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Dewatering Management Plan

25-27 Leeds Street, Rhodes NSW 2138

Billbergia Pty Ltd

Project No. 22148
Version 1

21 October 2024

Reditus Consulting Pty Ltd
ABN: 34 631 168 502

Dewatering Management Plan

25-27 Leeds Street, Rhodes NSW 2138

Prepared for Billbergia Pty Ltd

DOCUMENT CONTROL

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Roles and Responsibilities

During development construction, the Principal Contractor will be responsible for implementing the appropriate management of the groundwater discharge as detailed in this Dewatering Management Plan (DMP).

All environmental monitoring, assessment of results and compliance reporting must be completed by a suitably qualified environmental consultant and EIANZ Certified Environmental Practitioner – Site Contamination Specialist.

Monitoring, analysis, and assessment of offsite groundwater levels (offsite drawdown) must be completed by a suitability qualified hydrogeologist.

Geotechnical and structural engineering advice may be required if offsite groundwater drawdown threshold levels are triggered.

Details of the nominated Principal Contractor, Hydrogeologist & Environmental Consultant are provided in **Table 1** below.

It must be noted that the DMP is not inclusive of all conditions of consent in relation to groundwater management, and that the Principal Contractor is responsible for making itself aware of, and complying with all relevant conditions of any permits, licenses, and approvals.

This DMP must be reviewed by a suitability qualified professional on a regular basis to ensure compliance with relevant environmental legislation and guidelines. The DMP should be updated where required to comply with any changes to relevant environmental legislation and guidelines.

Table 1. Roles and Responsibilities

ROLE	COMPANY	CONTACT INFORMATION
Applicant / Developer	Billbergia Pty Ltd	**Name**: *To be advised* **Title**: *To be advised* **Phone**: *To be advised*
Principal Contractor	*To be Advised*	*To be advised*
Hydrogeologist & Environmental Consultant	Reditus Consulting Pty Ltd	**Name:** Lee Douglass **Title:** Principal Hydrogeologist EIANZ Certified Environmental Practitioner – Site Contamination Specialist **Phone:** 0412 625 989

Executive Summary

Reditus Consulting Pty Ltd (Reditus) were engaged by Billbergia Pty Ltd (the client) to prepare a Dewatering Management Plan (DMP) for the proposed residential development located at 25-27 Leeds Street, Rhodes, NSW 2138 (the site). The site is identified as Lot C DP367132, Lot A DP329241 and Lot 2 DP1192949 and occupies an area of approximately 1.16 hectares (ha).

A development application (DA2023/0235) was lodged with the City of Canada Bay (CCB) in October 2023 for the *demolition of all buildings onsite and site preparation; excavation for 2 basement levels with vehicular access via Blaxland Road; construction of a mixed-use development containing six (6) buildings ranging from 9 to 13 storeys and comprising: 7 retail premises, 249 apartments, landscape works including tree removal, through site links, communal and private open space and a foreshore park.*

Based on the architectural plans (SJB Architecture Pty Ltd, ref: 6924) the lowest basement level has a finished floor level (FFL) of RL-3.0 mAHD requiring a bulk excavation level (BEL) of RL-3.5 mAHD. The basement footprint occupies an area of approximately 7,200 m^2.

The preliminary basement development plans are provided as **Appendix B**.

This DMP provides details on the hydrogeological setting, construction design, predictions of groundwater extraction volumes, and assessment of potential dewatering impacts. The DMP also provides management strategies to minimise adverse environmental impacts including proposed water treatment system, environmental control procedures, monitoring program, performance criteria and compliance reporting requirements.

Groundwater take estimates were predicted, incorporating both groundwater inflows and matrix removal through excavation of the basement. The groundwater inflows were predicted using a steady-state analytical method developed by Marinelli and Niccoli (2000). The following 'Most Likely' groundwater take estimates were predicted for construction.

DEWATERING AREA	PREDICTED MATRIX TAKE (ML)	PREDICTED ANNUAL GROUNDWATER INFLOW TAKE (ML/YR)	TOTAL GROUNDWATER TAKE DURING CONSTRUCTION (ML)
Basement Excavation	0.406	6.64	**7.049**

Given that groundwater will be intercepted and require dewatering during construction of the basement, the proposed development is considered to be an aquifer inference activity requiring assessment and authorisation under the Water Management Act 2000 (within a Water Sharing Plan zone, regulated by WaterNSW).

Reditus notes the following:

- **Water Sharing Plan**: The site is mapped within the Sydney Basin Central Groundwater Source, under the Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources 2023.

To address the mandatory requirements of WaterNSW and NSW DPE-Water assessment, a DMP is required for the relevant applications. This mandatory information has been summarised within the WaterNSW "Dewatering Checklist for a Water Management Works Approval" form, with the DMP prepared in general accordance with the NSW DPIE (2021) *Minimum Requirements for Building Site Groundwater Investigations and Reporting*. The purpose of this DMP is to facilitate an application for:

- "Approval for Water Supply Works and/or Water Use" to be submitted to WaterNSW under the Water Management Act 2000.

The approvals will be issued on a temporary basis only, usually up to 12 months to cover the construction dewatering phase. It will include conditions to ensure that impacts are acceptable and that monitoring and reporting is implemented.

Based on the groundwater inflow and impact assessment, the dewatering activities are considered to be of **Minimal Impact** under the NSW DPI (2012) Aquifer Interference Policy, WMA 2000 and the NSW DPE (2023) *Groundwater Impact Assessment Criteria – Impact Assessment Criteria that apply to groundwater dealings and approval applications*

To assist the WaterNSW assessment, the following required information required to support the "Approval for Water Supply Works and/or Water Use" application is listed in the table below.

CHECKLIST ITEM & REQUIRED INFORMATION	DEWATERING MANAGEMENT PLAN FINDINGS	PAGE NO. & REPORT SECTION
1. Current groundwater levels, preferably based on at least three repeat measurements from at least three monitoring bores and should be used to develop a water table map for the site and its near environs, be accompanied by an interpretation of the groundwater flow direction from these data, and an assessment of the likely level to which groundwater might naturally rise during the life of the building.	Hourly onsite groundwater elevations were obtained from three (3) onsite monitoring wells over a period of 95 days (approximately 3 months) between 30 May to 2 September 2024. This covered a significant rainfall event including 2 June 2024 where 52.4 mm of rainfall occurred. Groundwater elevation contours were derived for the site based on standing groundwater levels measured at the site on 30 May 2024. The inferred groundwater flow direction is to the north/northeast towards Parramatta River. Standing groundwater levels measured from monitoring wells currently and previously located at the site ranged between 1.90 mAHD to -1.665 mAHD. The average of the maximum levels reported in the monitoring wells was 0.546 mAHD. From the long-term monitoring dataset, groundwater in the aquifer underlying the site fluctuated between 0.548 (RMW04) to 0.34 m (RMW05) during the 3-month monitoring period at the site. It is the professional experience of Reditus that the groundwater levels in porous Sandstone formation can vary naturally by ±4 m or more during prolonged periods of dry or wet weather.	Pages 13-16 Section 4.2
2. Predictions of total volume of groundwater to be extracted during the life of the approval (or during the construction period) – the method of calculation and the basis for parameter estimates and any assumptions used to derive the volume are to be clearly documented.	An analytical steady state model was used to predict groundwater extraction volumes, including both that contained in the excavation matrix and inflow during construction. The total groundwater take volume over the excavation and construction period was predicted to be 7.049 ML. This includes: • A matrix volume of 0.406 ML from the upper unconsolidated alluvial aquifer. • A groundwater inflow volume of 6.664 ML/yr from the underlying sandstone aquifer during construction, which is located within the Sydney Basin Central Groundwater Source, under the Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources 2023. No ongoing inflows are predicted as the basement will be 'fully tanked'.	Pages 24-32 Section 6
3. Predicted duration of dewatering at the property, noting that temporary water supply works approvals are generally issued for no more than 24 months.	The duration of temporary dewatering during construction is expected to be 12 months.	Page 21-22 Section 5.3

CHECKLIST ITEM & REQUIRED INFORMATION	DEWATERING MANAGEMENT PLAN FINDINGS	PAGE NO. & REPORT SECTION
4. Details of how dewatering volumes are to be measured, e.g., by calibrated flow meter or other suitable method, and of the maximum depth of the proposed dewatering system.	Groundwater extraction volumes are to be measured using a calibrated flow meter (inline Magflow meter). The maximum depth of the proposed dewatering system has been determined by the Bulk Excavation Level (BEL) of RL -3.50 mAHD (0.5 m below the Finished Floor Level (FFL) of RL -3.0 mAHD).	Pages 20 & 60 Section 5.1 & 13.4
5. Details of any predicted impacts or particular issues, e.g., proximity of groundwater dependent ecosystems springs; or water supply losses by neighbouring groundwater users; or potential subsidence impacts on nearby structures or infrastructure.	Groundwater Impact Assessment has been completed in **Section 8**, based on the predicted offsite drawdown model results, in general accordance with the NSW DPE (2023) *Groundwater impact assessment criteria* as per the NSW DPI (2012) *Aquifer Interference Policy*. Identification of Potential Dewatering Impacts are presented in **Section 10**. The closest high priority GDE (Samphire Saltmarsh and Grey Mangrove-River Mangrove Forest) is located approximately 1.45 km west of the site. Given the location of the Samphire Saltmarsh and Grey Mangrove-River Mangrove Forest, it is very unlikely to be affected by the proposed construction dewatering. The nearest Water Supply Works (BLR bore) is located 920 m northwest of the site, which is not located within the Rhodes Peninsula and is unlikely to be connected to the site's aquifers intercepted by the basement. Given the most likely predicted drawdown at 2 m from the basement excavation is <1 m, the dewatering works are unlikely to cause a detrimental impact to any GDE's or water supply works. Previous investigations confirmed that acid sulfate soils (ASS) are present at the site from a depth of 1-10.7 m below ground level. Therefore an Acid Sulfate Soil Management Plan is required to be prepared and implemeted during excavation and dewatering works. Potential settlement/subsidence impacts are likely to be lessor of an issue with water bearing rock aquifers, as in the case of the proposed development within a porous sandstone aquifer. The predicted drawdown at 2 m from the basement excavation is <1 m. A drawdown in the water table of 1 m or less is considered unlikely to result in off-site geotechnical settlement impacts. A drawdown monitoring program and contingency recommendation are provided within the DMP.	Pages 37-40, 47-49, and 32 Section 8, 10 & 6.7.4
6. Details of monitoring proposed during the dewatering program. These should be designed to inform and facilitate the protection of any identified potential impacts.	The requirements for monitoring, management, and compliance reporting of potential impacts (including discharge water quality, drawdown/settlement, noise, vibration and odour) are detailed in **Sections 11 to 14** of this DMP.	Page 50-63 Sections 11 to 14

CHECKLIST ITEM & REQUIRED INFORMATION	DEWATERING MANAGEMENT PLAN FINDINGS	PAGE NO. & REPORT SECTION
7. Details of ambient groundwater quality conditions beneath the property and of any proposed treatment to be applied to pumped water prior to disposal – at a minimum, treatment must be undertaken to remove contaminants, manage pH levels, reduce suspended solids and turbidity to acceptable levels and ensure that dissolved oxygen levels are compatible with ambient quality requirements in receiving waters. Groundwater cannot be re- injected into an aquifer without the specific approval of, and licensing by, WaterNSW.	Groundwater sampling of 10 onsite groundwater monitoring well was completed in May 2024. Tabulated analytical results are provided as **Appendix E** and copies of the laboratory reports are provided as **Appendix F**. The groundwater samples reported concentrations of potential contaminants of concern below the adopted ANZG (2018) 95% marine water quality guidelines and the PFAS NEMP 2.0 (2020), with the exception of heavy metals and PFAS. Cobalt, copper, lead, nickel and zinc were reported above the ANZG (2018) 95% marine water quality guidelines. PFAS was reported exceeding the PFAS NEMP (2020) Guidelines in wells MW1-B, MW2-B, MW3-B, MW4-B, RMW01 and RMW04 with reported concentrations of PFOS ranging between 0.0003 to 0.0130 µg/L. Based on the above concentrations, water treatment may be required. The proposed water treatment system is specified in **Section 12**. Water Quality Objectives (**Section 9**) and Adopted Discharge Criteria (**Section 9.3**) are provided in the DMP. Groundwater re-injection is not currently proposed.	Pages 17-18, 41-46, and 52-54 Sections 4.4, 9 and 12
8. Details of how reporting will occur during and following the dewatering program, to confirm that predicted quantities and quality objectives were met.	Weekly dewatering reports summarising the monitoring results are recommended for the Stage 1 & 2 monitoring periods. Following completion of the Stage 1 & Stage 2 monitoring period, ongoing monitoring reports will be completed on a monthly basis during Stage 3 monitoring period. A "Completion Report" detailing the volume of water taken and groundwater condition post construction dewatering activities, which will be provided to WaterNSW/NRAR within 6 months of completion of dewatering during construction.	Page 63 Section 14
9. Description of the method of dewatering and related construction including any proposal to use temporary piling or support walls and the relative depths thereof.	The basement will be constructed as a 'fully tanked' basement with secant pile walls around the perimeter of the entire basement which will be keyed into moderate to high strength sandstone. The proposed secant pile wall construction will prevent groundwater inflows (to minimise as much as possible the take of groundwater) from the upper unconsolidated alluvial aquifer following completion of the construction works. This will effectively create a watertight seal from the upper unconsolidated alluvial aquifer. The inherent impermeable nature of the Secant Pile Walls will prevent groundwater inflow from the unconsolidated sand/clay formation; therefore, the only groundwater inflows will be limited to that from the underlying sandstone formation (vertical inflow from the base until tanked construction is finished). The excavation and	Pages 20-21 Section 5

CHECKLIST ITEM & REQUIRED INFORMATION	DEWATERING MANAGEMENT PLAN FINDINGS	PAGE NO. & REPORT SECTION
	dewatering will only commence after the Secant Pile Walls have been completed. Groundwater from within the Secant Pile walls is proposed to be extracted using a combination of either a series of spearpoints internally around the permitter of the excavation and/or internal large diameter extraction wells and/or sumps. Once the upper unconsolidated alluvial sand/clay are removed from within the excavation, and the excavation extends into the underlying sandstone, groundwater extraction using sump pumps is likely to be sufficient.	

1 Introduction

Reditus Consulting Pty Ltd (Reditus) were engaged by Billbergia Pty Ltd (the client) to prepare a Dewatering Management Plan (DMP) for the proposed residential development located at 25-27 Leeds Street, Rhodes, NSW 2138 (the site). The site is identified as Lot C Deposited Plan (DP) 367132, Lot A DP329241 and Lot 2 DP1192949 and occupies an area of approximately 1.16 hectares (ha).

A development application (DA2023/0235) was lodged with the City of Canada Bay (CCB) in October 2023 for the *demolition of all buildings onsite and site preparation; excavation for 2 basement levels with vehicular access via Blaxland Road; construction of a mixed-use development containing six (6) buildings ranging from 9 to 13 storeys and comprising: 7 retail premises, 249 apartments, landscape works including tree removal, through site links, communal and private open space and a foreshore park.*

Based on the architectural plans (SJB Architecture Pty Ltd, ref: 6924) the lowest basement level has a finished floor level (FFL) of RL-3.0 metres Australia Height Datum (mAHD) requiring a bulk excavation level (BEL) of RL-3.5 mAHD. The basement footprint occupies an area of approximately 7,200 m^2.

The site location is provided in Figure 1, Appendix A and the site details are summarised in **Table 2** below.

Table 2. Site Identification Details

ITEM	DETAIL
Street Address	25-27 Leeds Street, Rhodes, NSW 2138
Lot and Deposited Plan	• 25 Leeds St: – Lot C DP367132 – Lot A DP329241 • 27 Leeds St: Lot 2 DP1192949
Local Government Area	City of Canada Bay Council
Site Coordinates of the approximate centre of the site (GDA2020-MGA56)	Easting: 323198.33 Northing: 6255760.83
Site Area	Approximately 1.16ha
Basement Excavation Areas	Basement 1 – Approximately 7,200 m^2 Basement 2 – Approximately 7,200 m^2
Bulk Excavation Levels (BEL)	RL-3.5 mAHD
Site Location	**Figure 1, Appendix A**
Site Layout	**Figure 2, Appendix A**
Water Sharing Plan	Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources 2023
Groundwater Source	Sydney Basin Central Groundwater Source

Given that groundwater will be intercepted and require dewatering during construction of the basement, the proposed development is an aquifer inference activity requiring assessment and authorisation under the Water Management Act 2000 (WMA 2000) (within a Water Sharing Plan zone, regulated by WaterNSW).

To address the mandatory requirements of WaterNSW and NSW DPIE-Water assessment, a DMP was required for the relevant applications. This mandatory information has been summarised within the WaterNSW "Dewatering Checklist for a Water Management Works Approval" form. The DMP has been prepared in general accordance with the NSW DPE (2021) *Minimum requirements for building site groundwater investigations and reporting*. The purpose of this DMP is to facilitate an application for:

- "Approval for Water Supply Works and/or Water Use" to be submitted to WaterNSW under the Water Management Act 2000 and Part 5 of the Water Act 1912.

Reditus note that if approval is granted under the WMA 2000, the dewatering works may require a Water Access License (WAL) as the predicted inflows are >3 ML/yr.

1.1 Objectives

Dewatering activities have the potential to impact the surrounding environment, primarily associated with:

- Potential settlement issues as a result of groundwater drawdown outside the site.
- Potential groundwater drawdown impacts on surrounding water supply works (e.g., domestic bores) or environmental groundwater uses.
- Potential issues with groundwater drawdown in acid sulfate soil environments.
- Potential mobilisation and migration of contamination from offsite sources.

