a northerly direction. To the north of the site the creek bends to the east and flows to the northeast and discharges into Homebush Bay located approximately 3.5 km downstream from the brewery. The portion of Haslams Creek adjacent to the brewery is a concrete lined stormwater channel.

The site is used for the production and storage of Tooheys' beer, which is transported and distributed by trucks to various outlets. The majority of the site is occupied by large warehouse structures and large fermentation, maturation and storage tanks/silos. A site drawing and borehole location plan are presented in Drawing 1, attached.

Six decommissioned USTs were located along the northern boundary of the utility building. The USTs are reported to have been emptied in the late 1990s when the boilers were converted to natural gas. It was reported by ARUP that in September 2008, Tooheys decommissioned the six former boiler USTs *in situ*, which involved removal of the residual water / fuel mix inside the tanks and foam filling.

A further three USTs were located on the north-eastern boundary of the site which were formerly used for the storage of petrol or diesel for on-site vehicle refuelling. A concrete plinth and awning structure indicated that a bowser was also located nearby. Monitoring Wells BH1 and BH2 are located to the east and west of the UST and petrol bowser respectively. It was reported that the former refuelling USTs were decommissioned *in situ* by being sand filled and capped in the 1990s.

DP prepared a remediation action plan (RAP) for the removal and validation of the above three USTs on the north-east boundary. The RAP was entitled *Remediation Action Plan, 29 Nyrang Street, Lidcombe,* October 2011, ref 71021.02 Revision 2. The subsequent remediation and validation for the underground petroleum storage system (UPSS) in this area was undertaken shortly after the completion of the second round of groundwater monitoring carried out on 21 October 2011. The procedure and results of the remediation and validation of the UPSS at the north-eastern boundary area were reported in, *UPSS Validation Assessment, Tooheys Brewery, 29 Nyrang Street, Lidcombe*, project reference 71021.04, dated February 2012. The successful validation was subject to a Site Audit undertaken by ENVIRON Australia Pty Ltd.

3. Groundwater Default Guideline Values

Groundwater default guideline values (DGV) have been sourced from the ANZG *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (2018) default guideline values for toxicants in fresh waters for the protection of 95% of species. It is noted that the groundwater investigation levels (GIL) for groundwater monitoring rounds prior to the August 2018 were sourced from the ANZECC *Australian and New Zealand Guidelines for Fresh and Marine Water Quality (*2000), trigger values for toxicants in fresh waters for the protection of 95% of species.

It is also noted that as of 29 August 2018, the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZG, 2018) revoked the documents listed below:

- The Australian Water Quality Guidelines for Fresh and Marine Waters (ANZECC, November 1992); and
- The Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC and ARMCANZ, October 2000).

Previously, in the absence of ANZECC (2000) criteria for TRH, the laboratory limits of reporting were adopted as the screening criteria as nominated for the auditor-approved RAP GILs. In order to be consistent with the adopted modified values and with the EPL, the laboratory limits of reporting for TRH have continued to be used as screening levels. It is noted also that the DGV values for TRH are more stringent to those adopted in earlier groundwater monitoring rounds (pre-November 2011).

The current adopted DGV are given in Table 1 for the contaminants of concern.

Table 1: Groundwater Default Guideline Values (DGV) and Rationale

Contaminant	Adopted Criteria (DGV) µg/L	Source
Metals Arsenic (V) Cadmium Chromium (III) Copper Lead Mercury Nickel Zinc	 13.0 2.4* (0.2) 33.1* (3.3) 1.4 121.1* (3.4) 0.6 120.2* (11) 87.4 (8)	ANZG (2018) Australian and New Zealand Guidelines for Fresh and Marine Water Quality for the protection of 95% of freshwater species. The threshold levels have been adjusted for extremely hard water (500 mg $CaCO_3$/L) in accordance with the guidelines which uses the algorithm available in ANZECC (2000).
TRH $C_6 – C_9$ $>C_9$ $>C_{10} – C_{16}$	 10 250 50	Screening DGV (at limit of reporting) - require further investigation if exceeded.

Contaminant	Adopted Criteria (DGV) µg/L	Source
BTEX		ANZG (2018) Australian Water Quality Guidelines for the protection of 95% of freshwater species.
Benzene	950	
Toluene	180	Reliability of DGV for toluene and ethylbenzene is unknown.
Ethylbenzene	80	
Xylene	625	DGV for xylene is the sum of m-xylene, o-xylene and p-xylene default guideline values.

* Hardness modified trigger value (default trigger level)

4. Groundwater Monitoring Methodology and Field Observations

4.1 Identification of Wells

The locations of the six existing wells labelled BH1, BH2, BH7, BH8, BH9 and BH10 along the western and northern boundaries of the site are presented in the attached Drawing 1.

4.2 Frequency of Sampling

The groundwater monitoring wells BH1, BH2, BH7, BH8, BH9 and BH10 are monitored on a bi-annual basis in May and November each year, until such time as the requirement for monitoring is terminated, in accordance with the environmental protection licence (EPL) pursuant to the site. The current round was undertaken in December instead of November due to illness resulting a delay in the fieldwork.

4.3 Well Development

Prior to collecting groundwater samples, each well was fully developed on 12 December 2022 using a submersible 12V pump in order to remove stagnant water and to provide good hydraulic connectivity to the local groundwater system. The exception was monitoring well BH7 that was developed with a peristaltic pump as the submersible 12V pump was unable to be lowered beyond a bend in the pipe. BH10 was developed on the morning of 13 December, as on 12 December the area was flooded, and the well could not be accessed.

Well development was achieved by the removal of a minimum of three well volumes of water or until the well was dry, whichever was the lesser. Monitoring wells BH7, BH9 and BH10 became dry during development. All wells were left to equilibrate to the groundwater over a one-day period.

4.4 Collection of Groundwater Samples

The collection of groundwater samples from each of the six monitoring wells was carried out in accordance with the methodology as set out in the DP *Field Procedures Manual*. Groundwater sampling was undertaken on 12 and 13 December 2022 by a DP Environmental Engineer using a low flow peristaltic pump. Samples were taken from near the middle of the screened section, being close to the middle of the water column. The sampling programme included 10% field replicates for QA / QC purposes. The replicate sample was identified as BD1 was also collected on 12 December 2022 from BH10. A trip spike and blank were also taken to site.

The samples were collected after stable readings were obtained for pH, conductivity, temperature and dissolved oxygen. Samples were carefully pumped into laboratory prepared sample containers including hydrochloric acid preserved BTEX vials. The groundwater samples collected for heavy metal testing were filtered in the field using a 45 µm filter. Completed field sheets are attached to this report. No phase separated hydrocarbons (PSH) were noted in the groundwater collected from any of the wells sampled in this monitoring round.

Sample containers were labelled and stored in the field and transported in an esky cooled with ice and later stored in a fridge at the office or laboratory. The samples were delivered to a NATA accredited laboratory, Envirolab Services (ELS), together with chain-of-custody records.

4.5 Quality Assurance and Quality Control (QA / QC)

QA / QC sampling and analysis included the analysis of one replicate sample and one trip blank and trip spike for each groundwater monitoring event in the monitoring programme.

An intra-laboratory replicate analysis was conducted as a check of the reproducibility of results and as a measure of consistency of sampling techniques.

The comparative results of analysis between original and intra-laboratory replicate sample are summarised in Table 2.

Table 2: RPD Results - Intra-laboratory Results (µg/L)

Well	Analyte	BH1	BD1	Difference	RPD (%)
Heavy Metals	As	2	2	0	0
	Cd	<0.1	<0.1	0	0
	Cr	<1	<1	0	0
	Cu	<1	<1	0	0
	Pb	<1	<1	0	0
	Hg	<0.05	<0.05	0	0
	Ni	4	3	1	29
	Zn	39	34	5	14
TRH	C6-C9	<10	<10	0	0
	C10-C36	<250	<250	0	0
	>C10-C16	<50	<50	0	0
Benzene		<1	<1	0	0
Toluene		<1	<1	0	0
Ethyl-Benzene		<1	<1	0	0
Total Xylene		<3	<3	0	0

The calculated RPDs were all within the acceptable range of ± 30 for inorganic analytes and ± 50% for organics. Therefore, the intra-laboratory replicate comparison indicates that the sampling technique was generally consistent and repeatable, and the laboratory sampling handling and analytical methods are comparable.

A trip spike and trip blank were also analysed. The trip spike recovery for BTEX was between 96% and 116% and the trip blank results for BTEX were below the laboratory level of reporting indicating that appropriate transport and handling techniques were adopted.

4.6 Laboratory Analysis

The groundwater samples (including QA / QC samples) were sent for the following analysis at a NATA accredited laboratory:

- Heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc); and
- TRH and BTEX.

Table 3 shows the analytical scheme for the groundwater samples.

Table 3: Analytical Scheme for Groundwater Samples

Sample ID	Heavy Metals	TRH	BTEX
BH1, 2, 7, 8, 9, 10	✓	✓	✓
BD1*	✓	✓	✓

* Blind duplicate sample of BH10

Following the receipt of the initial results a silica gel clean-up of the TRH test was ordered to further assess the detected TRH in BH10.

5. Results

5.1 Field Testing Results

Piezometric levels were measured prior to development and prior to sampling from the groundwater wells. The measured levels are summarised in Table 4. It is noted that groundwater levels are transient and change over time due to climatic, anthropogenic and other influences.

Table 4: Piezometric Levels

Monitoring Well	m AHD (surface)	Date			
		12/12/2022 (development)		13/12/2022 (sampling)	
		m bgl	m AHD	m bgl	m AHD
1	6.46	2.10	4.36	2.41	4.05
2	6.25	2.55	3.7	2.52	3.73
7	6.38	2.65	3.73	3.6	2.78
8	6.50	4.27	2.23	4.41	2.09
9	6.00	3.95	2.05	3.96	2.04
10*	5.12	0.84	4.28	4.3	0.82

Notes: m bgl metres below ground level
m AHD level in metres above Australian Height Datum
* Developed on 13 December 2022

The water level appeared to have recovered to the equilibrium level or close to the equilibrium level after development in each of the wells.

Groundwater samples were noted to be mostly clear. Samples were taken after stable readings were obtained for temperature, dissolved oxygen, conductivity, pH, and reduction potential as presented in Table 5.

At the time of well development on 12 December 2022 the location of borehole 10 was submerged as indicated in Figure 1. Therefore borehole 10 was developed on the morning of 13 December.

Figure 10: Borehole 10 on 12 December 2022

Table 5: Groundwater Readings Prior to Sampling

Monitoring Well	Temperature (ºC)	Dissolved Oxygen mg/L	Conductivity (µS/cm)	pH	Redox (mV)
1	20.5	0.66	3340	5.76	-2.7
2	20.4	7.56	1682	5.84	22.9
7	19.3	0.79	596	5.90	-16.3
8	20.4	0.60	19581	5.77	76.5
9	20.1	2.74	7534	5.90	80.4
10	21.6	5.08	89.5	6.77	-28.8

5.2 Analytical Results

The attached Tables 6 to 21 provide the results of previous groundwater testing for reference purposes. The laboratory results of the current groundwater samples plus the QA / QC results are summarised in the attached Table 22. The laboratory test results certificates and chain-of-custody information are also attached.

6. Discussion

Concentrations of TRH and BTEX were reported below the laboratory limits of reporting for all monitoring wells sampled during this round with the exception of trace TRH in sample BH10. The following TRH detections were noted:

- TRH C10-C14 - 78 µg/L;
- TRH C15-C28 - 570 µg/L;
- TRH C29-C36 - 610 µg/L;
- TRH >C10-C16- naphthalene - 100 µg/L;
- TRH >C16-C34 - 1000 µg/L; and
- TRH >C34-C40 - 580 µg/L.

These concentrations exceeded the detection limit and therefore warranted further consideration. Therefore, a silica-gel clean up was ordered to determine total petroleum hydrocarbon (TPH) which had the following results:

- TPH C10-C14 - <50 µg/L;
- TRH C15-C28 - 160 µg/L;
- TRH C29-C36 - 300 µg/L;
- TRH >C10-C16 - 59 µg/L;
- TRH >C16-C34 - 360 µg/L; and
- TRH >C34-C40 - 290 µg/L.

With respect to the TRH/TPH detected in Sample 10 the following is noted:

- The area above and surrounding BH10 was flooded on 12 December. The water level prior to development was 0.84 m bgl which is greater than the typical water level at this location of between 2 to 4 m bgl. The EC in BH10 was much lower than other locations also suggesting intrusion of (fresh) surface water compared to other locations which indicate moderately saline waters. This suggests that the well may have been (temporarily) impacted by surface waters / flooding;
- No BTEX or volatile TRH was detected at this location;

- The applicable NEPC National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013) NEPC (2013) criteria for a commercial / industrial site for F2 fraction TPH in NL (not limiting) suggesting that the detected TRH is not likely to result in a vapour intrusion risk within the site;
- The concentration of TPH upon silica gel clean-up was approximately half of that in the TRH results which indicates that the detected TRH was potentially a mix of organic compounds and petroleum based compounds; and
- Periodically, slightly elevated TRH detections have been observed at BH10.