The primary objectives of the DMP are to:

- Provide details on the hydrogeological setting of the site and a summary of key environmental factors relevant to dewatering with specific focus on water quality and aquifer properties at the site.
- Provide details of the proposed development layout, construction design and dewatering methods.
- Preparation of a steady-state analytical model to provide an estimate of the groundwater take and predictions of groundwater drawdown resulting from the basement dewatering during construction.
- Determine the potential impacts of the dewatering activity to groundwater dependent ecosystems (GDEs), springs, water supply works and potential for subsidence impacts on nearby structures or infrastructure (through assessment against the Minimal Impact thresholds detailed under the NSW DPI (2012) Aquifer Interference Policy, WMA 2000 and the NSW DPE (2023) Groundwater Impact Assessment Criteria to demonstrate that the proposed dewatering meets relevant "Minimal Impact" assessment criteria and therefore supports a Water Supply Works approval under the Water Management Act 2000.
- Provide details of the proposed dewatering pumping method and proposed water treatment system to ensure compliance with relevant guidelines and regulations.
- Provide management strategies to minimise adverse environmental impacts.
- Establish environmental control procedures, monitoring program, performance criteria and compliance reporting to assess the potential impacts of extracted groundwater on the receiving environment and the effectiveness of implemented controls.

1.2 Scope of Works

To meet the above objectives, the following scope of work was undertaken:

- Review of available development plans, construction methods, stormwater/hydraulic design plans, geotechnical & contamination reports, landscape plans and site surveys.
- A review of relevant groundwater policy, legislation, regulations, and guidelines, including:
  - NSW DPI (2012) Aquifer Interference Policy.
  - Water Management Act 2000 and Part 5 of the Water Act 1912.

  - NSW DPE (Oct 2022) Minimum Requirements for Building Site Groundwater Investigations and Reporting (revision V02.2210).
  - NSW DPE (2023) Groundwater Impact Assessment Criteria – Impact Assessment Criteria that apply to groundwater dealings and approval applications.
  - WaterNSW "Dewatering Checklist for a Water Management Works Approval" and "Geotechnical Investigation Reports Minimum Requirements" fact sheet.
- Review of basement construction details relevant to dewatering and proposed dewatering methodology.
- Development of groundwater elevation contour plan, interpretation of groundwater flow direction and assessment of the likely level fluctuations during the life of the building.
- Data analysis and interpretation of rising head (slug test) data and water quality data collected from the site.
- Development of a conceptual flow model to replicate the proposed excavation activity. This was completed using a steady-state analytical groundwater flow model for best case, most likely and upper-case scenarios, allowing prediction of groundwater inflow volumes and groundwater drawdown extent resulting from the proposed basement excavation and construction design:
  - Completion of analytical equations to derive groundwater extraction volumes using a range of representative aquifer parameters from published literature values and site-specific data.
  - Estimate volume of groundwater required to be removed during the dewatering process and assess the likely impacts of the dewatering activities on other groundwater users/receptors against the Minimal Impact thresholds detailed in the NSW DPE (2022) Groundwater Impact Assessment Criteria.
- Assessment of model results against the NSW DPE (2012) Aquifer Interference Policy Minimal Impact assessment criteria and the NSW DPE (2023) Groundwater Impact Assessment Criteria - Impact Assessment Criteria that apply to groundwater dealings and approval applications.
- Specify the discharge water quality criteria, anticipated treatment requirements and proposed water treatment system, sampling frequency and compliance reporting requirements.
- Preparation of this Dewatering Management Plan (this document).

1.3 Limitations

A detailed statement of limitations for this report is provided in **Section 15**.

This report is based on the Scope of Work outlined above in **Section 1.2**. Reditus prepared this report in a manner consistent with the normal level of care and expertise exercised by members of the environmental and hydrogeological assessment profession.

This report relates only to the objectives stated and does not relate to any other work undertaken for the Client (Billbergia Pty Ltd). It is a report based on the information reported in previous environmental and geotechnical assessments by others, and data made available to Reditus. These conditions stated in this report may change with time and space.

All conclusions regarding the property area are the professional opinions of Reditus, subject to the qualifications in the report. Whilst normal assessments of data reliability have been made, Reditus assumes no responsibility or liability for errors in any data obtained from regulatory agencies, statements from sources outside of Reditus, or developments resulting from situations outside the scope of this project. The client acknowledges that this report is for the exclusive use of the client.

All groundwater models include some degree of uncertainty in their predictions as they are, by necessity, simplifications of complex real world systems. Whilst every effort is made to ensure that the primary model reflects the 'best case', 'most likely' case and 'upper case' understanding of site conditions, this cannot be guaranteed and any model result presented as a single number should be viewed with a degree of caution.

Factors which significantly affect the groundwater model and impact assessment results include dewatering rate, dewatering design, dewatering period, aquifer characteristics and degree of aquifer variability (including hydraulic conductivity, specific yield/ storativity, porosity, recharge, heterogeneity).

A suitability qualified geotechnical consultant will be required to determine the potential settlement impacts caused by the potential drawdown as a result of the proposed dewatering activities. Detailed geotechnical considerations are beyond the scope of this assessment.

2 Document and Data Review

The following documents specific to the site were utilised for preparation of this report:

- ADE Consulting Group (2020) PFAS Investigation of Rhodes East – Leeds Foreshore Rhodes East Site 1 – Leeds Foreshore (ref; STC-2110-18546).
- ADE Consulting Group (2023) Detailed Site Investigation 25-27 Leeds Street, Rhodes, NSW (ref: 22.0861 DSI.v1d).
- ADE Consulting Group (2023) Acid Sulfate Soil Management Plan 25 – 27 Leeds Street, Rhodes NSW (ref: A101022.0861.ASSMP1).
- ADE Consulting Group (2022) Geotechnical Site Investigation Report, 25-27 Leeds Street, Rhodes NSW 2138 (ref: A201022.0990.00_v2f).
- Jacobs (2016) Rhodes East Priority Investigation Area Contamination and Acid Sulphate Soils Report (ref: IA102900).
- Reditus Consulting Pty Ltd (2024) – Detailed Site Investigation, 25-27 Leeds Street, Rhodes, NSW (ref: 22148RP01).
- SJB Architecture (NSW) Pty Ltd Architectural Plans for 25-27 Leeds Street, Rhodes (ref: 6924).

3 Geological Setting

Previous geotechnical and environmental investigations have been completed at the site which provide an understanding of the site geology. A summary of the geology at the site is summarised below.

3.1 Geology

The “Sydney Geological Series Sheet 9130, 1:100,000 scale” map produced by the Geological Survey of NSW indicates that geology at the site consists of Triassic aged Wianamatta Group Hawkesbury Sandstone (Rh) which is overlain by Ashfield Shale (Rwa) in the more elevated areas away from the Parramatta River. Hawkesbury Sandstone is described by the map as “medium to coarse grained quartz sandstone, very minor shale and laminate lenses”. The area immediately south of the site is described as man-made fill (mf) “dredged estuarine sand and mud, demolition rubble, industrial and household waste” and overlies alluvial soils and Hawkesbury sandstone.

The “Sydney Soil Landscape Series Sheet 9130” map produced by the Soil Conservation Service of NSW indicates that soils within the site are within the Blacktown soil landscape grouping. The landscape in this grouping is characterised as gently undulating rises to steep low hills on Wianamatta Group shales and Hawkesbury sandstone. Soils are characterised as shallow to moderately deep (<100cm) Red and Brown Podzolic Soils on crests, upper slopes and well drained areas; deep (150-300cm) Yellow Podzolic Soils and Soloths on lower slopes and in areas of poor drainage.

3.2 Site Specific Geology

The site specific geology has been determined through intrusive investigations as reported by the projects suitably qualified Geotechnical Engineers, ADE Consulting (December 2022).

The generalised site stratigraphy was described as follows:

- FILL – comprising silty sand/silty clay/gravelly sand/clayey sand with fine to coarse grained gravel was encountered in all boreholes to depths ranging approximately 0.5 to 2.5 m below ground level (mbgl).
- Alluvial silty clay and silty sand – Silty clay of medium to high plasticity between firm to very stiff strength generally encountered below fill in each borehole overlying sandy clay and fine to medium grained silty sand. Trace fine grained gravels observed.
- Weathered sandstone bedrock – Weathered sandstone bedrock encountered in all boreholes below alluvial soils between 1.0 mbgl and 6.5 mbgl. Sandstone bedrock generally extremely to highly weathered and extremely low or very low strength from first contact. Improved to slightly weathered to fresh and to medium and high strength with depth.

3.3 Acid Sulphate Soils

Acid sulfate soils (ASS) occur predominantly on coastal land with elevations generally below 5 mAHD. These soils also occur further inland in saline seepage areas, rivers, lake beds and irrigation channels. Where present, drawdown of the local water table can expose ASS to oxidising conditions creating acidity and mobilising metals at potentially harmful concentrations.

A review of the Canada Bay Local Environmental Plan 2009 acid sulfate soil risk map indicated that the majority of the site is located within a Class 2 ASS risk area, whilst the southwestern portion is located within a Class 5 ASS risk area. Acid sulfate soils in a Class 2 areas are likely to be found below the natural ground surface. Acid sulfate soils are not usually found in Class 5 areas, however, are within 500m of adjacent Class 1, 2, 3 or 4 soils.

The Detailed Site Investigation (Reditus, 2024 ref; 22148RP01) confirmed that ASS is present at the site from a depth of 1 mbgl to 10.7 mbgl. Therefore, an Acid Sulfate Soil Management Plan is required to be prepared and implemented during the excavation and dewatering works for the proposed development.

4 Hydrogeological Setting

The site is located within the *Sydney Basin Central Groundwater Source*, which is managed under the WMA 2000 through the *Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources 2023*.

The groundwater system within the development extent on the site is described as:

- **Unconfined Alluvial Aquifer**: Shallow unconfined to semi-confined groundwater system within the shallow alluvial silty clay and silty sand formation.
- **Semi-Confined/Confined Weathered and Fractured Sandstone Aquifer**: Semi-confined/Confined groundwater system comprising weathered and fractured sandstone of Middle Triassic Hawkesbury Sandstone.

4.1 Groundwater Monitoring Wells

Several groundwater investigations have been completed at the site and groundwater monitoring wells installed at the site are summarised as follows:

- MW01 to MW15 were installed by Jacobs in 2016 during the Contamination Assessment. It is noted that the majority of these wells have been lost/destroyed, only MW01 and MW14 remain at the site.
- MW1-B to MW4-B were installed by ADE in October 2022 during the Detailed Site Investigation and Geotechnical Site Investigation. It is noted that no well construction details were provided in the report therefore, it was unable to be determined where the wells were screened.
- Groundwater monitoring wells RMW01 through to RMW05 were installed by Reditus in April 2024. The groundwater monitoring wells were screened in either the alluvial soils or the sandstone formation to target specific aquifers.

The monitoring wells have been installed to depths ranging between RL 0.186 mAHD to -7.81 mAHD. All monitoring wells (with the exception of MW14) have been installed below the proposed basement finished floor level (FFL) (RL -3.0 mAHD) and the proposed basement bulk excavation level (BEL) (RL -3.5 mAHD).

The groundwater monitoring well locations are provided in **Figure 2**, **Appendix A**. Copies of available borehole drilling logs and well construction logs are provided in **Appendix C**.

4.2 Site Groundwater Elevations and Inferred Flow Direction

Groundwater level monitoring has been conducted by both manual measurements and programable data loggers, detailed as follows:

- **Manual**: Groundwater elevation measurements have been recorded on the following dates:
  - 19 August 2016 (MW01 and MW14).
  - 30 May 2024 (RMW01-RMW05).
  - 2 September 2024 (RMW01-RMW05).
- **Data Loggers**: Long-term groundwater level monitoring was conducted over 95 days (approximately 3 months), between 30 May 2024 to 2 September 2024. This covered a significant rainfall event including 2 June 2024 where 52.4 mm of rainfall occurred.

4.2.1 MANUAL MEASUREMENTS

A summary of the groundwater monitoring wells, and manual measurements recorded is provided in **Table 3** below.

Table 3. Manual Groundwater Elevation Measurements

WELL ID	DATE	TOC (RL mAHD)	DEPTH OF WELL (RL mAHD)	DEPTH TO WATER (mbTOC)	DEPTH TO WATER (RL mAHD)	COMMENTS
MW01	19/08/2016	2.747	-3.253	3.582	0.835	Screened within the shallow alluvial aquifer
MW14	19/08/2016	3.486	0.186	5.174	1.688	Screened within the shallow alluvial aquifer
RMW01	30/05/2024	2.86	-4.54	2.245	0.615	Screened within the shallow alluvial aquifer
	02/09/2024			2.265	0.595	
RMW02	30/05/2024	2.842	-7.81	2.32	0.522	Screened within the deeper sandstone aquifer
	02/09/2024			2.175	0.667	
RMW03	30/05/2024	2.963	-7.32	3.84	-0.877	Screened within the deeper sandstone aquifer
	02/09/2024			2.527	0.436	
RMW04	30/05/2024	2.985	-3.75	4.65	-1.665	Screened within the shallow alluvial aquifer
	02/09/2024			3.03	-0.045	
RMW05	30/05/2024	6.92	-6.98	5.04	1.88	Screened within the deeper sandstone aquifer
	02/09/2024			5.02	1.90	
			Minimum:	2.175	-1.665	
			Maximum:	5.174	1.90	
			Mean:	3.296	0.546	
			Median:	3.306	0.605	

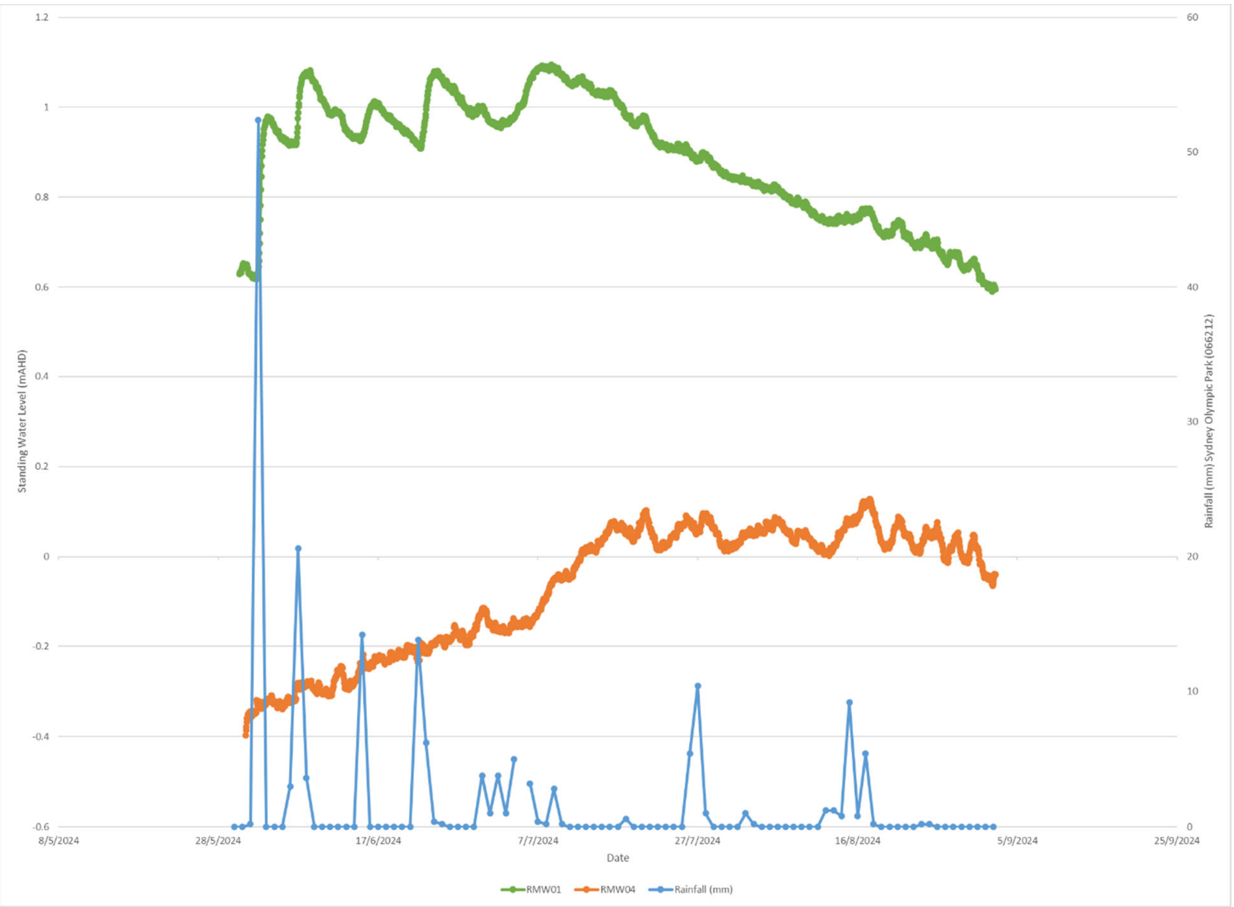
TOC – top of casing

RL mAHD – Reduced level metres Australian Height Datum

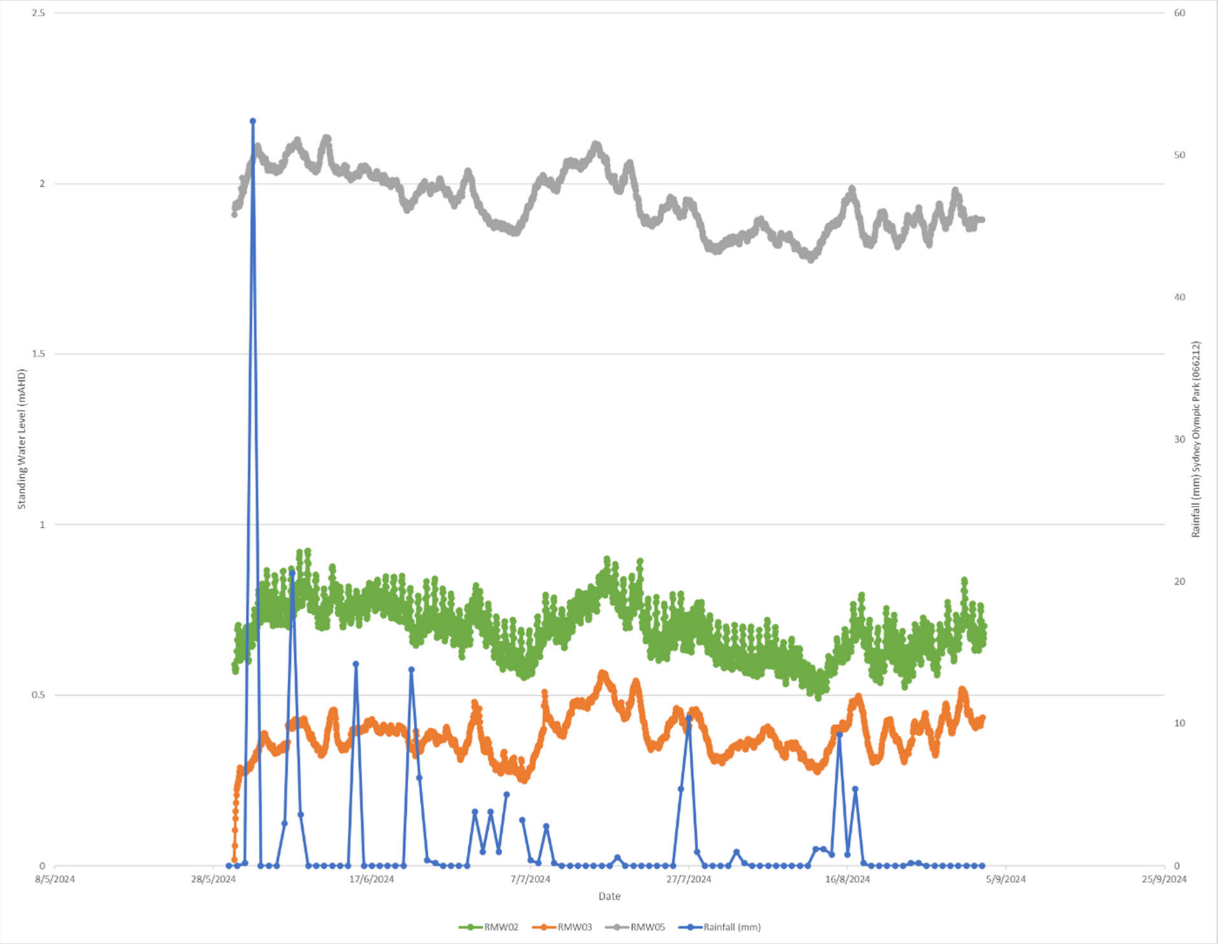
mbTOC – metres below top of casing

4.2.2 DATA LOGGERS

The data loggers recorded hourly groundwater elevation measurements over 95 days (approximately 3 months), between 30 May 2024 to 2 September 2024. Standing groundwater levels (SWL, RL mAHD), overlain with the recorded rainfall during this period (Sydney Olympic Park AWS 066212) have been plotted in **Graph 1** and **Graph 2** below.



Graph 1. Long-term Groundwater Elevation Measurements and Rainfall over 95 day period (3 months) within the shallow alluvial aquifer. Compensated to barometric changes.



Graph 2. Long-term Groundwater Elevation Measurements and Rainfall over 95 day period (3 months) within the deeper sandstone aquifer. Compensated to barometric changes.

The following key findings were reported from the long-term groundwater elevation monitoring:

- Standing groundwater levels at the site fluctuated at each well by 0.548 m (RMW04) to 0.36 m (RMW05) across the five (5) monitoring wells during the 3-month monitoring period at the site.
- Standing groundwater levels at the site do not appear to respond directly to local rainfall events within both the deep sandstone aquifer and the shallow alluvial aquifer exception of RMW01 where a steep rise in standing groundwater level was observed on 2 June 2024. This steep rise corresponds to a heavy rainfall event where 52.4 mm of rainfall was recorded.
- The maximum groundwater elevations reported over the 95-day monitoring period were as follows:
  - RMW01: 1.094 mAHD (~1.766 m below ground level).
  - RMW02: 0.923 mAHD (~1.919 m below ground level).
  - RMW03: 0.566 mAHD (~2.397 m below ground level).
  - RMW04: 0.128 mAHD (~2.857 m below ground level).
  - RMW05: 2.136 mAHD (~4.784 m below ground level).
  - Average of maximums: 0.969 mAHD, median of maximums: 0.923 mAHD.

4.2.3 INFERRED FLOW DIRECTION

Based on the measurements recorded of the standing groundwater levels at the site on 30 May 2024, groundwater elevation contours have been prepared using kriging interpolated software. The inferred groundwater flow direction is to the north/northeast towards Parramatta River. The groundwater contours established for the site are presented in **Figure 3, Appendix A**.

4.3 Site Specific Hydraulic Conductivity

Rising head aquifer tests (slug tests) were completed on the five (5) recently installed groundwater monitoring wells (RMW01 through to RMW05 inclusive) installed at the site by Reditus.

Slug tests were conducted on 2 September 2024, groundwater elevation measurements were collected at nominal 1 second intervals using programable pressure transducers (diver data loggers) following the instantaneous removal of water from the well column (assumed to be instantaneous). Groundwater displacement measurements were processed using a computer software package AQTESOLV Pro (version 4.0) and the groundwater displacement data was analysed using the Bouwer-Rice (1976)[1] and Hvorslev (1951)[2] solution for a confined aquifer. Estimates of hydraulic conductivity were calculated and are summarised in **Table 4** below. Slug test analysis outputs are provided in **Appendix D**.

Table 4. Estimates of Hydraulic Conductivity

WELL ID	DATE	HYDRAULIC CONDUCTIVITY (m/day) Hvorslev 1951 Solution (confined aquifer)	HYDRAULIC CONDUCTIVITY (m/day) Bouwer Rice 1976
Shallow Alluvial Aquifer			
RW01	02-Sep-24	3.22×10^{-1}	2.38×10^{-1}
RW04	02-Sep-24	1.19×10^{-2}	8.69×10^{-3}
Minimum:			8.69×10^{-3}
Maximum:			3.22×10^{-1}
Mean:			1.45×10^{-1}
Median:			1.25×10^{-1}
Deep Sandstone Aquifer			
RMW02	02-Sep-24	6.10×10^{-2}	5.60×10^{-2}
RMW03	02-Sep-24	1.20×10^{-2}	9.00×10^{-3}
RMW05	02-Sep-24	9.90×10^{-2}	7.80×10^{-2}
Minimum:			9.00×10^{-3}
Maximum:			9.90×10^{-2}
Mean:			5.25×10^{-2}
Median:			5.85×10^{-2}

The above estimates of hydraulic conductivity are noted to be generally consistent with literature values[3] for sandstone.

4.4 Groundwater Quality Sampling Results

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[1] Bouwer, H. and R.C. Rice, 1976. A slug test method for determining hydraulic conductivity of unconfined aquifers with completely or partially penetrating wells, Water Resources Research, vol. 12, no. 3, pp. 423-428.

[2] Hvorslev, M.J., 1951. Time Lag and Soil Permeability in Ground-Water Observations, Bull. No. 36, Waterways Exper. Sta. Corps of Engrs, U.S. Army, Vicksburg, Mississippi, pp. 1-50.

[3] Fitts, C.R., 2013. Groundwater Science (2nd ed.). Academic Press.

Collection and analysis of groundwater samples from 10 onsite monitoring wells (EW1, MW1-B-MW4-B and RMW01-RMW05) was completed by Reditus in May 2024. The groundwater monitoring well locations are presented in **Figure 2**, **Appendix A**, tabulated analytical results are provided as **Appendix E** and copies of the laboratory reports are provided as **Appendix F**.

The groundwater samples were submitted to the NATA accredited laboratories Envirolab (primary laboratory) and ALS Environmental (secondary laboratory) for the analysis of:

- Major Anions and Cations.
- Ionic Balance.
- Nutrients (including ammonia, nitrate, total nitrogen, oxidised nitrogen, total phosphorus and reactive phosphorus).
- Faecal coliforms and escherichia coli (E coli).
- Benzene, Toluene, Ethylbenzene, Xylenes, Naphthalene (BTEXN).
- Total Recoverable Hydrocarbons (TRH).
- Polycyclic Aromatic Hydrocarbons (PAHs).
- Heavy Metals (including arsenic (As), cadmium (Cd), chromium (Cr), copper (Cu), lead (Pb), mercury (Hg), nickel (Ni), zinc (Zn), aluminium (Al), antinomy (Sb), boron (B), beryllium (Be), cobalt (Co), iron (Fe), lithium (Li), manganese (Mn), molybdenum (Mo), selenium (Se), silver (Ag), strontium (Sr), uranium (U) and vanadium (V)).
- Total dissolved solids (TDS), total suspended solids (TSS) and turbidity.
- Per- and polyfluoroalkyl Substances (PFAS).
- Dioxins and Furans.

All samples collected reported concentrations of BTEXN, TRH, PAHs and Dioxins below the ANZG (2018) 95% Marine Water Quality Guidelines.

Concentrations of heavy metals were reported below the ANZG (2018) 95% Marine Water Quality Guidelines, with the exception of cobalt, copper, lead, nickel and zinc, which reported the following concentration ranges:

- Cobalt: 25 to 92 µg/L.
- Copper: <1 to 120 µg/L.
- Lead: <1 to 44 µg/L.
- Nickel: <1 to 130 µg/L.
- Zinc: 4 to 620 µg/L.

PFAS was reported exceeding the PFAS NEMP (2020) Guidelines in wells MW1-B, MW2-B, MW3-B, MW4-B, RMW01 and RMW04 with reported concentrations of PFOS ranging between 0.0003 to 0.0130 µg/L.

4.5 Registered Groundwater Bore Search

A search of the WaterNSW Registered Groundwater Bore Database (https://realtimedata.waternsw.com.au/water.stm) indicated there are 16 registered groundwater bores with a 1 km radius of the site. One (1) of the registered bores is a Water Supply Works (BLR bore) while the remaining 15 are shallow monitoring bores. Locations of the registered bores are presented on **Figure 4** in **Appendix A**.

The Water Supply Works (BLR bore) is located 920 m northwest of the site, on the other side of the Parramatta River, which is not located within the Rhodes Peninsula and is unlikely to be connected to the site's aquifers intercepted by the basement. Therefore, there are no Water Supply Works that have the potential to be impacted by the proposed basement development.

4.6 Groundwater Dependant Ecosystems

Groundwater dependent ecosystems (GDEs) are a diverse and important component of biological diversity. The term GDE takes into account ecosystems that use groundwater as part of their survival strategies. GDEs can potentially include wetlands, vegetation, mound springs, river base flows, cave ecosystems, playa lakes and saline discharges, springs, mangroves, river pools, billabongs and hanging swamps and near-shore marine ecosystems.

The groundwater dependence of ecosystems can range from complete to partial reliance on groundwater, such as might occur during droughts. The degree and nature of groundwater dependence will influence the extent to which they are affected by changes to the groundwater system, both in quality and quantity.

Many land and water use activities within a catchment can affect groundwater dependent ecosystem function and viability. It is important to manage these land and water use activities within a regulatory and licensing framework. Risk assessment guidelines for groundwater dependent ecosystems have been developed to operate within the regulatory and licensing framework provided by the Water Management Act 2000 and Water Sharing Plans (WSPs). The guidelines are based on an assessment of various ecological and risk factors that are important to decisions on allowing a proposed activity or development.

WSPs have been developed for groundwater systems in NSW to preserve water resources by establishing rules for sharing water between different types of water uses. The site is located within the Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources (2023) – Sydney Basin Central Groundwater Source.

The WSP define the extent and locations of High Priority GDE, which are mapped within the WSP as groundwater dependant vegetation ecosystems. NSW DPIE Water has adopted the Guidelines for Identifying High Ecological Value Aquatic Ecosystems (HEVAE) framework developed by the Australian Commonwealth Government to establish the High Priority GDEs mapped within the WSP. The map High Priority GDEs referred to in the WSP represent the 'Very High and High' categories of the HEVAE zones. As presented in **Figure 5, Appendix A**, there are no High Priority GDEs within 1 km of the site. The closest high priority GDE (Samphire Saltmarsh and Grey Mangrove-River Mangrove Forest) is located approximately 1.45 km west of the site. Given the location of the Samphire Saltmarsh and Grey Mangrove-River Mangrove Forest, it is very unlikely to be affected by the proposed construction dewatering.

5 Proposed Development

5.1 Development Details

The proposed development includes the demolition of the existing buildings onsite and the construction of four high rise towers for mixed use development, each between 11 and 17 storeys over a two (2) level basement. Based on the architectural plans (SJB Architecture (NSW), 17 April 2024), the lowest basement level has a finished floor level (FFL) of RL -3.0 mAHD. The bulk excavation level (BEL) is assumed to be approximately 0.5 m below the basement FFL. The lowest BEL of the basement is therefore RL -3.50 mAHD which will require excavation depths of between 11.5 and 7.5 m below the existing ground levels at the site.

Copies of the architectural drawings showing the proposed basements are provided in **Appendix B**.

A summary of the proposed basement excavation parameters is provided in **Table 5** below.

Table 5. Summary of Proposed Excavation Parameters

ITEM	DESCRIPTIONS
Basement Excavation Footprint Areas (m^2)	Approximately 7,200 m^2
Site Surface Elevation	The site slopes from the south to the north towards the Parramatta River with a fall from approximately 8 mAHD in the south to approximately 0 mAHD to the north along Parramatta River.
Basement Finished Floor Levels (FFL)	RL -3.0 mAHD
Bulk Excavation Levels[1] (BEL)	RL -3.5 mAHD

[1] Assumed to be 0.5 m below the basement FFLs.

5.2 Basement Construction Methodology

The proposed construction methodology is of a ‘fully tanked’ watertight structure using Secant Pile Wall construction methods.

The Secant Pile Wall is proposed to be constructed around the entire excavation perimeter, which will be keyed at least 1.5 m into moderate-high strength sandstone of naturally low permeability strata. The proposed Secant Pile wall construction design prevents groundwater inflows (to minimise as much as possible the take of groundwater) from the upper unconsolidated alluvial aquifer following of the construction works. This will effectively create a water-tight seal from the upper unconsolidated alluvial aquifer to the basement.

An example of a Secant Pile Wall is provided in **Figure 1** below.

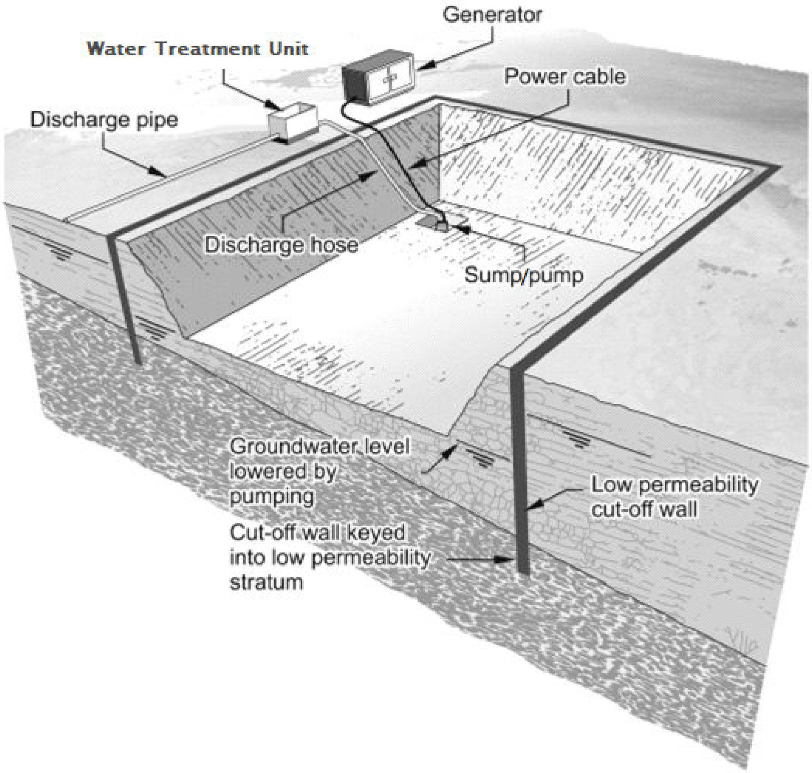

Figure 1. Example of a Low Permeability Secant Pile Wall Construction Dewatering

The inherent impermeable nature of the Secant Pile Wall will prevent groundwater inflow from the upper unconsolidated alluvial aquifer formation, therefore the only groundwater inflow will be limited to that from the underlying sandstone formation (vertical inflow from the base) until the floor slab is poured and the tanked construction is finished.