Therefore, the TRH detection at BH10 is not considered to be significant or evidence of groundwater contamination from the former USTs and it more likely a transient surface water impact. However, if the well integrity has deteriorated it would be prudent to decommission and replace this monitoring well. If BH10 is replaced it would also be worth considering decommissioning and replacing BH7 which has a bend in the midpoint.

Concentrations of heavy metals were reported either below their respective laboratory limits of reporting or DGV for all monitoring wells sampled during this round of sampling with the following exceptions:

- Cadmium in sample 8 (2.5 µg/L) which exceeded the DGV of 2.4 µg/L;
- Copper in samples 2 (4 µg/L), 7 (4 µg/L) and 8 (3 µg/L) which exceeded the DGV of 1.4 µg/L; and
- Zinc in sample 2 (340 µg/L) which exceeded the DGV of 87.4 µg/L of zinc in Monitoring Well 9 (89 µg/L) and copper in all locations except BH8 (2 to 35 µg/L).

Low levels of heavy metals have periodically been detected in groundwater and in that regard the results from the current round of testing are consistent with the previous rounds of testing at the site.

Elevated heavy metals are also typical of diffuse urban pollution and generally cannot be attributed to any specific on or off-site source.

7. Conclusion

Based on the current round of groundwater monitoring at the site, the laboratory results indicate that the groundwater is not significantly impacted by petroleum hydrocarbon contamination at the monitored locations.

The results are generally consistent with the previous monitoring rounds. Based on the current results, it is considered that the concentration of TRH in groundwater is not increasing.

Due to age of the wells and potential surface water intrusion at BH10 which may have impacted on the it may be prudent to decommission this well and replace it with a new monitoring well. Similarly, it may be prudent to decommission and replace BH7 which has a bend in the pipe which limits the equipment which can be used to develop and sample this location.

8. List of Previous Reports

The previous groundwater reports are listed below:

- Groundwater Monitoring Report, 29 Nyrang Street, Lidcombe, January 2010, ref: 71021.00;
- Groundwater Monitoring Report, 29 Nyrang Street, Lidcombe, January 2011 ref: 71021.01;
- First Round of Groundwater Monitoring Tooheys Brewery - 29 Nyrang Street, Lidcombe, June 2011 ref: 71021.03;
- Second Round of Groundwater Monitoring Tooheys Brewery - 29 Nyrang Street, Lidcombe, November 2011 ref: 71021.03;
- First Round of Groundwater Monitoring Tooheys Brewery - 29 Nyrang Street, Lidcombe, June 2012 ref: 71021.06;
- Second Round of Groundwater Monitoring Tooheys Brewery - 29 Nyrang Street, Lidcombe, October 2012 ref: 71021.06;
- First Round of Groundwater Monitoring Tooheys Brewery - 29 Nyrang Street, Lidcombe, May 2013 ref: 71021.07;
- Second Round of Groundwater Monitoring Tooheys Brewery - 29 Nyrang Street, Lidcombe, November 2013 ref: 71021.07;
- 2014 Groundwater Monitoring Tooheys Brewery - 29 Nyrang Street, Lidcombe, July 2014 ref: 71021.08;
- 2015 Groundwater Monitoring Tooheys Brewery - 29 Nyrang Street, Lidcombe, December 2015 ref: 71021.10;
- January 2016 Groundwater Monitoring Tooheys Brewery - 29 Nyrang Street, Lidcombe, February 2016 ref: 71021.10;
- January / February 2017 Groundwater Monitoring Tooheys Brewery - 29 Nyrang Street, Lidcombe, 6 March 2017 ref: 71021.11.R.001.Rev0;
- March 2017 Groundwater Monitoring Tooheys Brewery - 29 Nyrang Street, Lidcombe, 13 April 2017 ref: 71021.11.R.002.Rev;
- August 2017 Groundwater Monitoring Tooheys Brewery - 29 Nyrang Street, Lidcombe, 15 September 2017 ref: 71021.12.R001.Rev0;
- November 2017 Groundwater Monitoring, Tooheys Brewery - 29 Nyrang Street, Lidcombe, 1 December 2017 ref: 71021.12.R.002.Rev0;
- August 2018 Groundwater Monitoring Tooheys Brewery - 29 Nyrang Street, Lidcombe, 12 September 2018 ref: 71021.13.R.001.Rev0;
- Groundwater Monitoring - November 2018, 29 Nyrang Street, Lidcombe, 12 December 2018 ref: 71021.13.R.002.Rev0;
- August / September 2019 Groundwater Monitoring Round, 29 Nyrang Street, Lidcombe, 1 November 2019 ref: 71021.14.R.001.Rev0;

- November 2019 Groundwater Monitoring, Tooheys Brewery - 29 Nyrang Street, Lidcombe, 11 December 2019 ref: 71021.14.R.002.Rev0;
- May 2020 Groundwater Monitoring, Tooheys Brewery - 29 Nyrang Street, Lidcombe, 3 June 2020 ref: 71021.15.R.001.Rev0;
- November 2020 Groundwater Monitoring, Tooheys Brewery - 29 Nyrang Street, Lidcombe, November 2020 ref: 71021.15.R.002.Rev0;
- May 2021 Groundwater Monitoring, Tooheys Brewery - 29 Nyrang Street, Lidcombe, May 2021 ref: 71021.16.R.001.Rev0; and
- November 2021 Groundwater Monitoring, Tooheys Brewery - 29 Nyrang Street, Lidcombe, November 2021 ref: 71021.16.R.002.Rev0.
- May 2022 Groundwater Monitoring, Tooheys Brewery - 29 Nyrang Street, Lidcombe, November 2021 ref: 71021.18.R.001.Rev0.

9. Limitations

Douglas Partners Pty Ltd (DP) has prepared this report for this project at 29 Nyrang Street, Lidcombe in accordance with DP's proposal (71028.18.P.001.rev0) dated 10 May 2022 and acceptance received from Mr Jason Lee of Tooheys Pty Ltd. The work was carried out under DP's Conditions of Engagement. This report is provided for the exclusive use of Tooheys Pty Ltd for this project only and for the purposes as described in the report. It should not be used by or relied upon for other projects or purposes on the same or other site or by a third party. Any party so relying upon this report beyond its exclusive use and purpose as stated above, and without the express written consent of DP, does so entirely at its own risk and without recourse to DP for any loss or damage. In preparing this report DP has necessarily relied upon information provided by the client and/or their agents.

The results provided in the report are indicative of the sub-surface conditions on the site only at the specific sampling and / or testing locations, and then only to the depths investigated and at the time the work was carried out. Sub-surface conditions can change abruptly due to variable geological processes and also as a result of human influences. Such changes may occur after DP's field testing has been completed.

DP's advice is based upon the conditions encountered during this investigation. The accuracy of the advice provided by DP in this report may be affected by undetected variations in ground conditions across the site between and beyond the sampling and / or testing locations. The advice may also be limited by budget constraints imposed by others or by site accessibility.

This report must be read in conjunction with all of the attached and should be kept in its entirety without separation of individual pages or sections. DP cannot be held responsible for interpretations or conclusions made by others unless they are supported by an expressed statement, interpretation, outcome or conclusion stated in this report.

This report, or sections from this report, should not be used as part of a specification for a project, without review and agreement by DP. This is because this report has been written as advice and opinion rather than instructions for construction.

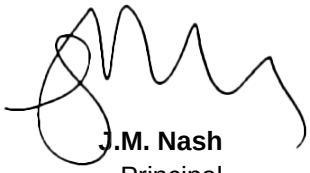
The contents of this report do not constitute formal design components such as are required, by the Health and Safety Legislation and Regulations, to be included in a Safety Report specifying the hazards likely to be encountered during construction and the controls required to mitigate risk. This design process requires risk assessment to be undertaken, with such assessment being dependent upon factors relating to likelihood of occurrence and consequences of damage to property and to life. This, in turn, requires project data and analysis presently beyond the knowledge and project role respectively of DP. DP may be able, however, to assist the client in carrying out a risk assessment of potential hazards contained in the Comments section of this report, as an extension to the current scope of works, if so requested, and provided that suitable additional information is made available to DP. Any such risk assessment would, however, be necessarily restricted to the groundwater components set out in this report and to their application by the project designers to project design, construction, maintenance and demolition.

Please contact the undersigned if you have any questions on this matter.

Yours faithfully
Douglas Partners Pty Ltd

Kurt Plambeck
Senior Associate

Reviewed by



J.M. Nash
Principal

Attachments:
About this Report
Drawing 1
Field Notes
Results of Laboratory Analysis, Tables 6-22
Laboratory Certificate of Analysis, Sample Receipt Advice and Chain of Custody Documentation

About this Report

Douglas Partners

Introduction

These notes have been provided to amplify DP's report in regard to classification methods, field procedures and the comments section. Not all are necessarily relevant to all reports.

DP's reports are based on information gained from limited subsurface excavations and sampling, supplemented by knowledge of local geology and experience. For this reason, they must be regarded as interpretive rather than factual documents, limited to some extent by the scope of information on which they rely.

Copyright

Borehole and Test Pit Logs

The borehole and test pit logs presented in this report are an engineering and/or geological interpretation of the subsurface conditions, and their reliability will depend to some extent on frequency of sampling and the method of drilling or excavation. Ideally, continuous undisturbed sampling or core drilling will provide the most reliable assessment, but this is not always practicable or possible to justify on economic grounds. In any case the boreholes and test pits represent only a very small sample of the total subsurface profile.

Interpretation of the information and its application to design and construction should therefore take into account the spacing of boreholes or pits, the frequency of sampling, and the possibility of other than 'straight line' variations between the test locations.

Groundwater

Where groundwater levels are measured in boreholes there are several potential problems, namely:

- In low permeability soils groundwater may enter the hole very slowly or perhaps not at all during the time the hole is left open;
- A localised, perched water table may lead to an erroneous indication of the true water table;
- Water table levels will vary from time to time with seasons or recent weather changes. They may not be the same at the time of construction as are indicated in the report; and
- The use of water or mud as a drilling fluid will mask any groundwater inflow. Water has to be blown out of the hole and drilling mud must first be washed out of the hole if water measurements are to be made.

More reliable measurements can be made by installing standpipes which are read at intervals over several days, or perhaps weeks for low permeability soils. Piezometers, sealed in a particular stratum, may be advisable in low permeability soils or where there may be interference from a perched water table.

Reports

The report has been prepared by qualified personnel, is based on the information obtained from field and laboratory testing, and has been undertaken to current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal, the information and interpretation may not be relevant if the design proposal is changed. If this happens, DP will be pleased to review the report and the sufficiency of the investigation work.

Every care is taken with the report as it relates to interpretation of subsurface conditions, discussion of geotechnical and environmental aspects, and recommendations or suggestions for design and construction. However, DP cannot always anticipate or assume responsibility for:

- Unexpected variations in ground conditions. The potential for this will depend partly on borehole or pit spacing and sampling frequency;
- Changes in policy or interpretations of policy by statutory authorities; or
- The actions of contractors responding to commercial pressures.

If these occur, DP will be pleased to assist with investigations or advice to resolve the matter.