5.3 Dewatering Extraction Rate and Duration

The excavation and dewatering will only commence after the Secant Pile walls have been completed. Groundwater from within the Secant Pile walls is proposed to be extracted using a combination of either a series of spearpoints internally around the permitter of the excavation and/or internal large diameter extraction wells and/or sumps.

Once the upper unconsolidated alluvial sand/clay are removed from within the excavation, and the excavation extends into the underlying sandstone, groundwater extraction using sump pumps is likely to be sufficient.

From an environmental perspective, the proposed basement construction method is recommended as it is effective in:

- Mitigating the risk of environmental impacts associated with drawdown of the water table, and the potential settlement of unconsolidated soils (through installation of the Secant Pile wall, keyed into sandstone).
- Reducing the volume of extracted groundwater to be discharged off-site.

Irrespective of the method, the dewatering depth shall be minimised to the extent practicable to reduce the volume of water to be extracted and to limit groundwater drawdown.

Dewatering is likely to be required to operate 24 hours a day / seven days a week to maintain groundwater level at the base of the excavation and ensure that basement is kept dry.

The uncertainty around the final dewatering method prevents absolute quantitative assessment of the pumping rates and project volumes. The many variables involved in dewatering make predicting flow rates problematic. These variables include variations in recharge rates, effects of varying geology on hydraulic conductivity and soil porosity, and natural and built hydraulic barriers and recharge zones. As such, the rate of groundwater extraction will be highly dependent on the required time frame for excavation works and can be varied to match excavation depth speed and/or discharge restrictions (if any).

The duration to complete the necessary excavation works and basement construction is assumed to be approximately 12 months. Dewatering is likely to be required continuously until the basement is constructed and watertight and there is sufficiently built loading to neutralise hydrostatic pressure.

To minimise interruptions to the project and unnecessary expenditure, it is recommended that extraction pumps that can cater for low to high flow rates rather than mobilising multiple pumps that may not be required if lower flows are encountered.

The predicted extraction volume required to be dewatered is provided in **Section 6** below, with the 'Most Likely' groundwater take predicted to be **7.049 ML.** The majority of this groundwater take (6.64 ML) is apportioned the groundwater inflow into the excavation void, as opposed to the groundwater within the matrix (pore water).

Assuming an excavation period of 12 months, an average groundwater extraction and discharge rate of <0.3 L/s is expected to be maintained to keep the excavation free of water.

5.4 Discharge Methods

Approval shall be obtained from City of Canada Bay to direct dewatered and treated groundwater to the stormwater network.

A permit from Council is required for discharge of any dewatering groundwater (tail water). Council require groundwater/tailwater to be discharged to be compliant with the General Terms of Approval/Controlled Activity permit issued by WaterNSW (if applicable), Landcom's 'Managing Urban Stormwater: Soils and Construction' (2004) (Blue Book), Council's Compliance and Enforcement Policy and legislation including Protection of the Environment Operations Act 1997 and Contaminated Lands Act 1997. All approvals, water discharges and monitoring results are to be documented and kept on site. Copies of all records shall be provided to the appropriate regulatory authority, including Council, upon request.

A direct connection to stormwater is a preferred option and it is expected that a direct connection to the local stormwater pit and/or discharge point from the dewatering and treatment system will be completed on either Leeds Street or Blaxland Road.

Appropriate treatment of extracted groundwater will be required during the proposed dewatering program to improve the water quality and minimise potential impacts to the receiving waters, relevant details are provided in **Section 11**.

The water quality of the extracted groundwater shall be assessed prior to discharge to the stormwater network, and then weekly thereafter during its release to monitor the waters suitability for continuous discharge. This monitoring will guide the initial type and level of treatment required to minimise environmental risks associated with the waters release, and reassessment of the treatment measures during the dewatering program.

5.4.1 OPTIONAL ONSITE REUSE

Groundwater may potentially be used for onsite construction purposes (i.e., dust suppression, washing) following treatment. The total volume of groundwater required to be dewatered precludes onsite reuse as the primary discharge and disposal method.

Treatment of extracted groundwater may be required to improve the water quality and minimise potential impacts to the potential receptors. The water quality of the extracted groundwater shall be assessed prior to reuse. This monitoring will guide the initial type and level of treatment required to minimise environmental risks associated with the waters release, and reassessment of the treatment measures during the dewatering program.

5.4.2 OPTIONAL REINJECTION

Whilst unlikely based on the proposed secant pile wall construction method, reinjection of groundwater may be required to control drawdown, to mitigate potential Acid Sulfate Soil generation effects and/or potential settlement effects.

Treatment of extracted groundwater will be required to improve the water quality and minimise potential impacts to the potential receptors prior to re-injection.

Regulatory approval from WaterNSW/NRAR would be required for any reinjection.

6 Groundwater Take and Drawdown Estimates

6.1 Summary of Geology and Hydrogeology

The generalised subsurface profile at the site is comprised of fill (0.5-2.5 mbgl), alluvial silty clay and silty sand overlying weathered sandstone bedrock (from 1.0 to 6.5 mbgl). The groundwater system within the development extent on the site is described as:

- **Unconfined Alluvial Aquifer**: Shallow unconfined to semi-confined groundwater system within the shallow alluvial silty clay and silty sand formation.
- **Semi-Confined/Confined Weathered and Porous Sandstone Aquifer**: Semi-confined/Confined groundwater system comprising weathered and porous sandstone of Middle Triassic Hawkesbury Sandstone.

The maximum standing groundwater levels measured onsite ranged from RL 2.136 mAHD in the southern portion of the site, to RL 0.128 mAHD along the northern boundary of the site. For conservatism, the maximum onsite groundwater elevation of RL 2.136 mAHD were used in the prediction of groundwater take. These values were adopted in the analytical model to predict groundwater take and extent of groundwater drawdown.

Based on the basement Bulk Excavation Levels (BELs) (additional 0.5 m from the FFLs) of RL -3.50 mAHD and a maximum standing water level of RL 2.136 mAHD, there was up to 5.64 m of groundwater requiring to be dewatered to ensure that the excavation surfaces are workable.

6.2 Conceptual Flow Model

A conceptual model is a description of the site, site works, and groundwater systems presented both as text and graphically. This description can then be approximated using an analytical solution to allow prediction of groundwater behaviour.

The groundwater extraction estimate comprises two key components to be considered:

a) The component of groundwater present within the aquifer matrix, which will be removed as part of the excavation process (pore water).

b) The component of inflow into the excavation from the surrounding aquifer (walls and base) during the dewatering activity.

The conceptual flow models developed for this assessment are "steady state" models – a snapshot in time representing average conditions. This snapshot was completed based on conservative assumptions of the excavation depth and proposed shoring wall designs, which estimate the greatest groundwater inflow. Note that a more detailed analysis can be provided through a three-dimensional flow model (beyond the scope of the current assessment).

The inherent impermeable nature of the secant pile wall will prevent/minimise groundwater inflow from the unconsolidated aquifer (alluvial sand/clay formation), therefore the only groundwater inflow will be limited to that from the underlying sandstone bedrock (vertical inflow from the base) until the floor slab is poured and the tanked construction is finished. This basement construction method will prevent any groundwater inflow or water discharge requirements following completion of the construction works. The excavation and dewatering will only commence after the secant pile walls have been completed. Groundwater from within the secant pile walls is proposed to be extracted using a combination of either a series of spearpoints internally around the permitter of the excavation and/or internal large diameter extraction wells and/or sumps.

Conceptually, the secant pile walls has been assigned a relatively low hydraulic conductivity (K) value of 8.64×10^{-5} m/day (1×10^{-9} m/sec), which is consistent with concrete. Given that the secant pile walls will extend into the moderate-high strength sandstone formation, the groundwater inflow into the excavation void will be limited by the hydraulic conductivity of the secant pile walls and underlying sandstone bedrock formation.

To estimate the groundwater extracted present within the aquifer matrix, which will be removed as part of the excavation process, the porosity of the matrix is multiplied by the saturated excavation volume. The saturated excavation volume was calculated by determining the difference between the conservative standing groundwater level and the BEL, multiplied by the approximate excavation area of the basement.

To estimate the groundwater inflow volumes, Reditus used the Marinelli and Niccoli (2000)[4] steady-state analytical solution. This solution provides a convenient means for estimating groundwater inflows into excavations and is considered applicable to use as a conservative assessment for the ongoing groundwater seepage into the proposed basement design.

The analytical method of Marinelli and Niccoli (2000) requires a simplification of the hydrogeological environment and was used to provide a broad range of potential drawdown and groundwater inflow. The equations calculate groundwater inflow from the aquifer based on the conceptual model.

The conceptual flow model was approximated by analytical models, which are divided into two zones separated by a conceptual no-flow boundary where horizontal flow will occur level with the excavation base:

- **Zone 1** – exists above the base of the excavation and represents lateral flow to the excavation via the surrounding walls and drainage layer.
- **Zone 2** – extends from the bottom of the excavation downward and considers vertical upward groundwater inflow through the excavation base into the void and drainage layer.

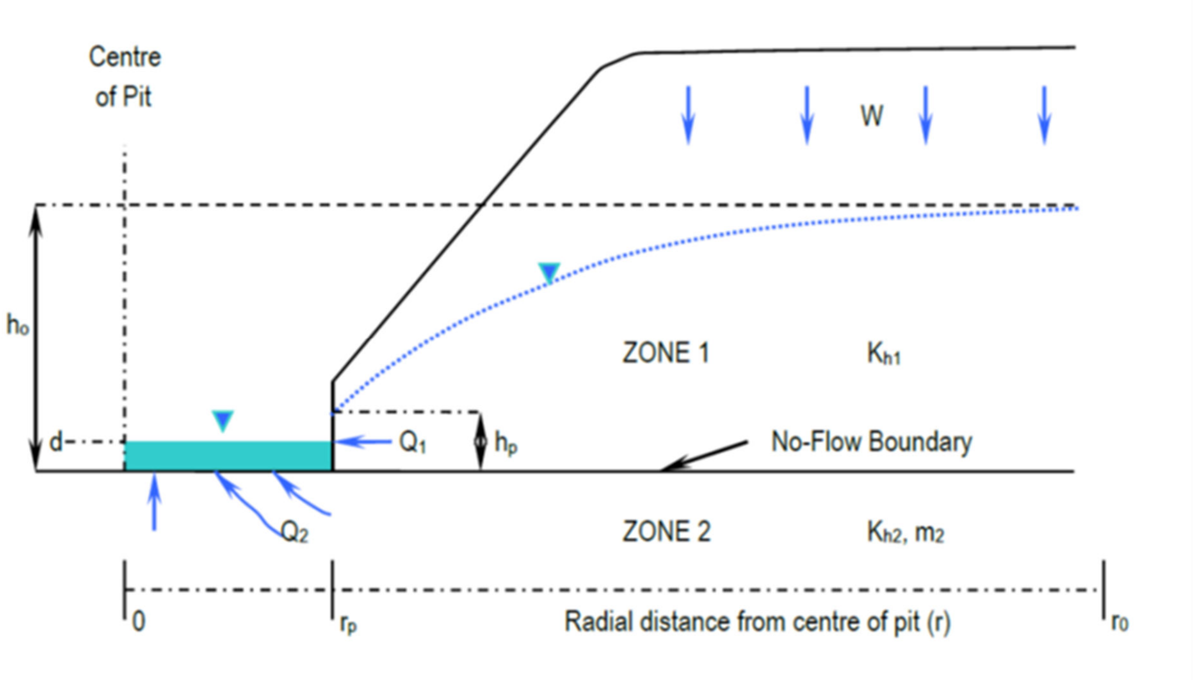

Figure 1. Conceptual Model of the Analytical Solution

The analytical solution for Zone 1 considered steady state, unconfined, horizontal radial flow, with uniformly distributed recharge at the water table. This represents the volume of water laterally flowing into the excavation through the excavation walls.

The analytical solution for Zone 2 is based on steady-state flow to one side of a circular disk sink of constant and uniform drawdown. The circular disk sink represents the volume of water needing to be removed to dewater the site to the target dewatering levels of RL -3.50 mAHD.

For the development of the conceptual flow model for the proposed excavation, the circular disk sink was assumed to encompass the approximate area of the excavation footprint. The total excavation is approximated as a single large well and as such the circular disk sink was assigned a radius of based on the footprint of the proposed excavation.

Monthly rainfall data was obtained from the Australian Government Bureau of Meteorology (BoM), from a weather station located approximately 1.86 km southwest of the site (Sydney Olympic Park AWS (Archery Centre), 066212). The data set from the weather station extends back to 2011, which provided 13 years of rainfall data encompassing longer term climatic trends. The mean annual rainfall (based on monthly observations) from a period between 2011 and 2023 was 1141.1 mm. This converted to an assumed average daily rainfall of 0.00313 m/day.

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[4] Marinelli, F, and Niccoli, W.L. (2000) Simple analytical equations for estimating ground water inflow to a mine pit: Groundwater, v. 38, no.2, p. 311-314

6.3 Summary of Aquifer Parameters

The hydraulic conductivity of the upper unconsolidated alluvial aquifer will vary depending on the grain size and degree of sorting.

The Hawkesbury Sandstone is a porous rock groundwater source, though preferential flow is typically through the secondary porosity features (fractures), as such, hydraulic conductivity of the weathered and porous sandstone rock will be limited by the connectivity and extent of the bedding layers and joints or faults, as well as the degree of connection to the drainage layer.

Slug tests were completed on five (5) monitoring wells (RMW01-RMW05) in both the upper unconsolidated alluvial aquifer and the underlying sandstone bedrock aquifer. The estimated hydraulic conductivity of the upper unconsolidated alluvial aquifer ranged between 9.0 x 10^{-3} and 9.9 x 10^{-2} m/day. However, given the secant pile wall will extend into the moderate-high strength sandstone layer, the Zone 1 horizontal inflow will be governed by the hydraulic conductivity of the secant pile wall, and not the alluvial aquifer. The Zone 2 inflow will be governed by the hydraulic conductivity of the underlying sandstone bedrock aquifer

Site specific test data (see **Section 4.3**) has provided an estimate of the hydraulic conductivity (summarised in **Table 6** below), which has been used to predict groundwater inflow volumes. These values are presented as representative averages over the area of the site, and localised natural variation up to an order of magnitude is to be expected in parts of the site.

Table 6. Summary of Hydraulic Conductivity Values

		HYDRAULIC CONDUCTIVITY (m/day)
Fractured Sandstone	Minimum	9.0 x 10^{-3}
	Maximum	9.9 x 10^{-2}
	Average	5.25 x 10^{-2}
	Median	5.85 x 10^{-2}
Secant Pile Wall	Assumed	8.64 x 10^{-5}
Upper Unconsolidated Alluvial Formation	Minimum	8.69 x 10^{-3}
	Maximum	3.22 x 10^{-1}
	Average	1.45 x 10^{-1}
	Median	1.25 x 10^{-1}

Site specific porosity values were not measured. As such, representative porosity values were adopted from literature sources. Given groundwater storage of the sandstone aquifer is likely confined to secondary porosity features (fractures), a porosity value 1% was assumed for the fractured sandstone unit.

The porous sandstone was assumed to be isotropic, with the horizontal permeability equal to vertical permeability.

6.4 Model Scenarios

All groundwater models include some degree of uncertainty in their predictions as they are, by necessity, simplifications of complex real world systems. Whilst every effort is made to ensure that the primary model reflects the best-case, most-likely case and upper-case understanding of site conditions, this cannot be guaranteed and any model result presented as a single number should be viewed with a degree of caution.

Factors which affect the dewatering rate, groundwater take and extent of drawdown within the steady state model include dewatering rate, dewatering design, dewatering period, aquifer characteristics and degree of aquifer variability (including hydraulic conductivity, specific yield/storativity, porosity, recharge, heterogeneity).

It is considered impractical to determine these factors by pumping tests and further analytical assessment, based on the relatively small scale of the development and the likely relatively low risk of impact to groundwater in the shallow water bearing zone given the secant pile wall construction method.

Typical representative values were used in the model. Assessment of the range of typical values and their effects on the model predictions were made to allow sound management decisions using **Best Case**, **Most Likely, and Upper Case** scenarios.

Table 7. Analytical Model Scenarios

SCENARIO	DESCRIPTION
Best Case	• Zone 1 inflows were limited to the hydraulic conductivity of the secant pile walls of 8.64 x 10^{-5} m/day. • Zone 2 inflows from the base (vertical) were limited to the lower hydraulic conductivity of the fractured sandstone bedrock at 9.0 x 10^{-3}. • Initial groundwater head of 2.136 mAHD was adopted based on the highest-level reported in the monitoring wells over the 95 day monitoring period.
Most Likely	• Zone 1 inflows were limited to the hydraulic conductivity of the secant pile walls of 8.64 x 10^{-5} m/day. • Zone 2 inflows from the base (vertical) were limited to the average hydraulic conductivity of the fractured sandstone bedrock at 5.25 x 10^{-2}. • Initial groundwater head of 2.136 mAHD was adopted based on the highest-level reported in the monitoring wells over the 95 day monitoring period.
Upper Case	• Zone 1 inflows were limited to the hydraulic conductivity of the secant pile walls of 8.64 x 10^{-5} m/day. • Zone 2 inflows from the base (vertical) were limited to the upper hydraulic conductivity limit of the fractured sandstone bedrock at 9.90 x 10^{-2}. • Initial groundwater head of 2.136 mAHD was adopted based on the highest-level reported in the monitoring wells over the 95 day monitoring period.

6.5 Analytical Model Equations

6.5.1 GROUNDWATER TAKE VOLUME WITHIN THE EXCAVATION MATRIX

The following equation was utilised to estimate the groundwater volume present in the aquifer matrix directly removed through excavation:

$$V = \emptyset \times m \tag{1}$$

$$m = (H_0 - BEL) \times A \tag{2}$$

where:

V = groundwater volume present in the aquifer matrix directly removed through excavation (m^3).

ϕ = matrix porosity

m = volume of saturated aquifer matrix to be excavated

H_0 = initial water table elevation (RLm)

BEL = basement excavation level (RLm)

A = area of excavation

6.5.2 GROUNDWATER INFLOW TAKE VOLUME

The steady state inflow rate into the disk sink is given by the following equations[2]:

Zone 1:

$$Q_1 = W\pi\left(r_o^2 - r_p^2\right) \tag{3}$$

$$h_o = \sqrt{h_p^2 + \frac{W}{K_{h1}}\left[r_0^2 ln\left(\frac{r_o}{r_p}\right) - \frac{\left(r_0^2 - r_p^2\right)}{2}\right]} \tag{4}$$

Zone 2:

$$Q_2 = 4r_p\left(\frac{K_{h2}}{m_2}\right)(h_0 - d) \tag{5}$$

$$m_2 = \sqrt{\frac{K_{h2}}{K_{v2}}} \tag{6}$$

where:

Q = groundwater flux (m^3/day)

K_{h1} = horizontal hydraulic conductivity (m/day) at Zone 1

K_{h2} = horizontal hydraulic conductivity (m/day) at Zone 2

K_{v2} = vertical hydraulic conductivity (m/day) at Zone 2

m_2 = vertical hydraulic conductivity anisotropy parameter

d = depth of water (above target dewatering level) within final excavation (m) (*assumed to be 0 at final excavation depth*)

r_p = radius from centre of excavation (circular disk sink) (m)

r_o = drawdown radius from centre of excavation (iterative calculation)

h_0 = initial saturated thickness above base of excavation (m)

h_p = saturated thickness above the base of excavation at the excavation wall (rp), which is assumed 0 m

W = rainfall recharge rate (assumed % of the mean daily rainfall)

6.5.3 GROUNDWATER DRAWDOWN EXTENT

The following equations were used to calculated the groundwater drawdown resulting from the groundwater take into the excavation[2]:

$$H_{1(r)} = H_0 - h_0 + \sqrt{h_p^2 + \frac{W}{K_{h1}}\left[r_o^2 \ln\left(\frac{r}{r_p}\right) - \frac{(r^2 - r_p^2)}{2}\right]} \tag{7}$$

where:

$H_{1(r)}$ = hydraulic head elevation (m) at a radial distance (r) from excavation centre

H_0 = initial groundwater elevation (mRL)

h_0 = initial saturated thickness above base of excavation (m)

r = radial distance from excavation centre (m)

z = vertical depth below the excavation bottom (assumed to be 0 m)

W = rainfall recharge rate (assumed % of the mean daily rainfall)

K_{h1} = horizontal hydraulic conductivity (m/day) at Zone 1

6.6 Model Assumptions and Input Parameters

6.6.1 ASSUMPTIONS

The analytical solution was based on the following assumptions, after Marinelli and Niccoli (2000):

- Steady state, unconfined, horizontal radial flow, with uniformly distributed recharge at the water table.
- The excavation walls are approximated as a circular cylinder.
- Groundwater flow is horizontal. The Dupuit-Forchheimer approximation (McWhorter and Sunada 1977) is used to account for changes in saturated thickness due to depression of the water table.
- The static (pre-excavation) water table is approximately horizontal.
- Uniform distributed recharge occurs across the site as a result of surface infiltration. All recharge within the radius of influence (cone of depression) of the pit assumed to be captured by the excavation.
- Groundwater flow toward the pit is axially symmetric.
- Hydraulic head is initially uniform (hydrostatic) throughout Zone 2. Initial head is equal to the elevation of the initial water table in Zone 1.
- The disk sink has a constant hydraulic head equal to the elevation of the "pit lake water surface". If the pit is completely dewatered, the disk sink head is equal to the elevation of the pit bottom – in this case the target dewatering level.
- Flow to the disk sink is three dimensional and axially symmetric.
- Materials within Zone 2 are anisotropic, and the principal coordinate directions for hydraulic conductivity are horizontal and vertical.

6.6.2 PARAMETERS

The parameters used to estimate the groundwater removal (excavation and inflow) within the analytical solution are provided in **Table 8** below.

Table 8. Groundwater Inflow Analytical Model Input Parameters

PARAMETER	UNIT	BEST CASE	MOST LIKELY	UPPER CASE
Excavation Matrix Storage				
Effective Porosity (ϕ)	-	1	1	1

PARAMETER	UNIT	BEST CASE	MOST LIKELY	UPPER CASE
Bulk Excavation Level (BEL)	RL mAHD	-3.5	-3.5	-3.5
Excavation Area	m^2	7,200	7,200	7,200
Zone 1				
r_p	m	47.87	47.87	47.87
r_o	m	50.80	50.80	50.80
W	m/day	3.13×10^{-4} (10% of average annual rainfall)	3.13×10^{-4} (10% of average annual rainfall)	3.13×10^{-4} (10% of average annual rainfall)
h_0*	m	5.6232	5.6232	5.6232
h_p**	m	0	0	0
K_{h1}	m/day	8.64×10^{-5}	8.64×10^{-5}	8.64×10^{-5}
Zone 2				
K_{h2}	m/day	9.0×10^{-3}	5.25×10^{-2}	9.9×10^{-2}
K_{v2}	m/day	9.0×10^{-4}	5.25×10^{-3}	9.9×10^{-3}
d	RL m	0	0	0

6.7 Summary of Analytical Model Results

6.7.1 ESTIMATE OF GROUNDWATER MATRIX VOLUME REMOVED WITHIN EXCAVATIONS

The groundwater matrix removal was estimated using equation 1 and equation 2, with predictions provided in **Table 9** below.

Table 9. Prediction of Groundwater Volume Removed within the Excavation Matrix

DEWATERING AREA	GROUNDWATER VOLUME REMOVED FROM MATRIX (ML)		
	BEST CASE	MOST LIKELY	WORST CASE
Excavation Matrix	0.406	**0.406**	0.406

6.7.2 PREDICTION OF GROUNDWATER INFLOW

The annual groundwater inflow was estimated using equation 3, 4, 5 & 6, with predictions provided in **Table 10** below, assuming a 12-month dewatering program.

Table 10. Prediction of Annual Groundwater Inflows

DEWATERING AREA	GROUNDWATER INFLOW (ML) – ZONE 1 & ZONE 2		
	BEST CASE	MOST LIKELY	UPPER CASE
Zone 1 & Zone 2	1.22	**6.64**	12.44

6.7.3 SUMMARY OF 'MOST LIKELY' TOTAL PREDICTED GROUNDWATER TAKE

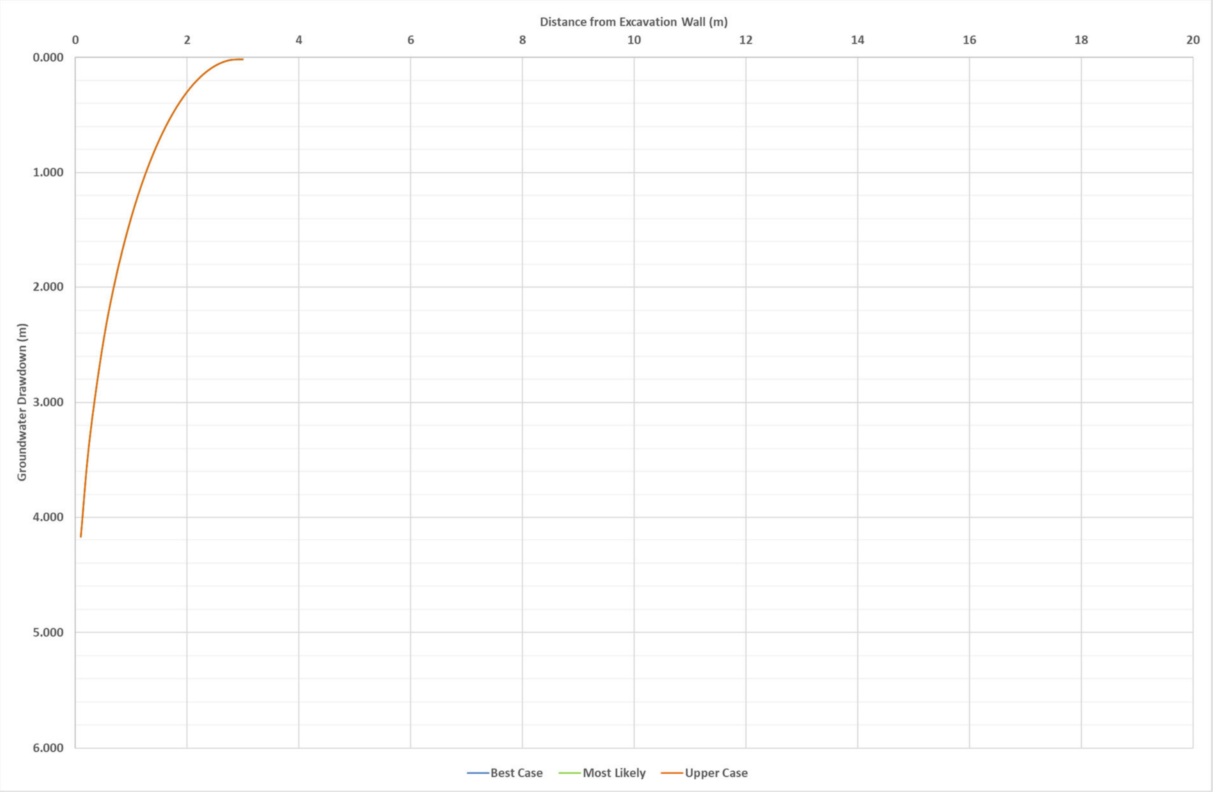
Based on the initial 12-months of dewatering (including both the initial matrix storage removed via excavation over the 12 month period until the basement is tanked) the following total groundwater extraction volumes for the basement is predicted and are presented in **Table 11** below for the first 12 months of dewatering.

Table 11. 'Most Likely' Predicted Groundwater Take

DEWATERING AREA	PREDICTED MATRIX TAKE (ML)	PREDICTED ANNUAL GROUNDWATER INFLOW TAKE (ML/YR)	TOTAL GROUNDWATER TAKE DURING CONSTRUCTION (ML)
Basement Excavation	0.406	6.64	7.049

6.7.4 PREDICTION OF DRAWDOWN DISTANCE

As part of the dewatering assessment, the extent of groundwater drawdown was estimated at regular distance intervals from the edge of the circular disk sinks (approximate excavation edge) and at the nearest neighbouring buildings. The estimated drawdown at distance from the excavation/basement walls have been provided in **Graph 3** below.



Graph 3. Extent of Drawdown from Basement/Excavation Wall

It is noted that the curve for each scenario is identical in the graph above.

It is the professional experience of Reditus that the groundwater levels in the fractured and weathered Hawkesbury sandstone can vary naturally by ±4 m or more during prolonged periods of dry or wet weather. Accordingly, a temporary drop in the water table of 1 m or less is considered unlikely to result in off-site geotechnical settlement impacts, particularly within rock.

There is potential that drawdown outside the site may be sufficient to induce settlement in overlying buildings unless an appropriate DMP is implemented. A suitability qualified geotechnical consultant will be required to determine the potential settlement impacts caused by the potential drawdown as a result of the proposed dewatering activities. Detailed geotechnical considerations are beyond the scope of this assessment.

If drawdown approaching 1.0 m is identified in the monitoring points outside the excavation shoring walls, consideration should be given to control of the off-site water table depression, in consultation with a geotechnical and structural engineer. This is likely to have in implication on the costs of the project but is recommended in order to reduce the risk of damage to adjacent buildings and roadways (refer to **Section 10 and 11**).

The closest registered water supply works bore is GW072314, which is located approximately 920 m northwest of the site. This bore is not located within the Rhodes Peninsula and is unlikely to be connected to the site's aquifers intercepted by the basement. Therefore, there are no Water Supply Works that have the potential to be impacted by the proposed basement development.

The closest high priority GDEs (see **Section 4.6**) are located approximately 1.45 km west of the site. Given the predicted drawdowns, the dewatering works are unlikely to cause a detrimental impact to these receptors.

Whilst every effort has been made to make accurate predictions in the dewatering volumes and off-site effects, it is strongly recommended that water levels be monitored regularly in the dewatered area and in surrounding properties (refer to **Section 11 and 13)** to ensure that local variations in hydraulic properties in the aquifer do not result in unacceptable groundwater table depression.

7 Legislation, Regulation and Relevant Endorsed Guidelines

To facilitate the construction and basement dewatering, in relation to impacts of groundwater resources and the surrounding environment, the following statutory requirements need to be achieved to address the WaterNSW regulations.

The majority of NSW groundwater is covered by statutory Water Sharing Plans and the NSW Aquifer Interference Policy (AIP). In the absence of a relevant Water Sharing Plan, groundwater is regulated under the Water Act 1912.

Given that groundwater will be incepted and dewatered as part of the development, the proposed development is considered to be an aquifer inference activity requiring authorisation from WaterNSW under either the Water Management Act 2000 and/or the Water Act 1912.

7.1 Environmental Planning and Assessment Act 1979

Conditions of consent in relation to dewatering are likely to be prescribed by the Council in the Development Consent and NSW DPIE General Terms of Approval for the works issued under the Environmental Planning and Assessment Act (1979). A copy of the approval must be kept on location at all times.

7.2 Protection of the Environment Operations (POEO) Act 1997

The POEO Act 1997 and its associated schedules and regulations are directly relevant to dewatering operations. In particular, the Act includes requirements prohibiting the pollution of waters, preventing or minimising air and noise pollution, regarding maintenance and operation plant in a proper and efficient condition/manner, and for minimising and managing wastes.

The Act also requires notification to the NSW Environmental Protection Authority (EPA) and Council, when a pollution incident occurs that causes or threatens material harm to the environment (including discharges above the set limits **Table 15** to the stormwater and where any unacceptable impact to the receiving waters is identified).

7.3 NSW Water Quality Objectives (2006)

The NSW Water Quality Objectives are the agreed environmental values and long-term goals for NSW's surface waters. They set out:

- The community's values and uses for our rivers, creeks, estuaries and lakes (i.e., healthy aquatic life, water suitable for recreational activities like swimming and boating, and drinking water).
- A range of water quality indicators to help us assess whether the current condition of our waterways supports those values and uses.

The site is located within the ‘Sydney Harbour and Parramatta River’ catchment area. The water quality objectives of the Sydney Harbour and Parramatta River Catchment and estuaries include aquatic ecosystems, visual amenity, secondary contact recreation, primary contact recreation and aquatic food (cooked).

7.4 City of Canada Bay Dewatering Discharge Approval/Permit

A permit from Council is required for any dewatering of groundwater.

Council require groundwater/tailwater to be discharged must be compliant with the General Terms of Approval/Controlled Activity permit issued by WaterNSW (if applicable), Landcom’s ‘Managing Urban Stormwater: Soils and Construction’ (2004) (Blue Book), Council’s Compliance and Enforcement Policy, and legislation including Protection of the Environment Operations Act 1997 and Contaminated Lands Act 1997.

All approvals, water discharges and monitoring results are to be documented and kept on site. Copies of all records shall be provided to the appropriate regulatory authority, including Council, upon request.

Council typically requires that the Principal Contractor provide a copy of the DMP to Council prior to commencing discharge of groundwater from site.

Council are required to provide ‘written approval’ (usually in the form of a permit) as part of “Application for approval for water supply works, and/or water use” with the WaterNSW prior to discharge of the treated groundwater to the stormwater network.

7.5 Water Act 1912 and Water Management Act 2000

Dewatering for construction purposes is classified as an aquifer interference activity under the NSW Aquifer Interference Policy 2012.

WaterNSW are responsible for waters work approvals under the provisions of the Water Management Act 2000 (WMA) which includes regulation of all aquifer interference activities within Water Sharing Plan management areas. WaterNSW also are responsible for water works approvals for all groundwater extraction in areas outside Water Sharing Plan management areas, as well as State Significant Development.

While minor aquifer interference activities works are generally exempt from the full extent of the WMA 2000, an application for “Approval for Water Supply Works and/or Water Use” (previously known as a Dewatering Licence) is required, regardless of if the total volume of groundwater extracted is expected to exceed <3 ML per year. A Water Access License (WAL), or written approval from WaterNSW/NRAR if no licence is required, must be obtained prior to commencement.