About this Report

Site Anomalies

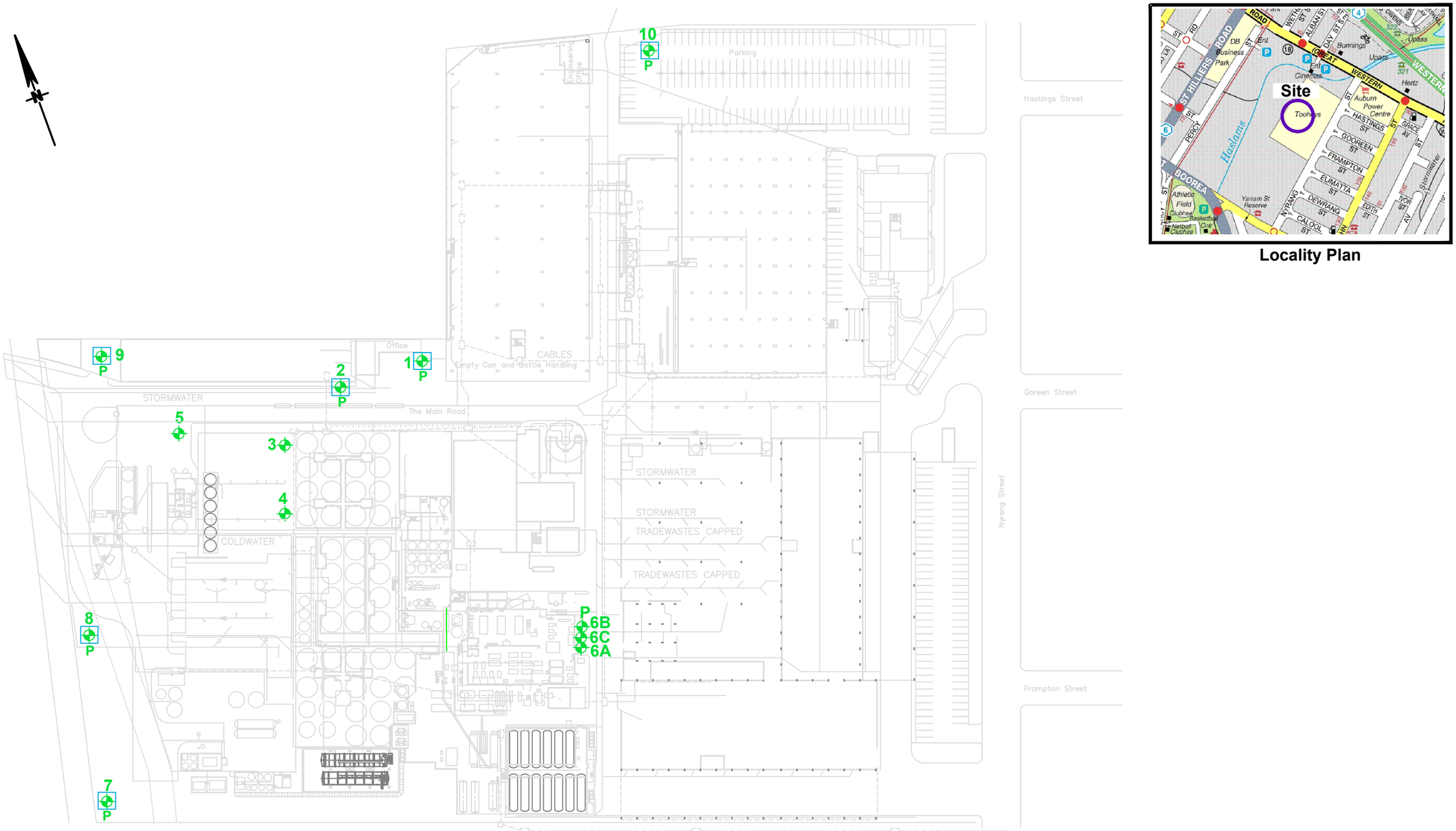
In the event that conditions encountered on site during construction appear to vary from those which were expected from the information contained in the report, DP requests that it be immediately notified. Most problems are much more readily resolved when conditions are exposed rather than at some later stage, well after the event.

Information for Contractual Purposes

Where information obtained from this report is provided for tendering purposes, it is recommended that all information, including the written report and discussion, be made available. In circumstances where the discussion or comments section is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. DP would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

Site Inspection

The company will always be pleased to provide engineering inspection services for geotechnical and environmental aspects of work to which this report is related. This could range from a site visit to confirm that conditions exposed are as expected, to full time engineering presence on site.



Locality Plan

LEGEND

- Test Bore Location
- P Piezometer
- Monitoring Well

SCALE
0 50 100m
1:1500

Douglas Partners
Geotechnics • Environment • Groundwater

CLIENT: Tooheys Pty Ltd		
DRAWN BY: PSCH	SCALE: As shown	OFFICE: Sydney
APPROVED BY:		DATE: 5.12.2019

TITLE: **Location of Monitoring Wells**
Groundwater Monitoring
29 Nyrang Street, LIDCOMBE

PROJECT No:	71021.17
DRAWING No:	1
REVISION:	0

Douglas Partners
Geotechnics / Environment / Groundwater

Groundwater Field Sheet

Project and Bore Installation Details			
Bore / Standpipe ID:	**BH1**		
Project Name:	Tooheys May 2022 Monitoring		
Project Number:	71021.18		
Site Location:	29 Nyrnag Street, Lidcombe		
Bore RL	6.5 m AHD		
Bore Easting:		Northing:	
Installation Date:	24-Oct-16		
GW Level (during drilling):		m bgl	
Well Depth:	14.2	m bgl	
Screened Interval:	2.0-14.2	m bgl	
Contaminants/Comments:			
Bore Development Details			
Date/Time:	12/12/22, 1100		
Purged By:	HD		
GW Level (pre-purge):	2.10	m bgl	
GW Level (post-purge):	2.64	m bgl	
PSH observed:	Yes / (No) (interface/visual). ? mm thick		
Observed Well Depth:	14.30	m bgl	
Estimated Bore Volume:		L	
Total Volume Purged:	~150	L	
Equipment:	12 Volt pump		
Micropurge and Sampling Details			
Date/Time:	13/12/22, 0800		
Sampled By:	HD		
Weather Conditions:	Sunny, 17°C		
GW Level (pre-purge):	2.41	m bgl	
GW Level (post sample):	2.42	m bgl	
PSH observed:	Yes / (No) (interface/visual). ? mm thick		
Observed Well Depth:	14.27	m bgl	
Estimated Bore Volume:		L	
Total Volume Purged:	~2	L	
Equipment:	peristaltic pump and ~~TPS multimeter~~ YSI		

Water Quality Parameters

Time / Volume	Temp (°C)	DO (mg/L)	EC (µS or mS/cm)	pH	Turbidity	Redox (mV)
Stabilisation Criteria (3 readings)	***0.1° C***	**+/- 0.3 mg/L**	**+/- 3%**	**+/- 0.1**	**+/- 10%**	**+/- 10 mV**
0	20.3	1.51	3501	5.71	72.53	4.8
1	20.4	1.01	3412	5.75	65.13	1.2
2	20.4	0.79	3353	5.76	63.72	-1.6
3	20.5	0.66	3340	5.76	65.36	-2.7
Additional Readings Following stabilisation:	DO % Sat	SPC mS/cm	TDS mg/L			
	6.7	3644	2365			

Sample Details

Sampling Depth (rationale):	8 m bgl, mid water column
Sample Appearance (e.g. colour, siltiness, odour):	clear, no odour.
Sample ID:	BH1
QA/QC Samples:	BD1
Sampling Containers and filtration:	500mL glass, 2x 40mL glass vials (HCl) , 1x 100mL plastic (HNO3 (filtered)
Comments / Observations:	-

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Groundwater Field Sheet

Project and Bore Installation Details	
Bore / Standpipe ID:	**BH2**
Project Name:	Tooheys May 2022 Monitoring
Project Number:	71021.18
Site Location:	29 Nyrnag Street, Lidcombe
Bore RL	6.2 m AHD
Bore Easting:	Northing:
Installation Date:	20-Oct-16
GW Level (during drilling):	m bgl
Well Depth:	14.5 m bgl
Screened Interval:	2.0-14.5 m bgl
Contaminants/Comments:	Heavy rain during development on 12/12/22
Bore Development Details	
Date/Time:	12/12/22, 1030
Purged By:	HD
GW Level (pre-purge):	2.55 m bgl
GW Level (post-purge):	0.00 m bgl (submerged by rainwater)
PSH observed:	Yes / (No) (interface/visual). ? mm thick
Observed Well Depth:	14.15 m bgl
Estimated Bore Volume:	L
Total Volume Purged:	~150 L
Equipment:	12 Volt pump
Micropurge and Sampling Details	
Date/Time:	13/12/22, 0830
Sampled By:	~~Lisa Teng~~ HD
Weather Conditions:	Sunny, 19°C
GW Level (pre-purge):	2.52 m bgl
GW Level (post sample):	2.60 m bgl
PSH observed:	Yes / (No) (interface/visual). ? mm thick
Observed Well Depth:	14.15 m bgl
Estimated Bore Volume:	L
Total Volume Purged:	~2 L
Equipment:	peristaltic pump and ~~TPS multimeter~~ YSI

Water Quality Parameters

Time / Volume	Temp (°C)	DO (mg/L)	EC (µS or mS/cm)	pH	Turbidity	Redox (mV)
Stabilisation Criteria (3 readings)	**0.1° C**	**+/- 0.3 mg/L**	**+/- 3%**	**+/- 0.1**	**+/- 10%**	**+/- 10 mV**
0	20.4	7.71	1442	6.02	249.02	11.7
1	20.4	7.65	1535	5.91	402.77	16.1
2	20.4	7.59	1595	5.87	304.81	19.1
3	20.4	7.56	1682	5.84	153.09	22.9
Additional Readings Following stabilisation:	DO % Sat	SPC µs/cm	TDS mg/L			
	84.1	1971	1321			

Sample Details

Sampling Depth (rationale):	8 m bgl, mid water column
Sample Appearance (e.g. colour, siltiness, odour):	clear, no odour.
Sample ID:	BH2
QA/QC Samples:	-
Sampling Containers and filtration:	500mL glass, 2x 40mL glass vials (HCl) , 1x 100mL plastic (HNO3 (filtered)
Comments / Observations:	-

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Groundwater Field Sheet

Project and Bore Installation Details			
Bore / Standpipe ID:	**BH7**		
Project Name:	Tooheys May 2022 Monitoring		
Project Number:	71021.18		
Site Location:	29 Nyrnag Street, Lidcombe		
Bore RL	6.4 m AHD		
Bore Easting:		Northing:	
Installation Date:	7-Dec-16		
GW Level (during drilling):	m bgl		
Well Depth:	6.5 m bgl		
Screened Interval:	1.5-6.5 m bgl		
Contaminants/Comments:	Bend in pipe - development requires peristaltic pump		
Bore Development Details			
Date/Time:	12/12/22, 0900		
Purged By:	HD		
GW Level (pre-purge):	2.85 m bgl		
GW Level (post-purge):	5.40 m bgl		
PSH observed:	Yes / (No) (interface/visual). ? mm thick		
Observed Well Depth:	5.43 m bgl		
Estimated Bore Volume:	L		
Total Volume Purged:	~15 L (dry)		
Equipment:	~~12 Volt pump~~ Peri pump		
Micropurge and Sampling Details			
Date/Time:	13/12/22, 1000		
Sampled By:	~~Lisa Teng~~ HD		
Weather Conditions:	Sunny, 21°C		
GW Level (pre-purge):	3.16 m bgl		
GW Level (post sample):	3.79 m bgl		
PSH observed:	Yes / (No) (interface/visual). ? mm thick		
Observed Well Depth:	5.48 m bgl		
Estimated Bore Volume:	L		
Total Volume Purged:	~2 L		
Equipment:	peristaltic pump and ~~TPS multimeter~~ YSI.		

Water Quality Parameters

Time / Volume	Temp (°C)	DO (mg/L)	EC (µS or mS/cm)	pH	Turbidity	Redox (mV)
Stabilisation Criteria (3 readings)	***0.1° C***	**+/- 0.3 mg/L**	**+/- 3%**	**+/- 0.1**	**+/- 10%**	**+/- 10 mV**
0	19.1	1.64	766	6.03	32.18	-31.5
1	19.0	1.17	630	6.03	26.04	-28.2
2	19.0	0.87	597	5.99	18.97	-17.1
3	19.3	0.79	596	5.90	20.01	-15.3
Additional Readings Following stabilisation:	DO % Sat	SPC µs/cm	TDS mg/L			
	7.1	622	403			

Sample Details

Sampling Depth (rationale):	4 m bgl, mid water column.
Sample Appearance (e.g. colour, siltiness, odour):	clear, no odour.
Sample ID:	BH7
QA/QC Samples:	-
Sampling Containers and filtration:	500mL glass, 2x 40mL glass vials (HCl) , 1x 100mL plastic (HNO3 (filtered)
Comments / Observations:	-

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Groundwater Field Sheet

Project and Bore Installation Details			
Bore / Standpipe ID:	**BH8**		
Project Name:	Tooheys May 2022 Monitoring		
Project Number:	71021.18		
Site Location:	29 Nyrnag Street, Lidcombe		
Bore RL	6.5 m AHD		
Bore Easting:		Northing:	
Installation Date:	7-Dec-06		
GW Level (during drilling):		m bgl	
Well Depth:	8.25	m bgl	
Screened Interval:	2.0-8.25	m bgl	
Contaminants/Comments:			
Bore Development Details			
Date/Time:	12/12/22, 0930		
Purged By:	HD		
GW Level (pre-purge):	4.27	m bgl	
GW Level (post-purge):	5.70	m bgl	
PSH observed:	Yes / (No) (interface/visual). ? mm thick		
Observed Well Depth:	8.24	m bgl	
Estimated Bore Volume:		L	
Total Volume Purged:	~80	L	
Equipment:	12 Volt pump		
Micropurge and Sampling Details			
Date/Time:	13/12/22, 0930		
Sampled By:	~~Lisa Teng~~ HD		
Weather Conditions:	Sunny, 21°C		
GW Level (pre-purge):	4.49	m bgl	
GW Level (post sample):	4.49	m bgl	
PSH observed:	Yes / (No) (interface/visual). ? mm thick		
Observed Well Depth:	8.24	m bgl	
Estimated Bore Volume:		L	
Total Volume Purged:	~1	L	
Equipment:	peristaltic pump and ~~TPS multimeter~~ YSI		

Water Quality Parameters

Time / Volume	Temp (°C)	DO (mg/L)	EC (µS or mS/cm)	pH	Turbidity	Redox (mV)
Stabilisation Criteria (3 readings)	***0.1° C***	**+/- 0.3 mg/L**	**+/- 3%**	**+/- 0.1**	**+/- 10%**	**+/- 10 mV**
0	20.9	2.33	19290	5.77	46.83	79.0
1	20.5	1.20	19502	5.77	40.77	78.2
2	20.4	0.79	19546	5.77	34.37	77.5
3	20.4	0.60	19581	5.77	31.55	76.5
Additional Readings Following stabilisation:	DO % Sat	SPC µS/cm	TDS mg/L			
	6.7	21480	13964			

Sample Details

Sampling Depth (rationale):	6 m bgl, mid water column.
Sample Appearance (e.g. colour, siltiness, odour):	clear, no odour.
Sample ID:	BH8
QA/QC Samples:	-
Sampling Containers and filtration:	500mL glass, 2x 40mL glass vials (HCl) , 1x 100mL plastic (HNO3 (filtered)
Comments / Observations:	-

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Groundwater Field Sheet

Project and Bore Installation Details			
Bore / Standpipe ID:	**BH9**		
Project Name:	Tooheys May 2022 Monitoring		
Project Number:	71021.18		
Site Location:	29 Nyrnag Street, Lidcombe		
Bore RL	6.0 m AHD		
Bore Easting:		Northing:	
Installation Date:	7 December 20016		
GW Level (during drilling):	m bgl		
Well Depth:	6.5 m bgl		
Screened Interval:	1.5-6.5 m bgl		
Contaminants/Comments:			
Bore Development Details			
Date/Time:	12/12/22, 1000		
Purged By:	HD		
GW Level (pre-purge):	5.95 m bgl		
GW Level (post-purge):	6.20 m bgl		
PSH observed:	Yes / No (interface/visual). ? mm thick		
Observed Well Depth:	6.63 m bgl		
Estimated Bore Volume:	L		
Total Volume Purged:	~50 L		
Equipment:	12 Volt pump		
Micropurge and Sampling Details			
Date/Time:	13/12/22, 0900		
Sampled By:	~~Lisa Teng~~ HD		
Weather Conditions:	Sunny, 20°C		
GW Level (pre-purge):	3.96 m bgl		
GW Level (post sample):	3.97 m bgl		
PSH observed:	Yes / No (interface/visual). ? mm thick		
Observed Well Depth:	6.63 m bgl		
Estimated Bore Volume:	L		
Total Volume Purged:	~2 L		
Equipment:	peristaltic pump and ~~TPS multimeter~~ YSI		

Water Quality Parameters

Time / Volume	Temp (°C)	DO (mg/L)	EC (µS or mS/cm)	pH	Turbidity	Redox (mV)
Stabilisation Criteria (3 readings)	***0.1° C***	**+/- 0.3 mg/L**	**+/- 3%**	**+/- 0.1**	**+/- 10%**	**+/- 10 mV**
0	20.4	4.61	8099	5.91	190.52	99.9
1	20.2	3.08	7141	5.86	316.56	86.2
2	20.2	2.77	7331	5.88	402.78	81.8
3	20.1	2.74	7534	5.90	370.29	80.4
Additional Readings Following stabilisation:	DO % Sat	SPC µS/cm	TDS mg/L			
	31.2	8784	6127			

Sample Details

Sampling Depth (rationale):	5 m bgl, mid water column
Sample Appearance (e.g. colour, siltiness, odour):	clear, no odours.
Sample ID:	BH9
QA/QC Samples:	-
Sampling Containers and filtration:	500mL glass, 2x 40mL glass vials (HCl) , 1x 100mL plastic (HNO3 (filtered)
Comments / Observations:	-

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Groundwater Field Sheet

Project and Bore Installation Details	
Bore / Standpipe ID:	**BH10**
Project Name:	Tooheys May 2022 Monitoring
Project Number:	71021.18
Site Location:	29 Nyrnag Street, Lidcombe
Bore RL	5.1 m AHD
Bore Easting:	Northing:
Installation Date:	7-Dec-06
GW Level (during drilling):	m bgl
Well Depth:	5 m bgl
Screened Interval:	1.5-5.0 m bgl
Contaminants/Comments:	Area flooded on 12/12/22, developed on 13/12/22
Bore Development Details	
Date/Time:	13/12/22, 0715
Purged By:	HD
GW Level (pre-purge):	0.84 m bgl
GW Level (post-purge):	4.96 m bgl
PSH observed:	Yes / No (interface/visual). ? mm thick
Observed Well Depth:	5.11 m bgl
Estimated Bore Volume:	L
Total Volume Purged:	~20 L, (dry)
Equipment:	~~12 Volt pump~~ bailer
Micropurge and Sampling Details	
Date/Time:	13/12/22, 1050
Sampled By:	~~Lisa Teng~~ HD
Weather Conditions:	Sunny, 22°C
GW Level (pre-purge):	4.30 m bgl
GW Level (post sample):	4.36 m bgl
PSH observed:	Yes / No (interface/visual). ? mm thick
Observed Well Depth:	5.11 m bgl
Estimated Bore Volume:	L
Total Volume Purged:	~1 L, after samples.
Equipment:	peristaltic pump and ~~TPS multimeter~~ YSI

Water Quality Parameters

Time / Volume	Temp (°C)	DO (mg/L)	EC (µS or mS/cm)	pH	Turbidity	Redox (mV)
Stabilisation Criteria (3 readings)	***0.1° C***	**+/- 0.3 mg/L**	**+/- 3%**	**+/- 0.1**	**+/- 10%**	**+/- 10 mV**
0	21.6	5.14	121.2	6.73	323.18	-9.4
1	21.6	5.11	74.0	6.76	327.09	-14.8
2	21.7	5.06	60.4	6.77	302.11	-23.3
3	21.6	5.08	59.3	6.77	297.01	-26.8
Additional Readings Following stabilisation:	DO % Sat	SPC µS/cm	TDS mg/L			
	56.9	71.0	45			

Sample Details

Sampling Depth (rationale):	~4.75 m bgl, mid water column.
Sample Appearance (e.g. colour, siltiness, odour):	Grey, silty, no odours.
Sample ID:	BH10
QA/QC Samples:	-
Sampling Containers and filtration:	500mL glass, 2x 40mL glass vials (HCl) , 1x 100mL plastic (HNO3 (filtered)
Comments / Observations:	Parameters taken after samples.

Table 6: Results of Laboratory Analysis in July 2014 (µg/L)

Well	Hardness	Heavy Metals[1]								TRH		Benzene	Toluene	Ethyl-benzene	Total Xylene
	(mg $CaCO_3$ /L)	As	Cd	Cr[3]	Cu	Pb	Hg	Ni	Zn	C_6-C_9	C_{10}-C_{36}				
1	130	<1	<0.1	<1	1	<1	<0.05	4	82	<10	<250	<1	<1	<1	<3
[2]BD1/ 180714		<1	<0.1	<1	<1	<1	<0.05	3	74	<10	<250	<1	<1	<1	<3
2	890	<1	0.2	<1	4	<1	<0.05	9	110	<10	<250	<1	<1	<1	<3
7	100	<1	<0.1	<1	3	<1	<0.05	6	28	<10	<250	<1	<1	<1	<3
8	1900	<1	0.2	<1	3	<1	<0.05	4	18	<10	<250	<1	<1	<1	<3
9	350	<1	<0.1	<1	1	<1	<0.05	2	18	<10	<250	<1	<1	<1	<3
10	380	<1	<0.1	<1	4	<1	<0.05	6	24	<10	<250	<1	<1	<1	<3
TS	-	-	-	-	-	-	-	-	-	-	-	101%	104%	102%	105%[4]
TB	-	-	-	-	-	-	-	-	-	-	-	<1	<1	<1	<3
DGV[1]		13	2.4[2]	33.1[2]	1.4[1]	121.1[2]	0.6	120.2[2]	87.4[2]	10	250	950	180	80	550

Notes:

1 DGV from the default guideline values provided in the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG, August 2018)

2 Heavy metal thresholds are adjusted for a hardness of 500 mg/L per ANZECC 2000

3 Field replicate of sample listed immediately above

4 All chromium are assumed to exist in the stable Cr (III) oxidation state, as Cr (VI) will be too reactive and unstable under the normal environment.

5 m+p+o xylene

bold exceeds DGV

Table 7: Results of Laboratory Analysis in October 2015 (µg/L)

Well	Hardness (mg $CaCO_3$ /L)	Heavy Metals[1]								TRH		Benzene	Toluene	Ethyl-benzene	Total Xylene
		As	Cd	Cr[3]	Cu	Pb	Hg	Ni	Zn	C_6-C_9	C_{10}-C_{36}				
1	670	2	<0.1	<1	4	<1	<0.05	7	55	<10	<250	<1	<1	<1	<3
[2]BD1/ 301015		2	<0.1	<1	<1	<1	<0.05	1	19	<10	<250	<1	<1	<1	<3
2	1000	<1	0.2	<1	2	<1	<0.05	10	50	<10	<250	<1	<1	<1	<3
7	180	3	<0.1	<1	<1	<1	<0.05	6	14	<10	<250	<1	<1	<1	<3
8	2300	<1	0.7	<1	4	<1	<0.05	4	17	<10	<250	<1	<1	<1	<3
9	420	<1	<0.1	<1	2	<1	<0.05	7	36	<10	<250	<1	<1	<1	<3
10	160	5	<0.1	<1	<1	<1	<0.05	9	8	<10	520	<1	<1	<1	<3
TS	-	-	-	-	-	-	-	-	-	-	-	81%	92%	98%	104%[4]
TB	-	-	-	-	-	-	-	-	-	<10	-	<1	<1	<1	<3
DGV[1]		13	2.4[2]	33.1[2]	1.4[1]	121.1[2]	0.6	120.2[2]	87.4[2]	10	250	950	180	80	550

Notes:

1 DGV from the default guideline values provided in the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG, August 2018)

2 Heavy metal thresholds are adjusted for a hardness of 500 mg/L per ANZECC 2000

3 Field replicate of sample listed immediately above

4 All chromium are assumed to exist in the stable Cr (III) oxidation state, as Cr (VI) will be too reactive and unstable under the normal environment.

5 m+p+o xylene

bold exceeds DGV

Table 8: Results of Laboratory Analysis in January 2016 (µg/L)

Well	Hardness (mg $CaCO_3$ /L)	Heavy Metals[1]								TRH			Benzene	Toluene	Ethyl-benzene	Total Xylene
		As	Cd	Cr[3]	Cu	Pb	Hg	Ni	Zn	C_6-C_9	C_{10}-C_{36}	>C_{10}-C_{16}				
1	360	3	<0.1	<1	<1	<1	<0.05	<1	12	<10	<250	66	<1	<1	<1	<3
[2]BD1/ 180714		2	<0.1	<1	<1	<1	<0.05	<1	15	<10	<250	79	<1	<1	<1	<3
2	720	<1	0.2	<1	3	<1	<0.05	14	120	<10	<250	<50	<1	<1	<1	<3
7	110	3	<0.1	<1	<1	<1	<0.05	8	13	<10	<250	<50	<1	<1	<1	<3
8	1900	<1	0.3	<1	4	<1	<0.05	4	18	<10	<250	<50	<1	<1	<1	<3
9	480	<1	<0.1	<1	2	<1	<0.05	5	43	<10	<250	<50	<1	<1	<1	<3
10	170	4	<0.1	<1	<1	<1	<0.05	2	5	<10	<250	<50	<1	<1	<1	<3
TS	-	-	-	-	-	-	-	-	-	-	-	-	94%	95%	92%	93%[4]
TB	-	-	-	-	-	-	-	-	-	<10	-	-	<1	<1	<1	<3
DGV[1]		13	2.4[2]	33.1[2]	1.4[1]	121.1[2]	0.6	120.2[2]	87.4[2]	10	250	50	950	180	80	550

Notes:

1 DGV from the default guideline values provided in the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG, August 2018)

2 Heavy metal thresholds are adjusted for a hardness of 500 mg/L per ANZECC 2000

3 Field replicate of sample listed immediately above

4 All chromium are assumed to exist in the stable Cr (III) oxidation state, as Cr (VI) will be too reactive and unstable under the normal environment.