The following information must be provided in support of the “Approval for Water Supply Works and/or Water Use” application:

- A copy of a valid planning consent for the project.
- A copy of the written authorisation for the disposal of the extracted groundwater.
- A Dewatering Management Plan, which clearly and concisely set out:
  - Current groundwater levels, preferably based on at least three repeat measurements from at least three monitoring bores and should be used to develop a water table map for the site and its near environs, be accompanied by an interpretation of the groundwater flow direction from these data, and an assessment of the likely level to which groundwater might naturally rise during the life of the building.
  - Predictions of total volume of groundwater to be extracted during the life of the approval (or during the construction period) – the method of calculation and the basis for parameter estimates and any assumptions used to derive the volume are to be clearly documented. Details of how dewatering volumes are to be measured, and of the maximum depth of the proposed dewatering system.
  - Predicted duration of dewatering at the property, noting that temporary water supply works approvals are generally issued for no more than 24 months.
  - Details of how dewatering volumes are to be measured, e.g., by calibrated flow meter or other suitable method, and of the maximum depth of the proposed dewatering system.
  - Details of any predicted impacts or particular issues, e.g., proximity of groundwater dependent ecosystems springs; or water supply losses by neighbouring groundwater users; or potential subsidence impacts on nearby structures or infrastructure.
  - Details of monitoring proposed during the dewatering program. These should be designed to inform and facilitate the protection of any identified potential impacts.
  - Details of ambient groundwater quality conditions beneath the property and of any proposed treatment to be applied to pumped water prior to disposal – at a minimum, treatment must be undertaken to remove contaminants, manage pH levels, reduce suspended solids and turbidity to acceptable levels and ensure that dissolved oxygen levels are compatible with ambient quality requirements in receiving waters. Groundwater cannot be re- injected into an aquifer without the specific approval of, and licensing by, WaterNSW.
  - Details of how reporting will occur during and following the dewatering program, to confirm that predicted quantities and quality objectives were met.
  - Description of the method of dewatering and related construction including any proposal to use temporary piling or support walls and the relative depths thereof.

Further information on the aquifer interference policy and licencing requirements are available from the WaterNSW website.

Reditus note that if/once approval has been provided, an application for a “new water access licence with a zero share component” may be required to be completed and a suitable groundwater entitlement may also need to be obtained from the market to account for the groundwater take within the same groundwater source (in this case, Sydney Basin Central Groundwater Source, under the Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources (2023). This will need to be obtained within three months of granting of the Zero Access Licence.

Works or activities that intersect or interfere with groundwater systems and where take is incidental to the primary purpose of the activity, or where there is no take, are managed as aquifer interference activities. Aquifer interference activities taking 3 ML or less of groundwater per year are exempt from requiring a Water Access Licence (WAL).

7.5.1 WATER SHARING PLANS (WSPS)

WSPs are being progressively developed for rivers and groundwater systems across NSW following the introduction of the Water Management Act 2000. WSPs made under the WMA are being prepared as Minister’s plans under Section 50 of the Act. These plans protect the health of our rivers and groundwater while also providing water users with perpetual access licences, equitable conditions, and increased opportunities to trade water through separation of land and water.

WSPs provide a legislative basis for sharing water between the environment and consumptive purposes. Under the WMA, a plan for the sharing of water must protect each water source and its dependent ecosystems and must protect basic landholder rights.

The site is located within the following WSP:

- Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources (2023) – Sydney Basin Central Groundwater Source.

7.6 NSW Aquifer Interference Policy 2012

The purpose of the NSW Aquifer Interference Policy 2012 is to explain the role and requirements of the Minister administering the WMA in the water licensing and assessment processes for aquifer interference activities under the WMA and other relevant legislative frameworks. The NSW Aquifer Interference Policy 2012:

1. Clarifies the requirements for obtaining water licences for aquifer interference activities under NSW water legislation; and
2. Establishes and objectively defines considerations in assessing and providing advice on whether more than minimal impacts might occur to a key water-dependent asset.

The proposed development will result in aquifer interference under the NSW Aquifer Interference Policy (2012) as groundwater will be removed from at least one aquifer. Accordingly, groundwater licensing may be required.

7.6.1 LICENCING OF WATER TAKEN THROUGH AQUIFER INTERFERENCE

A water licence is required under the WMA (unless an exemption applies or water is being taken under a basic landholder right) where any act by a person carrying out an aquifer interference activity causes:

- The removal of water from a water source; or
- The movement of water from one part of an aquifer to another part of an aquifer; or
- The movement of water from one water source to another water source, such as:
  - from an aquifer to an adjacent aquifer; or
  - from an aquifer to a river/lake; or
  - from a river/lake to an aquifer.

A licence for the removal of water from a water source may be required for the development.

7.7 Relevant National and NSW EPA Endorsed Guidelines

Approval for the disposal of groundwater to stormwater will be regulated by Council.

The adopted water quality guidelines for discharge waters are the:

- Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG 2018).
- ANZECC/ARMCANZ (2000) Default Trigger Values (TVs) for Physical and Chemical Stressors (used in the absence of ANZG 2018 criteria).
- Guidelines for Managing Risks in recreational Water (NHMRC 2008) / Drinking Water Criteria (NHMRC 2017).

Use of the 95% protection level (for the ANZG 2018 Guidelines) is based on an assumption that the surrounding watercourses are moderately disturbed ecosystems (as receiving road and stormwater runoff from adjacent highly urbanised environment). In the absence of ANZG (2018) DGVs, the ANZECC (2000) trigger values (TVs) were adopted.

This DMP will need to be revised if changes to the DGVs occur. If this change occurs during the current proposed dewatering period, this is to be reflected in a revised DMP.

There are currently no endorsed water quality guideline values in NSW for secondary contact which may occur during recreational activities. Reditus notes that the health-based drinking water guidelines criteria (NHMRC 2017) were derived based on the long-term consumption of 2 L/day of the water. Incidental ingestion of water from the Parramatta River during recreational activities is unlikely to exceed more than 50 mL/day, which is equivalent to approximately two mouthfuls of water. For conservatism, the greater of the health-based drinking water criteria or the aesthetic criteria (NHMRC 2017) multiplied by ten (10) has been chosen to address the secondary contact recreational uses of water. This factor of ten (10) is considered conservative as it is equivalent to long-term ingestion of 200 mL/day of water.

8 Groundwater Impact Assessment

8.1 Minimal Impact Considerations

The WMA 2000 includes the concept of ensuring “no more than minimal harm” for both the granting of water access licences and the granting of aquifer interference approvals.

The Aquifer Interference Policy includes a set of minimal impact considerations for assessing the impacts of all aquifer interference activities, including those regulated under the WMA 2000, the Water Act 1912 and those decided under other legislation. The NSW DPE (2022) Groundwater Impact Assessment Criteria provides a framework for the Minimal Impact threshold criteria.

Aquifer interference approvals are not to be granted unless the Minister is satisfied that adequate arrangements are in force to ensure that no more than minimal harm will be done to any water source, or its dependent ecosystems, as a consequence of its being interfered with in the course of the activities to which the approval relates.

Whilst aquifer interference approvals are not required to be granted, the minimal harm test under the WMA is not activated for the assessment of impacts. Therefore, this Policy establishes and objectively defines minimal impact considerations as they relate to water-dependent assets and these considerations will be used as the basis for providing advice to the Minister.

All NSW groundwater sources have been categorised as being either highly productive or less productive, based on the general character of the water source meeting or not meeting the criteria of 1500 mg/L total dissolved solids and a bore yield rate of greater than 5 L/s. This categorisation applies to a whole groundwater source as it is defined in a water sharing plan, not to the specific groundwater conditions at a particular location. The minimal impact considerations for the highly productive groundwater sources are different to those for the less productive groundwater sources.

Thresholds for minimal impact considerations have been developed for each groundwater source in NSW. Within the WMA, Table 1 – Minimal Impact Considerations for Aquifer Interference Activities are categorised into type of groundwater sources and are presented in **Table 12** below. The thresholds relate to impacts on groundwater table and pressure, and to groundwater and surface water quality.

Table 12. Highly and Less Productive Groundwater Source Types

HIGHLY PRODUCTIVE	LESS PRODUCTIVE
• Alluvial • Coastal Sands • Porous Rock – Great Artesian Basin - Eastern Recharge and Southern Recharge; – Great Artesian Basin – Surat, Warrego and Central – other porous rock • Fractured Rock	• Alluvial • **Porous Rock** • **Fractured Rock**

The proposed development is considered to be located in a ‘Less Productive’ groundwater source as yields are less than 5 L/s. The following table provides the Impact assessment criteria for porous and fractured rock groundwater sources of semi-confined/confined systems, incorporating the dual porosity Hawkesbury sandstone formation intercepted by the proposed basement.

Table 13. NSW DPE (2023) Groundwater Impact Assessment Criteria and Results

#	IMPACT ASSESSMENT CRITERIA	ASSESSMENT RESULTS
1	Cumulative extraction over a ten-year period must not cause the recovered water level (metres below ground level) to drop below 25% of the Relative Total Available Drawdown (TAD) at: a) a distance of 200 metres from any production water supply works including the applicant's bores (e.g. bores on an approval linked to an access licence). b) any other water supply work (i.e. at any basic landholder rights bores).	The proposed construction dewatering **will not** cause the water level in the semi-confined/confined dual porosity Hawkesbury sandstone aquifer to drop below 25% of the relative TAD (100% of TAD = 9.52 m; 25% of TAD = 2.38 m) at either a 200 m distance of a production bore, nor at any other water supply work, based on the following: • The closest registered water supply works bore is GW072314, which is located approximately 920 m northwest of the site, on the other side of the Parramatta River which is not located within the Rhodes Peninsula and is unlikely to be connected to the site's aquifers intercepted by the proposed basement development. • The predicted drawdown from the basement was <1 m from 2 m of the basement edge, as such would not result in a drawdown 25% of the relative TAD (1 m) at any water supply work.
2	Additional drawdown over a ten-year period cannot exceed 10% of the Total Available Drawdown to a maximum of 3 metres at any 3rd-party water supply works.	The closest registered water supply works bore is GW072314, which is located approximately 920 m northwest of the site, on the other side of the Parramatta River, which is not located within the Rhodes Peninsula and is unlikely to be connected to the site's aquifers intercepted by the proposed basement development. The predicted drawdown in the surrounding Fractured/Weathered sandstone semi-confined aquifer was <1 m beyond approximately 2 m of the basement wall.

Based on the above results of the groundwater impact assessment, the proposed water take activities are considered to be of **Minimal Impact** under the NSW DPI (2012) Aquifer Interference Policy, Water Management Act 2000 and the NSW DPE (2023) Groundwater Impact Assessment Criteria.

8.2 WSP Rules for Water Access Approval

A summary of the water sharing rules for granting of access licences (as detailed within the Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources 2023 – Sydney Basin Central Groundwater Source), compared against the results of the above assessment, are presented in **Table 14** below. Reditus note that the following rules are used as a guide only and actual approval conditions are granted at the discretion of the Department.

Table 14. Summary of Water Access Rules and Findings of Assessment

RELEVANT WSP RULE	ASSESSMENT
Granting of access licences may be considered for the following: • Local water utility, major water utility, domestic and stock and town water supply. • Commercial access licences under a controlled allocation order made in relation to any unassigned water in this water source.	The dewatering works for the development are not specified but may be considered as under a Commercial access licence conditions.

RELEVANT WSP RULE	ASSESSMENT
To minimise interference between neighbouring water supply works, no water supply works to be granted or amended within the following distances of existing bores: • 400 m from an aquifer access licence bore on another landholding, or • 100 m from a basic landholder rights bore on another landholding, or • 50 m from a property boundary (unless written consent from neighbour), or • 1,000 m from a local or major water utility bore, or • 200 m from a Department monitoring bore (unless written consent from NSW Office of Water). *The plan lists circumstances in which these distance rules may be varied and exemptions from these rules.*	The closest registered groundwater supply bore (GW072314) was located approximately 920 m to the northwest of the site. Written consent may be required from neighbouring properties as the dewatering will occur adjoining the site boundary.
To protect bores located near contamination, no water supply works are to be granted or amended within: • 250 m from the edge of a plume of a contamination source. • 250 m and 500 m from the edge of a plume associated with a contamination source, unless no drawdown or water will occur within 250 m of the plume. • 250 m of an onsite sewage disposal system unless the water supply work is: – Constructed with cement grout in the borehole annulus to a minimum depth of 20 m from the ground surface. – Located at sufficient distance from the on-site sewage disposal system to prevent migration of septic contamination in the aquifer. *The plan lists circumstances in which these distance rules may be varied and exemptions from these rules*	Based on the modelled groundwater conditions, the drawdown was predicted to be <1 m within 2 m of the basement edge. There is one (1) site listed on the NSW EPA Contaminated Sites Register that is located approximately 180 m southwest of the site. The former Allied Feeds site is noted as being formerly regulated under the CLM Act. Given the predicted drawdown is expected to be <1 m within 2 m of the basement edge and that the Former Allied Feeds site is no longer regulated, it is unlikely that the proposed dewatering would cause drawdown within 250 m from the edge of a contamination plume. Given the site location within metropolitan Sydney, onsite sewage disposals systems within 250 m of the site are unlikely.
To protect bores located near sensitive environmental areas, no water supply works (bores) to be granted or amended within the following distances of high priority Groundwater Dependent Ecosystems (GDEs) as identified within the plan: • Waterfront land • 100 m of the top of an escarpment • 200 m of any high-priority, groundwater dependant ecosystem • 200 m of a coastal wetland • 500 m of a Karst environment *The plan lists circumstances in which these distance rules may be varied and exemptions from these rules.*	Based on a review of the WSP, there are no high priority Groundwater Dependent Ecosystems (GDEs) within 1.0 km of the site (including springs, geothermal springs, wetlands and karst). The closest high priority GDE (Samphire Saltmarsh and Grey Mangrove-River Mangrove Forest) is located approximately 1.45 km west of the site.
To protect groundwater dependent culturally significant sites, no water supply works to be granted or amended within the	Based on a review of the WSP, there are no groundwater dependent cultural significant sites

RELEVANT WSP RULE	ASSESSMENT
following distances of groundwater dependent cultural significant sites as identified within the plan: • 100 m for bores used for extracting for basic landholder rights, or • 200 m for bores used for all other aquifer access licences *The plan lists circumstances in which these distance rules may be varied and exemptions from these rules.*	within 200 m of the site associated dewatering works.
Rules for bores located near potential acid sulfate soils: New bore cannot be constructed in an area classed as having a high probability of the occurrence of acid sulfate soils if there is a significant risk of acidification of the groundwater source.	A review of the Canada Bay Local Environmental Plan 2009 acid sulfate soil risk map indicated that the majority of the site is located within a Class 2 ASS risk area, whilst the southwestern portion is located within a Class 5 ASS risk area. Acid sulfate soils in a Class 2 areas are likely to be found below the natural ground surface. Acid sulfate soils are not usually found in Class 5 areas, however, are within 500m of adjacent Class 1, 2, 3 or 4 soils. An acid sulfate soil management plan will be prepared and implemented during the excavation and dewatering works for the proposed development.
Available Water Determinations (AWDs): • 100% stock and domestic, local and major utilities and specific purpose access licences • 1ML/unit of share aquifer access licences *AWD for aquifer access licences may be reduced in response to a growth in use.*	In accordance with WaterNSW, A Water Access Licence may be required for 7.049 ML/yr of groundwater take from the Water Sharing Plan for the Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources 2023 – Sydney Basin Central Groundwater Source.
Trading Rules • INTO groundwater source: Not permitted. • WITHIN groundwater source: Permitted. • Conversion to another category of access licence: Not permitted.	

Based on the above, the proposed dewatering works generally complies with the general rules for granting of a water access licence under the Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources 2023 – Sydney Basin Central Groundwater Source.

9 Water Quality Objectives

9.1 Receiving Environment

The site is situated within a highly urbanised residential and commercial/industrial area. The extracted groundwater will likely be treated and discharged to the stormwater network via connection to an approved location by Council (dewatering contactor to confirm exact location).

Based on the local topography, the receiving waters of the stormwater network are understood to Parramatta River, located to the north of the site.

Parramatta River is considered to be a moderately disturbed ecosystem, which receives water from a highly urbanised environment, including multiple waste streams. Use of the ANZG (2018) 95% protection level for ecological receptors has been adopted on this basis.

9.2 Adopted Discharge Water Quality Guidelines

The Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG 2018) provide detailed approaches and advice on identifying appropriate guideline values for the protection of environmental receptors. These guideline values help to ensure that agreed community values and their management goals are protected.

The ANZG (2018) have been endorsed by the NSW EPA, which supersede the previous ANZECC & ARMCANZ (2000) Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Applying the ANZECC (2000) guidelines to the range of community values relied largely on a single line of evidence (chemical assessment) to determine whether or not a guideline value was exceeded. The ANZG (2018) Water Quality Guidelines improve confidence in our assessments by:

- Introducing a systematic approach to assessing a number of lines of evidence along the pressure–stressor–ecosystem receptors pathway.
- Promoting decisions on the basis of the integrated weight of evidence.

For the protection of aquatic ecosystems, locally derived guideline values are most appropriate. In the absence of locally derived guideline values or other jurisdictionally-legislated requirements (as in this case), the ANZG (2018) provide default guideline values (DGVs) for assessing the impacts of physio-chemical parameters and potential toxicants on aquatic ecosystems, as well as advice on tailoring DGVs to suit the local region. Where DGVs are not available within the ANZG (2018), the ANZECC (2000) guidelines trigger values (TVs) are adopted.

It is specifically noted in the ANZG (2018) guidelines that "the Water Quality Guidelines are not intended to directly apply to contaminant concentrations in industrial discharges or stormwater quality (unless stormwater systems are regarded as having relevant community value)".

The ANZG (2018) provides guidance on assessing a waste discharge. The ANZG (2018) Water Quality Management Framework and associated monitoring data can be used to assess compliance or potential impacts of a waste discharge on water quality. Assessing a waste discharge in this way aims to ensure that it complies with the conditions of approval and is not causing environmental harm. The Water Quality Management Framework provides a step-by-step approach to protect the community values of waterways.

9.2.1 WATER QUALITY MANAGEMENT FRAMEWORK

The Water Quality Management Frameworks has the following steps which will be adopted as part of this DMP:

- **Step 1: Examine current understanding**
  - Use current understanding to develop or refine a conceptual model of key waterway processes and how the waste discharge could affect local waterways.
  - Site-specific information on the operation and receiving environment (e.g., current water quality and temporal and spatial release characteristics of the discharge, mixing zones and regulatory compliance points, water quality and ecology of the receiving environment).
  - As further monitoring data become available, update and refine the current understanding.

- **Step 2: Define community values and management goals**
  - Establish or refine community values and more specific management goals (including level of protection) for the relevant waterways at stakeholder involvement workshops.
  - The relevant values adopted are the 95% protection level of fresh and marine ecosystems and recreational use.
- **Step 3: Define relevant indicators**
  - Select indicators for relevant pressures identified for the system, the associated stressors and the anticipated ecosystem receptors.
  - Based on previous groundwater quality information, the analytical suite detailed in **Section 4.4** has been adopted as primary indicators. Other indicators include visual inspection at the discharge point of the stormwater into Parramatta River for any signs of potential adverse effects (e.g., turbidity, increased algae presence, discolouration).
- **Step 4: Determine water quality guideline values**
  - Determine the water quality guideline values for each of the relevant the biological, chemical and physical indicators required to provide the desired level of protection for the management goals of relevant waterways.
  - The DMP adopts the ANZG (2018) DGVs and the ANZECC (2000) TVs in the absence of DGVs. Results of monitoring data from the stormwater drain and Parramatta River will also be used for the assessment to determine if adverse environmental impact are occurring from groundwater discharge.
- **Step 5: Define draft water quality objectives**
  - Use the guideline values or narrative statements chosen for each selected indicator as draft water quality objectives to ensure the protection of all identified community values and their management goals.
- **Step 6: Assess if draft water quality objectives are met**
  - Use measurements from monitoring of each relevant indicator to assess whether current water quality meets the draft water quality objectives.
  - This includes comparison of the water quality monitoring data for each relevant indicator with the water quality objectives, together with the evidence from any additional lines of evidence (such as results from at the edge of the mixing zone).
  - The weight-of-evidence process evaluates results from multiple lines of evidence across the pressures, stressors and ecosystem receptors relevant to the waste discharge. It is the key process by which the protection of community values is assessed. Multiple potential outcomes are possible from a weight-of-evidence evaluation. The resulting evaluation of water quality results will be used to determine if adverse trends are evident as a result of the discharge of groundwater to stormwater.
  - If the Water Quality Objectives are met, then management should focus on maintaining discharge quality. If Water Quality Objectives are not met and potential adverse trends are evident, the following options will be considered:
  - ➢ Formulate, assess, and prioritise management strategies to improve existing water quality associated with the waste discharge (Steps 8 to 10), and/or
  - ➢ Reassess the appropriateness of the water quality guideline values (Step 7), and/or
  - ➢ Consider selection of additional or alternative indicators or lines of evidence (Step 7).
- **Step 7: Consider additional indicators or refine water quality objectives**
  - Assess the need to revise or add to the lines of evidence or indicators and the water quality guideline values.
- **Step 8: Consider alternative management strategies**
  - Evaluate the effectiveness of current management strategies to address the identified water quality issues and recommend possible improvements. Improved or alternative management strategies are formulated, assessed and prioritised.
- **Step 9: Assess if water quality objectives are achievable**
  - Use information gained from Steps 6 to 8 to assess whether the water quality objectives are achievable.

- **Step 10: Implement agreed management strategy**
    - Document and implement agreed management strategies, including, in some cases, a suitable and agreed adaptive management framework.

This DMP details the current management strategy to be implemented.

9.2.2 ANZG (2018) PHYSICAL AND CHEMICAL STRESSOR DETAILS

As noted above, there are two types of physical and chemical stressors that directly affect aquatic ecosystems that can be distinguished: those that are directly toxic to biota, and those that, while not directly toxic, can result in adverse changes to the ecosystem (e.g., algae blooms). In the absence of site-specific guideline values, the following DGVs were adopted as water quality assessment criteria in order to assess this situation:

- **ANZECC (2000)** Default trigger values for physical and chemical stressors for south-east Australia for slightly disturbed ecosystems in Estuaries. These trigger values do not represent direct toxicity to biota, but can potentially result in non-toxic impacts to the ecosystem. ANZG (2018) do not currently provide DGV for physical and chemical stressors, therefore the ANZECC (2000) trigger values have been adopted.
- **ANZG (2018) DGVs & ANZECC (2000)** Australian and New Zealand Guidelines for Water Quality. Trigger values for Fresh and Marine Water under the 95% protection levels. These trigger values represent toxicity to biota.

The adopted DGV criteria are protective of receptors at the point of exposure (i.e., stormwater drain and Parramatta River), and are overly conservative for the assessment of direct discharge water quality in areas where ecological receptors are not present (i.e. Site discharge into stormwater drains). On this basis, Parramatta River waters are considered the only receiving environment requiring protection. Reditus notes that the use of the DGVs is conservative and may not represent the Parramatta River local system.

Since the publication of ANZECC (2000), an Errata document (Department of Agriculture, Fisheries and Forestry) has been issued which details that Nitrate values in Table 3.4.1 (page 3.4-5) are deleted and replaced with “Under Review”. Furthermore, Nitrate guidelines values in ANZECC 2000 have been reviewed and recalculated[5], the recalculated trigger value for 95% level of protection was 2.4 mg/L for Nitrate-N.

It is important to note that the Draft Water Quality Objectives (WQO) listed below are specific to aquatic ecosystems only and are not intended as discharge water quality criteria. The adopted guidelines contain information on the comparison of test data with guideline DGVs & TVs. It emphasises that exceedances of the DGVs and TVs are an early warning mechanism to alert managers of a potential problem and are not intended to be an instrument to assess compliance and should not be used in this capacity.

The guidelines recognise that the environmental values and unique conditions of a site and specific behaviour of contaminants in different environments are important considerations when applying the guidelines. Factors relevant to assessing point source discharges include the flow rote of the discharge, receiving water flows and/or intensity of tidal exchange, and the levels of risk that vary from acute to chronic exposure.

Mixing zones are a tool for responsible management of the environment. As detailed within the ANZG (2018), mixing zone are described as an explicitly defined area around an effluent discharge where some, or all, water quality objectives may not be met. It is a generally accepted practice to apply the concept of a mixing zone for waste water discharges (such as stormwater). As a consequence, some community values of the water body may not be protected. The responsibility lies with the discharger to minimise this impact by keeping the mixing zone as small as practicable. They are designed to limit the impact to the environment that would otherwise occur if discharges were allowed to flow unchecked into waterways.

Critical to assessing the impact of an effluent discharge on beneficial uses and values is understanding the dilution and dispersion of the effluent. For discharges to marine environments, characteristics such as tidal and current movements, density and temperature differences, depth of water and rate of flow need to be considered to assess the dilution capabilities of the waterbody under various scenarios.

9.2.3 RECREATIONAL WATER QUALITY (NHMRC 2012 & 2017)

The greater of the health based drinking water criteria (NHMRC 2012) multiplied by ten or the aesthetic criteria have been chosen to address the primary and secondary contact recreational uses of water.

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[5] https://envirolink.govt.nz/assets/Envirolink/1207-ESRC255-Updating-nitrate-toxcity-effects-on-freshwater-aquatic-species-.pdf

9.3 Draft Water Quality Objectives – DGVs

A summary of the discharge water quality criteria is provided in **Table 15** below for the water quality parameters and chemical of concern, which have been selected on the basis of site operational history, regional setting and site groundwater quality.

It is important to note that the Water Quality Objectives (WQO) listed in **Table 15** below are specific to aquatic ecosystems only and are not intended as discharge water quality criteria. The ANZG (2018) framework emphasises that comparison of test data with guideline DGVs that 'exceedances of the DGVs are an "early warning" mechanism to alert managers of a potential problem and are not intended to be an instrument to assess "compliance" and should not be used in this capacity.

ANZG (2018) recognises that the environmental values and unique conditions of a site and specific behaviour of contaminants in different environments are important considerations when applying the guidelines. Factors relevant to assessing point source discharges include the flow rate of the discharge, receiving water flows and/or intensity of tidal exchange, and the levels of risk that vary from acute to chronic exposure.

Table 15. Draft Water Quality Objectives - DGVs

ANALYTE GROUP	ANALYTE	ANZG (2018) MARINE WATER QUALITY GUIDELINES (ug/L)	RECREATIONAL WATER QUALITY CRITERIA (ug/L)
BTEX	Benzene	950	1,000
	Ethylbenzene	80	3,000
	Toluene	180	8,000
	Xylene (m)	75	6,000
	Xylene (p)	200	
	Xylene (o)	350	
Heavy Metals	Arsenic	24	50
	Cadmium	0.2	5
	Chromium	27	50
	Copper	1.4	1,000
	Nickel	11	200
	Lead	3.4	50
	Zinc	8	5,000
	Mercury	0.6	10
PAHs	Phenanthrene	2	-
	Anthracene	0.4	-
	Flouranthane	1.4	-
	Benzo(a)Pyrene	0.2	0.1
	Naphthalene	16	-
Pesticides	Atrazine	13	200
	Carbofuran	0.06	100
	Chlorodane	0.03	20
	Chlorpyrifos	0.009	100
	2,4-D	280	300
	DDT	0.006	90
	Diazinon	0.01	40
	Dimethoate	0.15	70
	Diquat	1.4	70
	Endosulfan	0.005	200

ANALYTE GROUP	ANALYTE	ANZG (2018) MARINE WATER QUALITY GUIDELINES (ug/L)	RECREATIONAL WATER QUALITY CRITERIA (ug/L)
	Endrin	0.04	-
	Fenitrothion	0.2	70
	Glyphosate	370	1,000
	Heptachlor	0.01	-
	Lindane	0.2	100
	Malathion	0.05	700
	Methomyl	3.5	200
	Molinate	3.4	40
	Parathion	0.004	200
	Simazine	3.2	200
	2,4,5-T	36	1,000
	Tebuthiuron	2.2	-
	Temephos	0.05	4,000
	Thibencarb	2.8	400
	Thiram	0.01	70
	Toxafene	0.1	-
	Trifluralin	2.6	900
PCBs	Aroclor 1242	0.3	-
	Aroclor 1254	0.01	-
VOCs	1,1-DCA	90	-
	1,2-DCA	1,900	30
	1,1,1-TCA	270	-
	1,1,2-TCA	1,900	-
	1,1,2,2-TCA	400	-
	PCA	80	-
	DCM	4,000	40
	Chloroform	370	30
	Carbon Tetrachloride	240	30
	Vinyl Chloride	100	3
	DCE	700	600
	TCE	330	-
	PCE	70	500
	CB	55	100
	1,2-DCB	160	10
	1,3-DCB	260	200
	1,4-DCB	60	3
	1,2,3-TCB	3	50
	1,2,4-TCB	20	
	1,3,4-TCB	8	-
	1,2,3,4-PCB	2	-
	1,2,3,5-PCB	3	-
	1,2,4,5-PCB	5	-

ANALYTE GROUP	ANALYTE	ANZG (2018) MARINE WATER QUALITY GUIDELINES (ug/L)	RECREATIONAL WATER QUALITY CRITERIA (ug/L)
	PCB	1.5	-
Total Petroleum Hydrocarbons	TPH/TRH	2 (mg/L) [a]	-
Total Nitrogen	Total Nitrogen	500 [b]	-
Nitrate	Nitrate	7,200 [c]	500,000
Total Phosphorus	Total Phosphorus	50 [b]	-
Ammonia	Ammonia	900 (pH dependant)	5,000
pH	pH	6.0-8.0 [b]	6.5-8.5
Total Suspended Solids	TSS	50,000	-
Turbidity	Turbidity	10 NTU	5 NTU
Temperature	Temperature	15-30 °C	-
Sheens/Odours	Sheens/Odours	No Observable Sheen or Odour	-

a - Recommended water quality criteria (NSW EPA).

b - ANZECC (2000) Default trigger values for physical and chemical stressors for south-east Australia for slightly disturbed ecosystems for Estuaries (Table 3.3.2 Chapter 3 Aquatic Ecosystems).

c - Errata document has been issued which details that Nitrate values in Table 3.4.1 (page 3.4-5) are deleted and replaced with "Under Review" (Department of Agriculture, Fisheries and Forestry). The Nitrate guidelines values in ANZG (2018) have been reviewed and recalculated[6] with the value for 95% level of protection reported at 2.4mg/L for Nitrate-N.

Analytes such as Total Suspended Solids (TSS) and other easily observable aspects from the dewatering process will need to monitored closely as adverse public interest in this site is a foreseeable possibility. Which includes the following water quality objectives:

- Total suspended solids (TSS) < 50 mg/L
- No observable sheen or odour
- Turbidity < 10 NTU
- Temperature < 30˚C

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[6] https://envirolink.govt.nz/assets/Envirolink/1207-ESRC255-Updating-nitrate-toxcity-effects-on-freshwater-aquatic-species-.pdf

10 Potential Dewatering Impacts

Dewatering operations have the potential to impact receptors and the surrounding environment if not managed appropriately. This section outlines key areas of concern with respect to dewatering and potential environmental impacts.

Procedures for the management of potential environmental impacts are detailed in **Section 11**.

10.1 Receiving Water Quality

Typically, large volume and/or well flushed water bodies have a capacity to buffer the discharge of potential contaminants depending on the flow rate and duration of discharge. While the receiving waters are subject to the influences of an urbanised catchment, dewatering activities must not contribute to or cause significant decreases in receiving waters quality. Potential impacts associated with releasing dewatered groundwater to receiving waters (via the stormwater network) are summarised below.

10.1.1 PHYSICOCHEMICAL PARAMETERS

Changes to natural pH levels in a receiving waterway can be directly or indirectly detrimental to aquatic biota as particular species can be intolerant to specific conditions caused by dewatering processes.

Acidifying the receiving waters can cause metals bound to sediment and organic matter to be liberated, increasing toxicity, and enhancing the bioavailability of background metals. Oxidation of dissolved metals can also strip oxygen from the receiving waters resulting in fish kills, however this is less likely in medium to high flow systems such as Parramatta River.

Turbidity and suspended solids impact on a receiving environment include siltation, reduction of the euphotic zone affecting photosynthetic organisms by limiting light transmission through the water column, this has a flow on effect as the food chain is disrupted affecting benthic organisms and higher level organisms.

10.1.2 NUTRIENTS

Streams/rivers, canals and coastal lakes environments have the ability to assimilate and export nutrients (such as nitrogen and phosphorus) through a variety of pathways including flushing, bacterial conversion and permanent accumulation in sediments. Under favourable conditions these cycles can help buffer the receiving environment from potentially deleterious effects of nutrient loading. These effects can include eutrophication, potentially toxic algal blooms, increased oxygen demand and ammonia toxicity.

While the buffering ability of the receiving environment should not be relied upon as a management strategy, the efficiency of a particular water body to process nutrients is an important consideration in assessing the potential impacts of eutrophication of a water body.

10.1.3 HEAVY METALS

High concentrations of potentially harmful metals may be encountered in the groundwater depending on geology and historical uses of the site (and surrounding properties).

Whilst metals and associated compounds occur naturally in the environment and are essential for many organisms, the potential toxicity of metals to aquatic biota generally increases with concentration, particularly when in dissolved form. Furthermore, concentrations of dissolved metals may fluctuate throughout dewatering as water is drawn in from surrounding environments.

Metal toxicity also varies between different species of a particular metal, the physical and chemical characteristics of the receiving environment, and biological receptors. Thus, the size, tidal/mixing/flushing regime, and background concentrations of metals in the receiving waterway must be taken into account when assessing compliance.

Importantly, the total load and duration of metals discharged also needs to be considered when assessing potential chronic effects of metals on biota, though this is less crucial in deeper water with strong tidal interaction where the risk of accumulation is minimised.

10.1.4 PETROLEUM HYDROCARBONS AND CHLORINATED SOLVENTS

Research indicates that petroleum hydrocarbons toxicity is highly variable, as they contain many hydrocarbon chain compounds. Generally, petroleum hydrocarbon based compounds can naturally biodegrade given the right conditions and generally degrade to lesser toxic substances.

The chemical degradation products of the potential VOC contaminants in groundwater, specifically chlorinated hydrocarbons including tetrachloroethene (PCE) and degradation daughter products trichloroethene (TCE), dichloroethene (DCE) and vinyl chloride (VC) can be of greater ecological and human health risk than the parent compounds and are therefore considered to be significant.

Whilst not currently required based on recent analytical results, TRH and VOC compounds may require treatment prior to discharge, which can be achieved via several methods. The treatment system may consist of a single remediation method, such as air stripping or filtered through activated carbon (sorption) to remediate the water to a suitable standard for disposal or re-injection.

10.1.5 OTHER CONTAMINANTS

Other hydrocarbon contamination (PAHs and Phenols) and other common anthropogenic contaminants (OCPs, OPPs and PCBs) have not been identified exceeding the adopted ecological criteria within the localised groundwater.

Whilst these contaminants are not expected to be present at elevated concentrations during the dewatering process (based on the most recent groundwater quality data), historical use of pesticides and other chemicals are known in the surrounding area. As such, monitoring of these compounds (as identified in previous environmental investigations) is strongly recommended.

10.2 Settlement of Unconsolidated Soils

Dewatering has the potential to induce settlement in loose sands and soft sediments, possibly compromising the structural integrity of surrounding structures. This is likely to be lessor of an issue with water bearing rock aquifers, as in the case of the proposed development within a porous sandstone aquifer.