5 m+p+o xylene

bold exceeds DGV

Table 9: Results of Laboratory Analysis in January / February 2017 (µg/L)

Well	Heavy Metals[1]								TRH					Benzene	Toluene	Ethyl-benzene	Total Xylene
	As	Cd	Cr[3]	Cu	Pb	Hg	Ni	Zn	C_6-C_9	C_{10}-C_{14}	C_{15}-C_{28}	C_{29}-C36	>C_{10}-C_{16}				
1	1	<0.1	<1	1	<1	<0.05	4	28	<10	<50	<100	<100	<50	<1	<1	<1	<3
2	<1	0.2	<1	<1	<1	<0.05	5	20	<10	<50	<100	<100	<50	<1	<1	<1	<3
7	3	<0.1	<1	<1	<1	<0.05	6	1	<10	<50	<100	<100	<50	<1	<1	<1	<3
8	<1	0.5	<1	6	<1	<0.05	4	14	<10	<50	<100	<100	<50	<1	<1	<1	<3
9	<1	<0.1	<1	2	<1	<0.05	8	38	<10	<50	<100	<100	<50	<1	<1	<1	<3
BD1	<1	<0.1	<1	1	<1	<0.05	8	34	<10	<50	<100	<100	<50	<1	<1	<1	<3
10	3	<0.1	<1	7	<1	<0.05	50	**150**	<10	<50	**220**	<100	**98**	<1	<1	<1	<3
DGV[1]	13	2.4[2]	33.1[2]	1.4[1]	121.1[2]	0.6	120.2[2]	87.4[2]	10	250			50	950	180	80	550

Notes:

1 DGV from the default guideline values provided in the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG, August 2018)

2 Heavy metal thresholds are adjusted for a hardness of 500 mg/L per ANZECC 2000

3 Field replicate of sample listed immediately above

4 All chromium are assumed to exist in the stable Cr (III) oxidation state, as Cr (VI) will be too reactive and unstable under the normal environment.

5 m+p+o xylene

bold exceeds DGV

Table 10: Results of Laboratory Analysis in March 2017 (µg/L)

Well	Heavy Metals[1]								TRH					Benzene	Toluene	Ethyl-benzene	Total Xylene
	As	Cd	Cr[3]	Cu	Pb	Hg	Ni	Zn	C_6-C_9	C_{10}-C_{14}	C_{15}-C_{28}	C_{29}-C36	>C_{10}-C_{16}				
1	2	<0.1	<1	1	<1	<0.05	10	90	<10	<50	<100	<100	<50	<1	<1	<1	<3
BD1	2	<0.1	<1	<1	<1	<0.05	11	92	<10	<50	<100	<100	<50	<1	<1	<1	<3
2	<1	<0.1	<1	3	<1	<0.05	5	38	<10	<50	<100	<100	<50	<1	<1	<1	<3
7	3	<0.1	<1	<1	<1	<0.05	8	2	<10	<50	<100	<100	<50	<1	<1	<1	<3
8	<1	<0.1	<1	4	<1	<0.05	4	16	<10	<50	<100	<100	<50	<1	<1	<1	<3
9	1	<0.1	<1	3	<1	<0.05	7	42	<10	<50	<100	<100	<50	<1	<1	<1	<3
10	2	<0.1	<1	2	<1	<0.05	4	33	<10	<50	<100	<100	<50	<1	<1	<1	<3
DGV[1]	13	2.4[2]	33.1[2]	1.4[1]	121.1[2]	0.6	120.2[2]	87.4[2]	10	250			50	950	180	80	550

Notes:

1 DGV from the default guideline values provided in the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG, August 2018)

2 Heavy metal thresholds are adjusted for a hardness of 500 mg/L per ANZECC 2000

3 Field replicate of sample listed immediately above

4 All chromium are assumed to exist in the stable Cr (III) oxidation state, as Cr (VI) will be too reactive and unstable under the normal environment.

5 m+p+o xylene

bold exceeds DGV

Table 11: Results of Laboratory Analysis in August 2017 (µg/L)

Well	Heavy Metals[1]								TRH					Benzene	Toluene	Ethyl-benzene	Total Xylene
	As	Cd	Cr[3]	Cu	Pb	Hg	Ni	Zn	C_6-C_9	C_{10}-C_{14}	C_{15}-C_{28}	C_{29}-C36	>C_{10}-C_{16}				
1	1	<0.1	<1	<1	<1	<0.05	5	19	<10	<50	<100	<100	<50	<1	<1	<1	<3
2	<1	<0.1	<1	<1	<1	<0.05	4	12	<10	<50	<100	<100	<50	<1	<1	<1	<3
BD1	<1	<0.1	<1	<1	<1	<0.05	4	13	<10	<50	<100	<100	<50	<1	<1	<1	<3
7	9	<0.1	<1	<1	<1	<0.05	17	19	<10	<50	<100	<100	<50	<1	<1	<1	<3
8	<1	1	<1	**27**	<1	<0.05	4	20	<10	<50	<100	<100	<50	<1	<1	<1	<3
9	5	<0.1	<1	4	<1	<0.05	30	**420**	<10	<50	<100	<100	<50	<1	<1	<1	<3
10	5	<0.1	<1	2	<1	<0.05	16	44	<10	<50	<100	<100	<50	<1	<1	<1	<3
DGV[1]	13	2.4[2]	33.1[2]	1.4[1]	121.1[2]	0.6	120.2[2]	87.4[2]	10	250			50	950	180	80	550

Notes:

1 DGV from the default guideline values provided in the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG, August 2018)

2 Heavy metal thresholds are adjusted for a hardness of 500 mg/L per ANZECC 2000

3 Field replicate of sample listed immediately above

4 All chromium are assumed to exist in the stable Cr (III) oxidation state, as Cr (VI) will be too reactive and unstable under the normal environment.

5 m+p+o xylene

bold exceeds DGV

Table 12: Results of Laboratory Analysis in November 2017 (µg/L)

Well	Heavy Metals[1]								TRH					Benzene	Toluene	Ethyl-benzene	Total Xylene
	As	Cd	Cr[3]	Cu	Pb	Hg	Ni	Zn	C_6-C_9	C_{10}-C_{14}	C_{15}-C_{28}	C_{29}-C36	>C_{10}-C_{16}				
1	<1	<0.1	<1	2	<1	<0.05	2	10	<10	<50	<100	<100	<50	<1	<1	<1	<3
2	<1	<0.1	<1	<1	<1	<0.05	3	6	<10	<50	<100	<100	<50	<1	<1	<1	<3
BD1/15 112017	<1	<0.1	<1	<1	<1	<0.05	3	5	<10	<50	<100	<100	<50	<1	<1	<1	<3
7	**17**	<0.1	<1	<1	<1	<0.05	24	69	<10	<50	<100	<100	<50	<1	<1	<1	<3
8	<1	0.4	<1	11	<1	<0.05	3	14	<10	<50	<100	<100	<50	<1	<1	<1	<3
9	1	<0.1	<1	<1	<1	<0.05	7	82	<10	<50	<100	<100	<50	<1	<1	<1	<3
10	3	<0.1	<1	<1	<1	<0.05	3	12	<10	<50	<100	<100	<50	<1	<1	<1	<3
DGV[1]	13	2.4[2]	33.1[2]	1.4[1]	121.1[2]	0.6	120.2[2]	87.4[2]	10	250			50	950	180	80	550

Notes:

1 DGV from the default guideline values provided in the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG, August 2018)

2 Heavy metal thresholds are adjusted for a hardness of 500 mg/L per ANZECC 2000

3 Field replicate of sample listed immediately above

4 All chromium are assumed to exist in the stable Cr (III) oxidation state, as Cr (VI) will be too reactive and unstable under the normal environment.

5 m+p+o xylene

bold exceeds DGV

Table 13: Results of Laboratory Analysis in August 2018 (µg/L)

Well	Heavy Metals[2]								TRH					Benzene	Toluene	Ethyl-benzene	Total Xylene[5]
	As	Cd	Cr[4]	Cu	Pb	Hg	Ni	Zn	C_6-C_9	C_{10}-C_{14}	C_{15}-C_{28}	C_{29}-C_{36}	>C_{10}-C_{16}				
1	1	<0.1	<1	**3**	<1	<0.05	5	30	<10	<50	<100	<100	<50	<1	<1	<1	<3
2	<1	<0.1	<1	**3**	<1	<0.05	3	12	<10	<50	<100	<100	<50	<1	<1	<1	<3
BD1/20180828[3]	<1	<0.1	<1	<1	<1	<0.05	3	9	<10	<50	<100	<100	<50	<1	<1	<1	<3
7	11	0.8	<1	**4**	1	<0.05	77	**670**	<10	<50	<100	<100	<50	<1	<1	<1	<3
8	<1	1.7	<1	**10**	<1	<0.05	3	21	<10	<50	<100	<100	<50	<1	<1	<1	<3
9	2	<0.1	<1	**5**	<1	<0.05	7	110	<10	<50	<100	<100	<50	<1	<1	<1	<3
10	4	<0.1	<1	**3**	<1	<0.05	8	59	**22**	**190**	**610**	**<100**	**230**	8	<1	<1	<3
DGV[1]	13	2.4[2]	33.1[2]	1.4[1]	121.1[2]	0.6	120.2[2]	87.4[2]	10	250			50	950	180	80	550[5]

Notes:

1 DGV from the default guideline values provided in the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG, August 2018)

2 Heavy metal thresholds are adjusted for a hardness of 500 mg/L per ANZECC 2000

3 Field replicate of sample listed immediately above

4 All chromium are assumed to exist in the stable Cr (III) oxidation state, as Cr (VI) will be too reactive and unstable under the normal environment.

5 m+p+o xylene

bold exceeds DGV

Table 14: Results of Laboratory Analysis in November 2018 (µg/L)

Well	Heavy Metals[2]								TRH					Benzene	Toluene	Ethyl-benzene	Total Xylene[5]
	As	Cd	Cr[4]	Cu	Pb	Hg	Ni	Zn	C_6-C_9	C_{10}-C_{14}	C_{15}-C_{28}	C_{29}-C_{36}	>C_{10}-C_{16}				
1	<1	<0.1	<1	**2**	<1	<0.05	6	45	<10	<50	<100	<100	<50	<1	<1	<1	<3
2	<1	<0.1	<1	1	<1	<0.05	4	19	<10	<50	<100	<100	<50	<1	<1	<1	<3
BD1/2018[3]	<1	<0.1	<1	<1	<1	<0.05	4	16	<10	<50	<100	<100	<50	<1	<1	<1	<3
7	**15**	<0.1	<1	1	<1	<0.05	9	10	<10	<50	<100	<100	<50	<1	<1	<1	<3
8	<1	0.7	<1	**5**	<1	<0.05	4	24	<10	<50	<100	<100	<50	<1	<1	<1	<3
9	3	<0.1	1	**14**	<1	<0.05	17	**250**	<10	<50	<100	<100	<50	<1	<1	<1	<3
10	4	<0.1	<1	**6**	<1	<0.05	6	30	<10	<50	<100	<100	<50	<1	<1	<1	<3
DGV[1]	13	2.4[2]	33.1[2]	1.4[1]	121.1[2]	0.6	120.2[2]	87.4[2]	10	250			50	950	180	80	550[5]

Notes:

1 DGV from the default guideline values provided in the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG, August 2018)

2 Heavy metal thresholds are adjusted for a hardness of 500 mg/L per ANZECC 2000

3 Field replicate of sample listed immediately above

4 All chromium are assumed to exist in the stable Cr (III) oxidation state, as Cr (VI) will be too reactive and unstable under the normal environment.

5 m+p+o xylene

bold exceeds DGV

Table 15: Results of Laboratory Analysis in August / September 2019 (µg/L)

Well	Heavy Metals[2]								TRH					Benzene	Toluene	Ethyl-benzene	Total Xylene[5]
	As	Cd	Cr[4]	Cu	Pb	Hg	Ni	Zn	C_6-C_9	C_{10}-C_{14}	C_{15}-C_{28}	C_{29}-C_{36}	>C_{10}-C_{16}				
1	<1	<0.1	<1	**2**	<1	<0.05	3	69	<10	<50	<100	<100	<50	<1	<1	<1	<3
2	<1	0.2	<1	**2**	<1	<0.05	4	16	<10	<50	<100	<100	<50	<1	<1	<1	<3
BD1/ 20190902[3]	<1	0.2	<1	**2**	<1	<0.05	4	19	<10	<50	<100	<100	<50	<1	<1	<1	<3
7	**42**	<0.1	<1	1	<1	<0.05	22	14	<10	<50	<100	<100	<50	<1	<1	<1	<3
8	<1	0.8	<1	**8**	<1	<0.05	4	16	<10	<50	<100	<100	<50	<1	<1	<1	<3
9	3	<0.1	<1	**2**	<1	<0.05	3	39	<10	<50	<100	<100	<50	<1	<1	<1	<3
10	3	<0.1	<1	**2**	<1	<0.05	22	34	<10	<50	<100	<100	<50	<1	<1	<1	<3
DGV[1]	13	2.4[2]	33.1[2]	1.4[1]	121.1[2]	0.6	120.2[2]	87.4[2]	10	250			50	950	180	80	550[5]

Notes:

1 DGV from the default guideline values provided in the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG, August 2018)

2 Heavy metal thresholds are adjusted for a hardness of 500 mg/L per ANZECC 2000

3 Field replicate of sample listed immediately above

4 All chromium are assumed to exist in the stable Cr (III) oxidation state, as Cr (VI) will be too reactive and unstable under the normal environment.

5 m+p+o xylene

bold exceeds DGV

Table 16: Results of Laboratory Analysis in November 2019 (µg/L)

Well	Heavy Metals[2]								TRH					Benzene	Toluene	Ethyl-benzene	Total Xylene[5]
	As	Cd	Cr[4]	Cu	Pb	Hg	Ni	Zn	C_6-C_9	C_{10}-C_{14}	C_{15}-C_{28}	C_{29}-C_{36}	>C_{10}-C_{16}				
1	<1	<0.1	<1	<1	<1	<0.05	6	40	<10	<50	<100	<100	<50	<1	<1	<1	<3
BD1/ 20191125[3]	<1	<0.1	<1	1	<1	<0.05	6	40	<10	<50	<100	<100	<50	<1	<1	<1	<3
2	<1	<0.1	<1	1	<1	<0.05	5	25	<10	<50	<100	<100	<50	<1	<1	<1	<3
7	8	<0.1	<1	1	<1	<0.05	22	39	<10	<50	<100	<100	<50	<1	<1	<1	<3
8	<1	0.3	<1	1	<1	<0.05	4	21	<10	<50	<100	<100	<50	<1	<1	<1	<3
9	3	<0.1	<1	**2**	<1	<0.05	3	42	<10	<50	<100	<100	<50	<1	<1	<1	<3
10	3	<0.1	<1	<1	<1	<0.05	5	24	<10	<50	<100	<100	<50	<1	<1	<1	<3
DGV[1]	13	2.4[2]	33.1[2]	1.4[1]	121.1[2]	0.6	120.2[2]	87.4[2]	10	250			50	950	180	80	550[5]

Notes:

1 DGV from the default guideline values provided in the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG, August 2018)

2 Heavy metal thresholds are adjusted for a hardness of 500 mg/L per ANZECC 2000

3 Field replicate of sample listed immediately above

4 All chromium are assumed to exist in the stable Cr (III) oxidation state, as Cr (VI) will be too reactive and unstable under the normal environment.

5 m+p+o xylene

bold exceeds DGV

Table 17: Results of Laboratory Analysis in May 2020 (µg/L)

Well	Heavy Metals[2]								TRH					Benzene	Toluene	Ethyl-benzene	Total Xylene[5]
	As	Cd	Cr[4]	Cu	Pb	Hg	Ni	Zn	C_6-C_9	C_{10}-C_{14}	C_{15}-C_{28}	C_{29}-C_{36}	>C_{10}-C_{16}				
1	<1	<0.1	<1	**7**	<1	<0.05	3	<1	<10	<50	<100	<100	<50	<1	<1	<1	<3
BD1/ 20200513[3]	2	<0.1	<1	<1	<1	<0.05	2	<1	<10	<50	<100	<100	<50	<1	<1	<1	<3
2	<1	<0.1	<1	**17**	<1	<0.05	5	3	<10	<50	<100	<100	<50	<1	<1	<1	<3
7	3	<0.1	<1	**19**	<1	<0.05	13	16	<10	<50	<100	<100	<50	<1	<1	<1	<3
8	<1	1.9	<1	**26**	<1	<0.05	11	68	<10	<50	<100	<100	<50	<1	<1	<1	<3
9	5	<0.1	<1	**20**	<1	<0.05	9	49	<10	<50	<100	<100	<50	<1	<1	<1	<3
10	2	<0.1	<1	**9**	<1	<0.05	6	14	<10	<50	110	<100	<50	<1	<1	<1	<3
DGV[1]	13	2.4[2]	33.1[2]	1.4[1]	121.1[2]	0.6	120.2[2]	87.4[2]	10	250			50	950	180	80	550[5]

Notes:

1 DGV from the default guideline values provided in the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG, August 2018)

2 Heavy metal thresholds are adjusted for a hardness of 500 mg/L per ANZECC 2000

3 Field replicate of sample listed immediately above

4 All chromium are assumed to exist in the stable Cr (III) oxidation state, as Cr (VI) will be too reactive and unstable under the normal environment.

5 m+p+o xylene

bold exceeds DGV

Table 18: Results of Laboratory Analysis in November 2020 (µg/L)

Well	Heavy Metals[2]								TRH					Benzene	Toluene	Ethyl-benzene	Total Xylene[5]
	As	Cd	Cr[4]	Cu	Pb	Hg	Ni	Zn	C_6-C_9	C_{10}-C_{14}	C_{15}-C_{28}	C_{29}-C_{36}	>C_{10}-C_{16}				
1	2	<0.1	<1	<1	<1	<0.05	3	11	<10	<50	<100	<100	<50	<1	<1	<1	<3
2	<1	<0.1	<1	<1	<1	<0.05	4	17	<10	<50	<100	<100	<50	<1	<1	<1	<3
BD1 20201126	2	<0.1	<1	<1	<1	<0.05	3	15	<10	<50	<100	<100	<50	<1	<1	<1	<3
7	1	<0.1	<1	**5**	<1	<0.05	8	11	<10	<50	<100	<100	<50	<1	<1	<1	<3
8	<1	1.2	<1	**21**	<1	<0.05	5	31	<10	<50	<100	<100	<50	<1	<1	<1	<3
9	2	<0.1	<1	<1	<1	<0.05	3	12	<10	<50	<100	<100	<50	<1	<1	<1	<3
10	2	<0.1	<1	**16**	<1	<0.05	10	74	<10	<50	<100	<100	<50	<1	<1	<1	<3
DGV[1]	13	2.4[2]	33.1[2]	1.4[1]	121.1[2]	0.6	120.2[2]	87.4	10	250			50	950	180	80	550[5]

Notes:

1 DGV from the default guideline values provided in the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG, August 2018)

2 Heavy metal thresholds are adjusted for a hardness of 500 mg/L per ANZECC 2000

3 Field replicate of sample listed immediately above

4 All chromium are assumed to exist in the stable Cr (III) oxidation state, as Cr (VI) will be too reactive and unstable under the normal environment.

5 m+p+o xylene

bold exceeds DGV

Table 19: Results of Laboratory Analysis in May 2021 (µg/L)

Well	Heavy Metals[2]								TRH					Benzene	Toluene	Ethyl-benzene	Total Xylene[5]
	As	Cd	Cr[4]	Cu	Pb	Hg	Ni	Zn	C_6-C_9	C_{10}-C_{14}	C_{15}-C_{28}	C_{29}-C_{36}	>C_{10}-C_{16}				
1	1	<0.1	<1	1	<1	<0.05	4	10	<10	<50	<100	<100	<50	<1	<1	<1	<3
BD1 20210528	1	<0.1	<1	<1	<1	<0.05	3	3	<10	<50	<100	<100	<50	<1	<1	<1	<3
2	<1	<0.1	<1	**13**	<1	<0.05	9	43	<10	<50	<100	<100	<50	<1	<1	<1	<3
7	<1	0.3	<1	**12**	<1	<0.05	35	**220**	<10	<50	<100	<100	<50	<1	<1	<1	<3
8	<1	2.6	<1	<1	<1	<0.05	7	82	<10	<50	<100	<100	<50	<1	<1	<1	<3
9	3	<0.1	<1	**15**	<1	<0.05	6	33	<10	<50	<100	<100	<50	<1	<1	<1	<3
10	4	<0.1	<1	<1	<1	<0.05	12	32	<10	<50	<100	<100	<50	<1	<1	<1	<3
DGV[1]	13	2.4[2]	33.1[2]	1.4[1]	121.1[2]	0.6	120.2[2]	87.4[2]	10	250			50	950	180	80	550[5]

Notes:

1 DGV from the default guideline values provided in the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG, August 2018)

2 Heavy metal thresholds are adjusted for a hardness of 500 mg/L per ANZECC 2000

3 Field replicate of sample listed immediately above

4 All chromium are assumed to exist in the stable Cr (III) oxidation state, as Cr (VI) will be too reactive and unstable under the normal environment.

5 m+p+o xylene

bold exceeds DGV

Table 20: Results of Laboratory Analysis in November 2021 (µg/L)

Well	Heavy Metals[2]								TRH					Benzene	Toluene	Ethyl-benzene	Total Xylene[5]
	As	Cd	Cr[4]	Cu	Pb	Hg	Ni	Zn	C_6-C_9	C_{10}-C_{14}	C_{15}-C_{28}	C_{29}-C_{36}	>C_{10}-C_{16}				
1	<1	<0.1	<1	<1	<1	<0.05	5	33	<10	<50	<100	<100	<50	<1	<1	<1	<3
2	<1	<0.1	<1	<1	<1	<0.05	5	22	<10	<50	<100	<100	<50	<1	<1	<1	<3
7	4	0.1	<1	<1	<1	<0.05	17	10	<10	<50	<100	<100	<50	<1	<1	<1	<3
8	<1	1.4	<1	2	<1	<0.05	9	**89**	<10	<50	<100	<100	<50	<1	<1	<1	<3
BD1	<1	1.5	<1	2	<1	<0.05	10	**97**	<10	<50	<100	<100	<50	<1	<1	<1	<3
9	1	<0.1	<1	2	<1	<0.05	8	67	<10	<50	<100	<100	<50	<1	<1	<1	<3
10	5	<0.1	<1	<1	<1	<0.05	15	38	<10	<50	<100	<100	<50	<1	<1	<1	<3
DGV[1]	13	2.4[2]	33.1[2]	1.4[1]	121.1[2]	0.6	120.2[2]	87.4[2]	10	250			50	950	180	80	625[5]

Notes:

1 DGV from the default guideline values provided in the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG, August 2018)

2 Heavy metal thresholds are adjusted for a hardness of 500 mg/L per ANZECC 2000

3 Field replicate of sample listed immediately above

4 All chromium are assumed to exist in the stable Cr (III) oxidation state, as Cr (VI) will be too reactive and unstable under the normal environment.

5 m+p+o xylene

bold exceeds DGV

Table 21: Results of Laboratory Analysis in May 2022 (µg/L)

Well	Heavy Metals[2]								TRH					Benzene	Toluene	Ethyl-benzene	Total Xylene[5]
	As	Cd	Cr[4]	Cu	Pb	Hg	Ni	Zn	C_6-C_9	C_{10}-C_{14}	C_{15}-C_{28}	C_{29}-C_{36}	>C_{10}-C_{16}				
1	<1	<0.1	<1	**19**	<1	<0.05	2	20	<10	<50	<100	<100	<50	<1	<1	<1	<3
2	<1	<0.1	<1	**2**	<1	<0.05	7	84	<10	<50	<100	<100	<50	<1	<1	<1	<3
7	<1	<0.1	<1	**35**	<1	<0.05	19	72	<10	<50	<100	<100	<50	<1	<1	<1	<3
8	<1	1.0	<1	<1	<1	<0.05	5	18	<10	<50	<100	<100	<50	<1	<1	<1	<3
BD1	<1	1.1	<1	**2**	<1	<0.05	4	19	<10	<50	<100	<100	<50	<1	<1	<1	<3
9	3	<0.1	<1	**4**	<1	<0.05	14	**89**	<10	<50	<100	<100	<50	<1	<1	<1	<3
10	2	<0.1	<1	**2**	<1	<0.05	13	43	<10	<50	<100	130	<50	<1	<1	<1	<3
DGV[1]	13	2.4[2]	33.1[2]	1.4[1]	121.1[2]	0.6	120.2[2]	87.4[2]	10	250			50	950	180	80	625[5]

Notes:

1 DGV from the default guideline values provided in the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG, August 2018)

2 Heavy metal thresholds are adjusted for a hardness of 500 mg/L per ANZECC 2000

3 Field replicate of sample listed immediately above

4 All chromium are assumed to exist in the stable Cr (III) oxidation state, as Cr (VI) will be too reactive and unstable under the normal environment.

5 m+p+o xylene

bold exceeds DGV

Table 22: Results of Laboratory Analysis in December 2022 (µg/L)

Well	Heavy Metals[2]								TRH					Benzene	Toluene	Ethyl-benzene	Total Xylene[5]
	As	Cd	Cr[4]	Cu	Pb	Hg	Ni	Zn	C_6-C_9	C_{10}-C_{14}	C_{15}-C_{28}	C_{29}-C_{36}	>C_{10}-C_{16}				
1	2	<0.1	<1	<1	<1	<0.05	4	39	<10	<50	<100	<100	<50	<1	<1	<1	<3
BD1	2	<0.1	<1	<1	<1	<0.05	3	34	<10	<50	<100	<100	<50				
2	<1	0.1	<1	**4**	<1	<0.05	4	340	<10	<50	<100	<100	<50	<1	<1	<1	<3
7	2	<0.1	<1	**4**	<1	<0.05	12	37	<10	<50	<100	<100	<50	<1	<1	<1	<3
8	1	2.5	<1	3	<1	<0.05	9	56	<10	<50	<100	<100	<50	<1	<1	<1	<3
9	1	<0.1	<1	**1**	<1	<0.05	4	**33**	<10	<50	<100	<100	<50	<1	<1	<1	<3
10	7	<0.1	<1	<1	<1	<0.05	3	11	<10	**78**	**570**	**610**	**100**	<1	<1	<1	<3
DGV[1]	13	2.4[2]	33.1[2]	1.4[1]	121.1[2]	0.6	120.2[2]	87.4[2]	10	250			50	950	180	80	625[5]

Notes:

1 DGV from the default guideline values provided in the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG, August 2018)

2 Heavy metal thresholds are adjusted for a hardness of 500 mg/L per ANZECC 2000

3 Field replicate of sample listed immediately above

4 All chromium are assumed to exist in the stable Cr (III) oxidation state, as Cr (VI) will be too reactive and unstable under the normal environment.

5 m+p+o xylene

bold exceeds DGV

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CERTIFICATE OF ANALYSIS 312979

Client Details

Client	Douglas Partners Pty Ltd
Attention	Kurt Plambeck
Address	96 Hermitage Rd, West Ryde, NSW, 2114

Sample Details

Your Reference	**71021.18, Tooheys - November 2022 Lidcombe**
Number of Samples	9 Water
Date samples received	13/12/2022
Date completed instructions received	13/12/2022

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Please refer to the last page of this report for any comments relating to the results.

Report Details

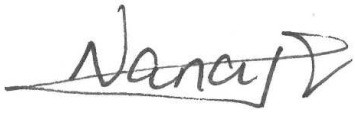
Date results requested by	20/12/2022
Date of Issue	20/12/2022

NATA Accreditation Number 2901. This document shall not be reproduced except in full.

Accredited for compliance with ISO/IEC 17025 - Testing. **Tests not covered by NATA are denoted with ***

Results Approved By
Hannah Nguyen, Metals Supervisor
Liam Timmins, Organic Instruments Team Leader

Authorised By



Nancy Zhang, Laboratory Manager

vTRH(C6-C10)/BTEXN in Water						
Our Reference		312979-1	312979-2	312979-3	312979-4	312979-5
Your Reference	UNITS	BH1	BH2	BH7	BH8	BH9
Date Sampled		13/12/2022	13/12/2022	13/12/2022	13/12/2022	13/12/2022
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	16/12/2022	16/12/2022	16/12/2022	16/12/2022	16/12/2022
Date analysed	-	16/12/2022	16/12/2022	16/12/2022	16/12/2022	16/12/2022
TRH C_6 - C_9	µg/L	<10	<10	<10	<10	<10
TRH C_6 - C_{10}	µg/L	<10	<10	<10	<10	<10
TRH C_6 - C_{10} less BTEX (F1)	µg/L	<10	<10	<10	<10	<10
Benzene	µg/L	<1	<1	<1	<1	<1
Toluene	µg/L	<1	<1	<1	<1	<1
Ethylbenzene	µg/L	<1	<1	<1	<1	<1
m+p-xylene	µg/L	<2	<2	<2	<2	<2
o-xylene	µg/L	<1	<1	<1	<1	<1
Naphthalene	µg/L	<1	<1	<1	<1	<1
Surrogate Dibromofluoromethane	%	103	101	113	100	106
Surrogate toluene-d8	%	101	106	105	103	104
Surrogate 4-BFB	%	96	101	101	98	101

vTRH(C6-C10)/BTEXN in Water					
Our Reference		312979-6	312979-7	312979-8	312979-9
Your Reference	UNITS	BH10	BD1	Spike	Blank
Date Sampled		13/12/2022	13/12/2022	13/12/2022	13/12/2022
Type of sample		Water	Water	Water	Water
Date extracted	-	16/12/2022	16/12/2022	16/12/2022	16/12/2022
Date analysed	-	16/12/2022	16/12/2022	16/12/2022	16/12/2022
TRH C_6 - C_9	µg/L	<10	<10	[NA]	<10
TRH C_6 - C_{10}	µg/L	<10	<10	[NA]	<10
TRH C_6 - C_{10} less BTEX (F1)	µg/L	<10	<10	[NA]	<10
Benzene	µg/L	<1	<1	96%	<1
Toluene	µg/L	<1	<1	97%	<1
Ethylbenzene	µg/L	<1	<1	116%	<1
m+p-xylene	µg/L	<2	<2	109%	<2
o-xylene	µg/L	<1	<1	111%	<1
Naphthalene	µg/L	<1	<1	[NA]	<1
Surrogate Dibromofluoromethane	%	99	96	97	99
Surrogate toluene-d8	%	100	100	99	99
Surrogate 4-BFB	%	97	96	95	96

svTRH (C10-C40) in Water						
Our Reference		312979-1	312979-2	312979-3	312979-4	312979-5
Your Reference	UNITS	BH1	BH2	BH7	BH8	BH9
Date Sampled		13/12/2022	13/12/2022	13/12/2022	13/12/2022	13/12/2022
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	14/12/2022	14/12/2022	14/12/2022	14/12/2022	14/12/2022
Date analysed	-	15/12/2022	15/12/2022	15/12/2022	15/12/2022	15/12/2022
TRH C_{10} - C_{14}	µg/L	<50	<50	<50	<50	<50
TRH C_{15} - C_{28}	µg/L	<100	<100	<100	<100	<100
TRH C_{29} - C_{36}	µg/L	<100	<100	<100	<100	<100
Total +ve TRH (C10-C36)	µg/L	<50	<50	<50	<50	<50
TRH >C_{10} - C_{16}	µg/L	<50	<50	<50	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	µg/L	<50	<50	<50	<50	<50
TRH >C_{16} - C_{34}	µg/L	<100	<100	<100	<100	<100
TRH >C_{34} - C_{40}	µg/L	<100	<100	<100	<100	<100
Total +ve TRH (>C10-C40)	µg/L	<50	<50	<50	<50	<50
Surrogate o-Terphenyl	%	79	89	81	72	69

svTRH (C10-C40) in Water			
Our Reference		312979-6	312979-7
Your Reference	UNITS	BH10	BD1
Date Sampled		13/12/2022	13/12/2022
Type of sample		Water	Water
Date extracted	-	14/12/2022	14/12/2022
Date analysed	-	15/12/2022	15/12/2022
TRH C_{10} - C_{14}	µg/L	78	<50
TRH C_{15} - C_{28}	µg/L	570	<100
TRH C_{29} - C_{36}	µg/L	610	<100
Total +ve TRH (C10-C36)	µg/L	1,300	<50
TRH >C_{10} - C_{16}	µg/L	100	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	µg/L	100	<50
TRH >C_{16} - C_{34}	µg/L	1,000	<100
TRH >C_{34} - C_{40}	µg/L	580	<100
Total +ve TRH (>C10-C40)	µg/L	1,700	<50
Surrogate o-Terphenyl	%	87	81

HM in water - dissolved						
Our Reference		312979-1	312979-2	312979-3	312979-4	312979-5
Your Reference	UNITS	BH1	BH2	BH7	BH8	BH9
Date Sampled		13/12/2022	13/12/2022	13/12/2022	13/12/2022	13/12/2022
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	16/12/2022	16/12/2022	16/12/2022	16/12/2022	16/12/2022
Date analysed	-	19/12/2022	19/12/2022	19/12/2022	19/12/2022	19/12/2022
Arsenic-Dissolved	µg/L	2	<1	2	1	1
Cadmium-Dissolved	µg/L	<0.1	0.1	<0.1	2.5	<0.1
Chromium-Dissolved	µg/L	<1	<1	<1	<1	<1
Copper-Dissolved	µg/L	<1	4	4	3	1
Lead-Dissolved	µg/L	<1	<1	<1	<1	<1
Mercury-Dissolved	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel-Dissolved	µg/L	4	4	12	9	4
Zinc-Dissolved	µg/L	39	340	37	56	33

HM in water - dissolved			
Our Reference		312979-6	312979-7
Your Reference	UNITS	BH10	BD1
Date Sampled		13/12/2022	13/12/2022
Type of sample		Water	Water
Date prepared	-	16/12/2022	16/12/2022
Date analysed	-	19/12/2022	19/12/2022
Arsenic-Dissolved	µg/L	7	2
Cadmium-Dissolved	µg/L	<0.1	<0.1
Chromium-Dissolved	µg/L	<1	<1
Copper-Dissolved	µg/L	<1	<1
Lead-Dissolved	µg/L	<1	<1
Mercury-Dissolved	µg/L	<0.05	<0.05
Nickel-Dissolved	µg/L	3	3
Zinc-Dissolved	µg/L	11	34

Method ID	Methodology Summary
Metals-021	Determination of Mercury by Cold Vapour AAS.
Metals-022	Determination of various metals by ICP-MS.
Org-020	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
Org-023	Water samples are analysed directly by purge and trap GC-MS.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	[NT]
Date extracted	-			16/12/2022	1	16/12/2022	19/12/2022		16/12/2022	[NT]
Date analysed	-			16/12/2022	1	16/12/2022	19/12/2022		16/12/2022	[NT]
TRH C_6 - C_9	µg/L	10	Org-023	<10	1	<10	<10	0	105	[NT]
TRH C_6 - C_{10}	µg/L	10	Org-023	<10	1	<10	<10	0	105	[NT]
Benzene	µg/L	1	Org-023	<1	1	<1	<1	0	102	[NT]
Toluene	µg/L	1	Org-023	<1	1	<1	<1	0	105	[NT]
Ethylbenzene	µg/L	1	Org-023	<1	1	<1	<1	0	106	[NT]
m+p-xylene	µg/L	2	Org-023	<2	1	<2	<2	0	107	[NT]
o-xylene	µg/L	1	Org-023	<1	1	<1	<1	0	105	[NT]
Naphthalene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Surrogate Dibromofluoromethane	%		Org-023	103	1	103	110	7	101	[NT]
Surrogate toluene-d8	%		Org-023	103	1	101	104	3	100	[NT]
Surrogate 4-BFB	%		Org-023	95	1	96	98	2	100	[NT]

QUALITY CONTROL: svTRH (C10-C40) in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	312979-2
Date extracted	-			14/12/2022	1	14/12/2022	14/12/2022		14/12/2022	14/12/2022
Date analysed	-			15/12/2022	1	15/12/2022	15/12/2022		15/12/2022	15/12/2022
TRH C_{10} - C_{14}	µg/L	50	Org-020	<50	1	<50	<50	0	83	81
TRH C_{15} - C_{28}	µg/L	100	Org-020	<100	1	<100	<100	0	95	87
TRH C_{29} - C_{36}	µg/L	100	Org-020	<100	1	<100	<100	0	100	90
TRH >C_{10} - C_{16}	µg/L	50	Org-020	<50	1	<50	<50	0	83	81
TRH >C_{16} - C_{34}	µg/L	100	Org-020	<100	1	<100	<100	0	95	87
TRH >C_{34} - C_{40}	µg/L	100	Org-020	<100	1	<100	<100	0	100	90
Surrogate o-Terphenyl	%		Org-020	88	1	79	90	13	85	89

QUALITY CONTROL: HM in water - dissolved						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	312979-2
Date prepared	-			16/12/2022	1	16/12/2022	16/12/2022		16/12/2022	16/12/2022
Date analysed	-			19/12/2022	1	19/12/2022	19/12/2022		19/12/2022	19/12/2022
Arsenic-Dissolved	µg/L	1	Metals-022	<1	1	2	2	0	92	96
Cadmium-Dissolved	µg/L	0.1	Metals-022	<0.1	1	<0.1	<0.1	0	92	91
Chromium-Dissolved	µg/L	1	Metals-022	<1	1	<1	<1	0	88	88
Copper-Dissolved	µg/L	1	Metals-022	<1	1	<1	<1	0	95	94
Lead-Dissolved	µg/L	1	Metals-022	<1	1	<1	<1	0	92	88
Mercury-Dissolved	µg/L	0.05	Metals-021	<0.05	1	<0.05	<0.05	0	91	[NT]
Nickel-Dissolved	µg/L	1	Metals-022	<1	1	4	4	0	93	93
Zinc-Dissolved	µg/L	1	Metals-022	<1	1	39	33	17	93	#

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Where matrix spike recoveries fall below the lower limit of the acceptance criteria (e.g. for non-labile or standard Organics <60%), positive result(s) in the parent sample will subsequently have a higher than typical estimated uncertainty (MU estimates supplied on request) and in these circumstances the sample result is likely biased significantly low.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Report Comments

8 HM in water - dissolved - # Percent recovery is not applicable due to the high concentration of the element/s in the sample/s. However an acceptable recovery was obtained for the LCS.

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customerservice@envirolab.com.au
www.envirolab.com.au

SAMPLE RECEIPT ADVICE

Client Details

Client	Douglas Partners Pty Ltd
Attention	Kurt Plambeck

Sample Login Details

Your reference	71021.18, Tooheys - November 2022 Lidcombe
Envirolab Reference	312979
Date Sample Received	13/12/2022
Date Instructions Received	13/12/2022
Date Results Expected to be Reported	20/12/2022

Sample Condition

Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	9 Water
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	7
Cooling Method	Ice Pack
Sampling Date Provided	YES

Comments

Nil

Please direct any queries to:

Aileen Hie	Jacinta Hurst
Phone: 02 9910 6200	**Phone: 02 9910 6200**
Fax: 02 9910 6201	**Fax: 02 9910 6201**
Email: ahie@envirolab.com.au	**Email: jhurst@envirolab.com.au**

Analysis Underway, details on the following page:

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Sample ID	vTRH(C6-C10)/BTEXN in Water	svTRH (C10-C40) in Water	HM in water - dissolved
BH1	✓	✓	✓
BH2	✓	✓	✓
BH7	✓	✓	✓
BH8	✓	✓	✓
BH9	✓	✓	✓
BH10	✓	✓	✓
BD1	✓	✓	✓
Spike	✓		
Blank	✓		

The '✓' indicates the testing you have requested. **THIS IS NOT A REPORT OF THE RESULTS.**

Additional Info

Sample storage - Waters are routinely disposed of approximately 1 month and soils approximately 2 months from receipt.
Requests for longer term sample storage must be received in writing.
Please contact the laboratory immediately if observed settled sediment present in water samples is to be included in the extraction and/or analysis (exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS analysis where solids are included by default.
TAT for Micro is dependent on incubation. This varies from 3 to 6 days.

Douglas Partners
Geotechnics | Environment | Groundwater

CHAIN OF CUSTODY DESPATCH SHEET

Project No:	71021.18	**Suburb:**	Lidcombe	**To:**	Envirolab
Project Name:	Tooheys - November 2022	**Order Number**			12 Ashley Street, Chatswood
Project Manager:	Kurt Plambeck	**Sampler:**	HD	**Attn:**	Aileen Hie
Emails:	kurt.plambeck@douglaspartners.com.au			**Phone:**	
Date Required:	Standard ☐			**Email:**	

Prior Storage: ☒ Esky ☐ Fridge ☐ Shelved Do samples contain 'potential' HBM? Yes ☐ No ☒ (If YES, then handle, transport and store in accordance with FPM HAZID)

Sample ID	Lab ID	Date Sampled	Sample Type (S - soil, W - water)	Container Type (G - glass, P - plastic)	Analytes: Heavy Metals	TRH	BTEX							Notes/preservation
BH1	1	13/12/22	W	G/P	X	X	X							
BH2	2	13/12/22	W	G/P	X	X	X							
BH7	3	13/12/22	W	G/P	X	X	X							
BH8	4	13/12/22	W	G/P	X	X	X							
BH9	5	13/12/22	W	G/P	X	X	X							
BH10	6	13/12/22	W	G/P	X	X	X							
BD1	7	13/12/22	W	G/P	X	X	X							
Spike	8	13/12/22	W	G/P			X							
Blank	9	13/12/22	W	G/P			X							
PQL (S) mg/kg														**ANZECC PQLs req'd for all water analytes** ☐

Envirolab Services
12 Ashley St
Chatswood NSW 2067
Job No: 312979
Date Received: 13/12/2022
Time Received: 13:00
Received By: HTL
Temp: Cool/Ambient
Security: Intact/Broken/None

PQL = practical quantitation limit. If none given, default to Laboratory Method Detection Limit

Metals to Analyse: 8HM unless specified here:

Lab Report/Reference No:

Total number of samples in container: **Relinquished by:** HD KP **Transported to laboratory by:**

Send Results to: Douglas Partners Pty Ltd **Address** **Phone:** **Fax:**

Signed: **Received by:** **Date & Time:**

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CERTIFICATE OF ANALYSIS 312979-A

Client Details

Client	Douglas Partners Pty Ltd
Attention	Kurt Plambeck
Address	96 Hermitage Rd, West Ryde, NSW, 2114

Sample Details

Your Reference	**71021.18, Tooheys - November 2022 Lidcombe**
Number of Samples	additional analysis
Date samples received	13/12/2022
Date completed instructions received	20/01/2023

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Report Details

Date results requested by	30/01/2023
Date of Issue	25/01/2023

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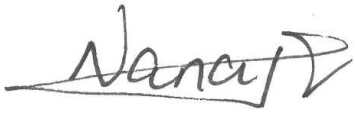
Accredited for compliance with ISO/IEC 17025 - Testing. **Tests not covered by NATA are denoted with ***

Results Approved By
Kyle Gavrily, Senior Chemist

Authorised By



Nancy Zhang, Laboratory Manager

sTPH in Soil (C10-C40)-Silica		
Our Reference		312979-A-6
Your Reference	UNITS	BH10
Date Sampled		13/12/2022
Type of sample		Water
Date extracted	-	23/01/2023
Date analysed	-	23/01/2023
TPH C_{10} - C_{14}	mg/kg	<50
TPH C_{15} - C_{28}	mg/kg	160
TPH C_{29} - C_{36}	mg/kg	300
TPH >C_{10} -C_{16}	mg/kg	59
TPH >C_{16} -C_{34}	mg/kg	360
TPH >C_{34} -C_{40}	mg/kg	290
Surrogate o-Terphenyl	%	102

Method ID	Methodology Summary
Org-020	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.

QUALITY CONTROL: sTPH in Soil (C10-C40)-Silica						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			23/01/2023	[NT]	[NT]	[NT]	[NT]	23/01/2023	[NT]
Date analysed	-			23/01/2023	[NT]	[NT]	[NT]	[NT]	23/01/2023	[NT]
TPH C_{10} - C_{14}	mg/kg	50	Org-020	<50	[NT]	[NT]	[NT]	[NT]	112	[NT]
TPH C_{15} - C_{28}	mg/kg	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	108	[NT]
TPH C_{29} - C_{36}	mg/kg	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	101	[NT]
TPH >C_{10} -C_{16}	mg/kg	50	Org-020	<50	[NT]	[NT]	[NT]	[NT]	112	[NT]
TPH >C_{16} -C_{34}	mg/kg	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	108	[NT]
TPH >C_{34} -C_{40}	mg/kg	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	101	[NT]
Surrogate o-Terphenyl	%		Org-020	100	[NT]	[NT]	[NT]	[NT]	70	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Where matrix spike recoveries fall below the lower limit of the acceptance criteria (e.g. for non-labile or standard Organics <60%), positive result(s) in the parent sample will subsequently have a higher than typical estimated uncertainty (MU estimates supplied on request) and in these circumstances the sample result is likely biased significantly low.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Ming To

From: Joshua Williams
Sent: Monday, 23 January 2023 10:43 AM
To: Customer Service
Subject: RE: Results for Registration 312979 71021.18, Tooheys - November 2022 Lidcombe

Categories: Additional

Ref: 312979-A
TAT: Standard
Due: 30/01/2023.
MT.

Customer service can you please create an A-Job

312979-10 TSilica.

Thanks

Kind Regards,

Joshua Williams | Organics Supervisor | Envirolab Services

Great Science. Great Service.

E JWilliams@envirolab.com.au | W www.envirolab.com.au

Follow us on: LinkedIn | Facebook | Twitter

Samples will be analysed per our T&C's.

From: Joshua Williams
Sent: Friday, 20 January 2023 4:34 PM
To: Simon Song <SSong@envirolab.com.au>; Kurt Plambeck <kurt.plambeck@douglaspartners.com.au>
Cc: Steven Luong <SLuong@envirolab.com.au>
Subject: RE: Results for Registration 312979 71021.18, Tooheys - November 2022 Lidcombe

Hi Kurt,

From the chromatogram the sample looks like some type of oil (not natural). I wouldn't expect it to clean-up.

From: Simon Song <SSong@envirolab.com.au>
Sent: Friday, 20 January 2023 3:41 PM
To: Kurt Plambeck <kurt.plambeck@douglaspartners.com.au>
Cc: Joshua Williams <JWilliams@envirolab.com.au>; Steven Luong <SLuong@envirolab.com.au>
Subject: RE: Results for Registration 312979 71021.18, Tooheys - November 2022 Lidcombe

Hi Kurt,
Josh/Steven will check for you

Kind Regards,

Simon Song | Senior Customer Service | Envirolab Services

Great Science. Great Service.

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Samples will be analysed per our T&C's. 312979A.

From: Kurt Plambeck <kurt.plambeck@douglaspartners.com.au>
Sent: Friday, 20 January 2023 3:19 PM
To: Simon Song <SSong@envirolab.com.au>
Subject: FW: Results for Registration 312979 71021.18, Tooheys - November 2022 Lidcombe

Hi Simon,

Can you please provide advice as the below.

Regards

Kurt Plambeck | Senior Associate/Environmental Scientist
Douglas Partners Pty Ltd | ABN 75 053 980 117 | www.douglaspartners.com.au
96 Hermitage Road West Ryde NSW 2114 | PO Box 472 West Ryde NSW 1685
P: 02 9809 0666 | M: +61 402 057 147 | E: kurt.plambeck@douglaspartners.com.au

To find information on our COVID-19 measures, please visit douglaspartners.com.au/news/covid-19

From: Kurt Plambeck
Sent: Friday, 20 January 2023 3:17 PM
To: Greta Petzold <GPetzold@envirolab.com.au>
Subject: RE: Results for Registration 312979 71021.18, Tooheys - November 2022 Lidcombe

Hi Greta,

Can you please if the TRH in Sample 10 appears to be petroleum based. If there is sample left please run a silica clean up on it

Regards

Kurt Plambeck | Senior Associate/Environmental Scientist
Douglas Partners Pty Ltd | ABN 75 053 980 117 | www.douglaspartners.com.au
96 Hermitage Road West Ryde NSW 2114 | PO Box 472 West Ryde NSW 1685

Douglas Partners
Geotechnics / Environment / Groundwater

YSI CALIBRATION RECORD

Serial Number: 21D221627

DP Identification No. YSI

Project: Toohys

Project Number: 71021.18

PARAMETER	STANDARD	PRE CALIBRATION READING		POST CALIBRATION READING	
Temperature	* 23.0	–	degrees C	–	degrees C
pH	10	9.98	pH units	10	pH units
	7	7.10	pH units	7	pH units
	4	3.81	pH units	4	pH units
Conductivity	0.0** uS/cm	–	µS/cm	–	µS/cm
	2.76 mS/cm	–	mS/cm	–	mS/cm
TDS	0.0** ppm	–	ppm	–	ppm
	36.0 ppk	–	ppk	–	ppk
Dissolved Oxygen	0.0% sat	–	ppm		
		–	%	–	%
	100.0**% sat	–	ppm		
		–	%	–	%
Turbidity	0*** NTU	–	NTU	–	NTU
	360 NTU	–	NTU	–	NTU
ORP	240 mV	–	mV	–	mV

Calibrated by: HD

Date: 12/12/22

* use NATA certified reference thermometer from soils clean lab
** air
*** distilled water

NOTES:

Form Updated 21Mar2011