There is potential that drawdown outside the site may be sufficient to induce settlement in overlying buildings unless an appropriate DMP is implemented. A suitability qualified geotechnical consultant will be required to determine the potential settlement impacts caused by the potential drawdown because of the proposed dewatering activities. Detailed geotechnical considerations are beyond the scope of this assessment.

A suitably qualified engineer is required to determine the risk of settlement, potential impacts on the integrity of adjacent structures (i.e., buildings, roads, pipelines, etc.), and appropriate management measures.

10.3 Acid Sulphate Soils

Acid sulfate soils (ASS) occur predominantly on coastal land with elevations generally below 5 m Australian Height Datum (AHD). These soils also occur further inland in saline seepage areas, rivers, lake beds and irrigation channels. Where present, drawdown of the local water table can expose ASS to oxidising conditions creating acidity and mobilising metals at potentially harmful concentrations.

A review of the Canada Bay Local Environmental Plan 2009 acid sulfate soil risk map indicated that the majority of the site is located within a Class 2 ASS risk area, whilst the southwestern portion is located within a Class 5 ASS risk area. Acid sulfate soils in a Class 2 areas are likely to be found below the natural ground surface. Acid sulfate soils are not usually found in Class 5 areas, however, are within 500m of adjacent Class 1, 2, 3 or 4 soils.

The Detailed Site Investigation (Reditus, 2024 ref; 22148RP01) confirmed that ASS is present at the site from a depth of 1 mbgl to 10.7 mbgl. Therefore, an Acid Sulfate Soil Management Plan is required to be prepared and implemented during the excavation and dewatering works for the proposed development.

10.4 Impact to Water Supply Works and GDEs

As detailed in **Section 8** above, the basement dewatering works will not adversely impact on any water supply works, high priority GDEs, and is not expected to result in a change to water quality.

Based on the above assessment, the basement dewatering activities are considered to be of **Minimal Impact** under the NSW DPE (2023) Groundwater impact assessment criteria, NSW DPI (2012) AIP, and WMA 2000.

10.5 Noise, Vibration and Odour

Noise and vibrations are generated by pumps, generators and treatment systems which typically operate 24 hours a day during dewatering operations. Offensive odours, such as hydrogen sulphide can also be liberated through excavation of sand and or soils with high organic content. Other odours from volatile organic compounds can occur from sites contaminated with petroleum hydrocarbons or solvents. It is also common for diesel fumes to emanate from dewatering pumps and generators where electric systems cannot be used.

Noise, vibrations and odour have the potential to cause a public nuisance, particularly in dense residential areas such as the site, and may also impact on the natural movements or behaviour of wildlife.

11 Management of Potential Impacts

11.1 Drawdown

The depth of groundwater extraction infrastructure and the rate of extraction shall be limited to the minimum requirements set in the hydrogeological model to achieve the lowering of groundwater within the site to undertake construction works.

Dewatering shall be managed in consultation with a suitably qualified environmental and geotechnical engineer to ensure the structural integrity as built structures is not compromised.

Whilst effort has been made to make accurate predictions in the dewatering volumes and off-site effects, it is strongly recommended that water levels be monitored regularly in the dewatered area and in surrounding properties to ensure that local variations in hydraulic properties do not result in unacceptable groundwater table depression or mounding.

Monitoring of groundwater levels outside the basement wall at a minimum of three locations is recommended on a daily basis (refer to Section 13 for further details).

If drawdown approaching 1.0 m is identified in the monitoring points outside the shoring wall or near existing buildings, geotechnical and structural engineering advise should be sought, and consideration should be given to control of the off-site water table depression (if deemed required). This is likely to have in implication on the costs of the project but may be recommended in order to reduce the risk of damage to adjacent buildings and roadways.

11.2 Discharge of Groundwater

Groundwater discharge shall be controlled in a manner which does not create a flooding hazard. The rate of groundwater extraction will be highly dependent on the required time frame for excavation works and can be varied to match excavation depth speed and/or discharge restrictions (if any).

An average groundwater extraction and discharge rate of <0.3 L/s is expected to be maintained to keep the excavation and basement free of water.

During extreme rainfall/storm/tide events the local stormwater drainage system can become full or flooded. If combined stormwater and dewatering flows exceed the capacity of the stormwater drainage system, discharge shall be reduced or, if necessary, stopped until stormwater flows, and/or tidal inundation subsides. Routine inspections at the stormwater inlet will need to be conducted by the Site Manager or on appropriate delegate during storm events and greater than average tides.

The flowing sections may be required during the dewatering process if deemed necessary by the licencing provider and Council.

11.2.1 WATER QUALITY TESTING PRIOR TO DISCHARGE

Prior to discharge of extracted groundwater, the groundwater will be recirculated back into the open excavation or temporary onsite water storage to allow clearing of sediment from the dewatering system and allow water quality to stabilise. Once conditions have stabilised, initial batch testing of extracted water will be completed and compared against the WQO listed in **Table 15** (see **Section 9.3**).

The treated groundwater will be tested for analytes specified in **Section 13**, following receipt of the test results, the Environmental Manager/Consultant, in consultation with Council (where required), shall determine the suitability for discharge to the stormwater network. Compliance with the WQO set out in **Table 15** is required prior to discharge. Additional components to the water treatment process may be required if initial batch testing results do not meet the WQO.

Reditus note that the period between collecting the pre-start samples and discharging from site can exceed one week (more if test results are not favourable and retesting is required) and that this should be accounted for in the construction program.

11.3 Noise and Vibration

The following methods shall be employed to reduce noise emissions resulting from dewatering operations:

- Preference shall be given to electric powered dewatering pumps over diesel / fuel powered equipment (due to the sound generated being lower with electric pumps).
- Installation and maintenance of high efficiency mufflers for all noise generating plant. All reasonable steps shall be taken to acoustically baffle and muffle all plant and equipment.
- Pump equipment and generators shall be located away from site boundaries where possible, with consideration to adjoining residences, Installation of acoustically baffled enclosures around and generators and pump is recommended to minimise noise issues or complaints.
- All subcontractors to be managed to ensure they work only within defined hours.
- Where there are several noise generating equipment, schedule operations to minimise cumulative impacts.
- Keep equipment well maintained.
- Ensure engine shrouds (acoustic linings) are installed (where feasible).

It is the responsibility of the Site Manager to ensure appropriate management of vibration, noise and odour during dewatering operations, and that the management approaches adopted are in accordance with the Council Conditions of Consent and any relevant management plan (e.g., Construction Environmental Management Plan, Demolition Management Plan, Excavation Management Plan, or Construction Noise and Vibration Management Plan).

11.4 Odour

Routine odour monitoring should be undertaken to identify offensive odours and avoid potential impacts on adjacent site users. Control measures, such as deodorants or passing the discharge through a carbon filter tank, shall be adopted in the event odours are considered unacceptable levels at the site boundary. Where odour controls prove ineffective, activities that cause an offensive odour shall cease until odour emissions are resolved.

12 Dewatering and Water Treatment System

The proposed dewatering system and treatment system (if required) to be operated at the site is specified below.

12.1 Dewatering System

Dewatering is proposed to commence following completion of the secant pile walls. This will minimise/prevent groundwater inflows from the upper unconsolidated alluvial aquifer, resulting in significantly lower dewatering volume requirements.

Groundwater is proposed to be extracted using a combination of a series of spearpoints internally around the permitter of the excavation and/or internal large diameter extraction wells.

The exact specification of the construction dewatering system will be determined by the Dewatering Contractor and will be dependent on pump sizing and water flow capacity. Reinjection is currently not proposed.

If water quality results deem that treatment is required prior to discharge, a water treatment system (detailed in **Section 12.2** below) will be implemented prior to proposed discharge to the stormwater pit.

12.2 Water Treatment System (if required during construction)

Depending on the water quality results established during initial dewatering monitoring works, a water treatment plant (WTP) may be required during construction, given the excavation and dewatering method. The process diagram for a potential water treatment system is provided in **Figure 2** below.

The water treatment system may comprise the following elements:

- Sediment Tank.
- Chemically Enhanced Primary Treatment (CEPT) System:
  - Including internal Chemical Dosing Unit for pH Adjustment and Flocculent Dosing

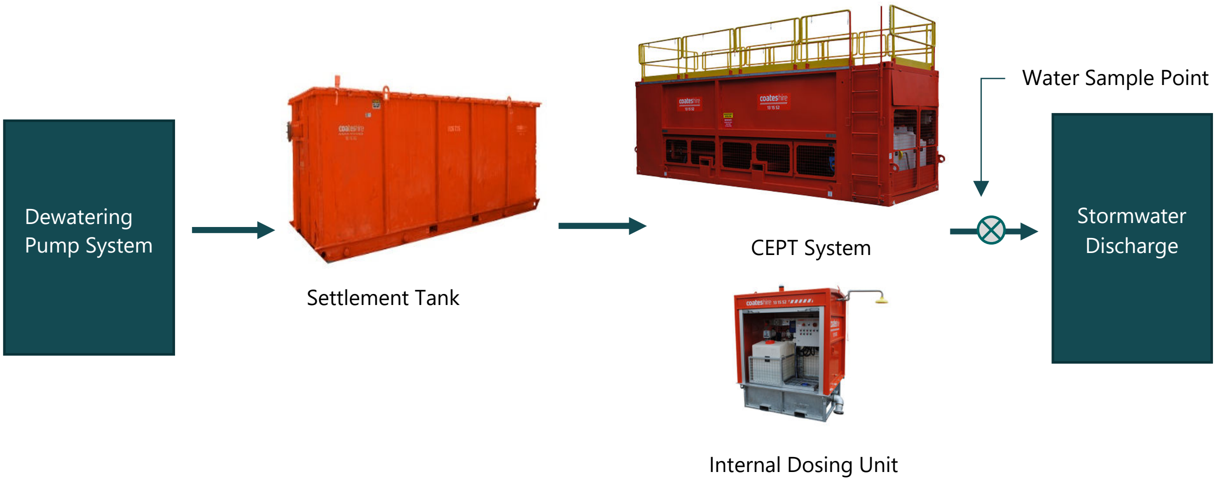


Figure 2. Water Treatment Plant Process Diagram

Details of each component of the WTP is provided in the sections below.

12.2.1 SETTLEMENT TANK

A suitability sized Sediment Tank will be installed initially to allow for the heavy suspended particles in waters to settle and also to serve as a balance tank to regulate any inconsistent or irregular flows. The settlement tank allows for a maximum settling time for a continuous flow of water.

12.2.2 CHEMICALLY ENHANCED PRIMARY TREATMENT (CEPT) SYSTEM

Following the initial sedimentation primary treatment, the water is then preferentially piped to a "Chemically Enhanced Primary Treatment (CEPT) System" unit which has an inbuilt dosing and control system provide automatic water treatment.

Physio-chemical processes allow the operator to adjust pH, remove total suspended solids and control heavy metal precipitation. The following sequence of water treatment process is proposed:

- Adjustment of pH; if pH recorded outside a range of 6.5-8.5.
- Chemical dosing with a flocculate (aluminium chloride) to remove fine sediments.
- Following the flocculation process the water flows upwards through a clarifier (similar to lamella box) to further filter suspended matter before discharging through a fabric filter.
- The CEPT is fitted with a flow meter capable of monitoring the total volume of water treated/discharged.

Groundwater monitoring and discharge will be completed in stages to ensure the protection of the receiving water environments.

Prior to any groundwater discharge commencing from the site to stormwater, an initial round of sampling must be conducted during the installation of the dewatering system. All groundwater will be retained onsite until water quality objectives have been achieved.

Once groundwater discharge water quality objectives are demonstrated to be achieved (which may require modifications to the dewatering systems or implementation of water treatment technologies if required), continuous discharge may occur in accordance with the DMP (still to be produced for the site).

12.2.3 CONTINGENCY WATER TREATMENT EQUIPMENT

Where the above procedures prove ineffective at decreasing concentrations of dissolved and/or total metals or other contaminants to appropriate levels, the inclusion of the following procedures in the treatment train may be recommended:

- Media Filtration Units to remove additional sediment loads to target any suspended heavy metal particulate, as well as removal of dissolved heavy metals via ionic exchange;
- pH/Eh Modification to maximum metal precipitation/flocculation;
- Air-stripping unit or Granulated Activated Carbon (GAC) unit to target any dissolved phase TPH/VOC contamination.

The role of the Media Filtration units (if required) will be to provide secondary water treatment for the removal of any residual heavy metals from the water. The Media Filtration Units may encompass a combination of sand and ionic resin units. The sand media will be appropriately sized to remove fine suspended particular matter and any bound heavy metals. The ionic resin media will be selected based on the particular heavy metal chemical properties, which will remove targeted dissolved heavy metals from the water stream through adsorption and ionic exchange. The rate of heavy metal removal will be dependent on the residence time of the water within the vessel.

The role of pH modification is to utilise the heavy metal geochemistry to change dissolved metals to insoluble precipitates by modifying pH and Eh. Certain metals will form mineral complexes under specific pH/Eh conditions, which are then able to be removed from the water stream as particulate through flocculation and coagulation process. Following removal of the heavy metals, the treated water pH/Eh is then adjusted back to within the adopted discharge criteria. This process can be enhanced through Media Filtration.

The role of the air strippers is to volatilise dissolved volatile contaminants, removing them from the groundwater influent stream. The vapour phase contaminants are captured and diverted through external GAC hoppers where they are sorbed. Treated groundwater influent then undergoes tertiary polishing treatment to remove any remaining dissolved phase hydrocarbons and reduce background heavy metals through particulate filtration. This is achieved via filtration of the groundwater influent through GAC and ion exchanging media filtration vessels via the process of adsorption and ion exchange.

Initial monitoring of discharge water quality shall provide the information required to optimise the water treatment regime.

Any addition of chemical agents must be managed by a suitably qualified environmental scientist and the chemicals approved for use by the NSW EPA. Intensive monitoring of treatment agent dose rates and discharge water quality must be untaken to optimise the water treatment regime specific to the site.

12.2.4 MAINTENANCE OF WATER TREATMENT SYSTEM

Routine maintenance of the treatment equipment will be required to ensure optimum performance. The discharge pipeline and any protective structures, such as driveway ramps/culverts, must be checked for leaks and damage on a regular basis. Retention structures must also be inspected regularly to ensure adequate performance and structural integrity.

Chemical treatment and settlement is likely to result in the retention of organic and/or inorganic material. Removal of the accumulated material will be required periodically to avoid re-suspension of accumulated sediment and reduction of treatment system capacity. Strategies to limit the volume of waste to be removed should be developed in consultation with the project environmental consultant.

13 Water Quality Monitoring Program

Monitoring of the discharge water will be completed for the duration of the dewatering activities in accordance with the monitoring schedules below.

All monitoring of water quality will be completed by a suitably qualified person, using calibrated equipment to collect samples that are representative of the discharge and analysis completed by a NATA accredited laboratory.

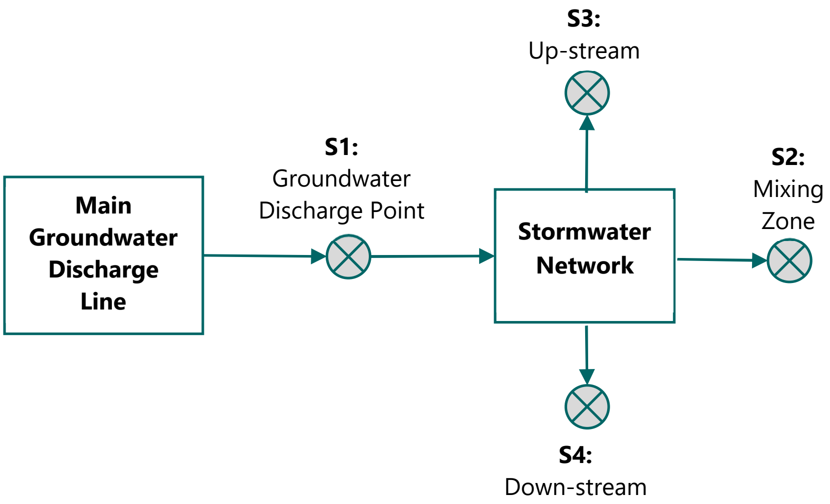
Council must be notified of any results received that indicate an adverse environmental impact within 24 hours of results being obtained.

Monitoring of the discharge water will be completed for the duration of the construction dewatering activities in accordance with the monitoring schedules below. All monitoring of water quality will be completed by a suitably qualified person, using calibrated equipment to collect samples that are representative of the discharge.

Specifications set out in the dewatering and discharge licence (if any) will outline the specific frequency of assessment, an interim sampling and monitoring program is outlined below.

13.1 Water Quality Monitoring Locations

Water quality samples will be collected from the following locations as presented in the flow chart below.



The following descriptions of the sampling locations are provided below, noting these may need to be updated based on the as constructed discharge points:

- S1: Groundwater Discharge Point:
  - A sample of the groundwater discharge prior to discharge into the onsite riparian creek. The sample will be collected directly from the main groundwater discharge line, representing the water quality following final treatment.
- S2: Stormwater Channel – Mixing Zone:
  - A sample of the receiving waters at the mixing zone boundary.
- S3: Stormwater Channel – Up-stream:
  - A sample of the receiving waters at a location approximately 100m up-stream from the stormwater discharge point.
- S4: Stormwater Channel / Broad Water Outlet– Down-stream:
  - A sample of the receiving waters at either an accessible location within the stormwater channel or at the discharge point at Parramatta River.

In the event that groundwater discharge waters (S1) can be demonstrated to consistently meet the adopted DGVs, sampling of the receiving waters at monitoring points S2, S3 and S4 can cease. The proposed water quality sample locations are presented in **Figure 3** below.

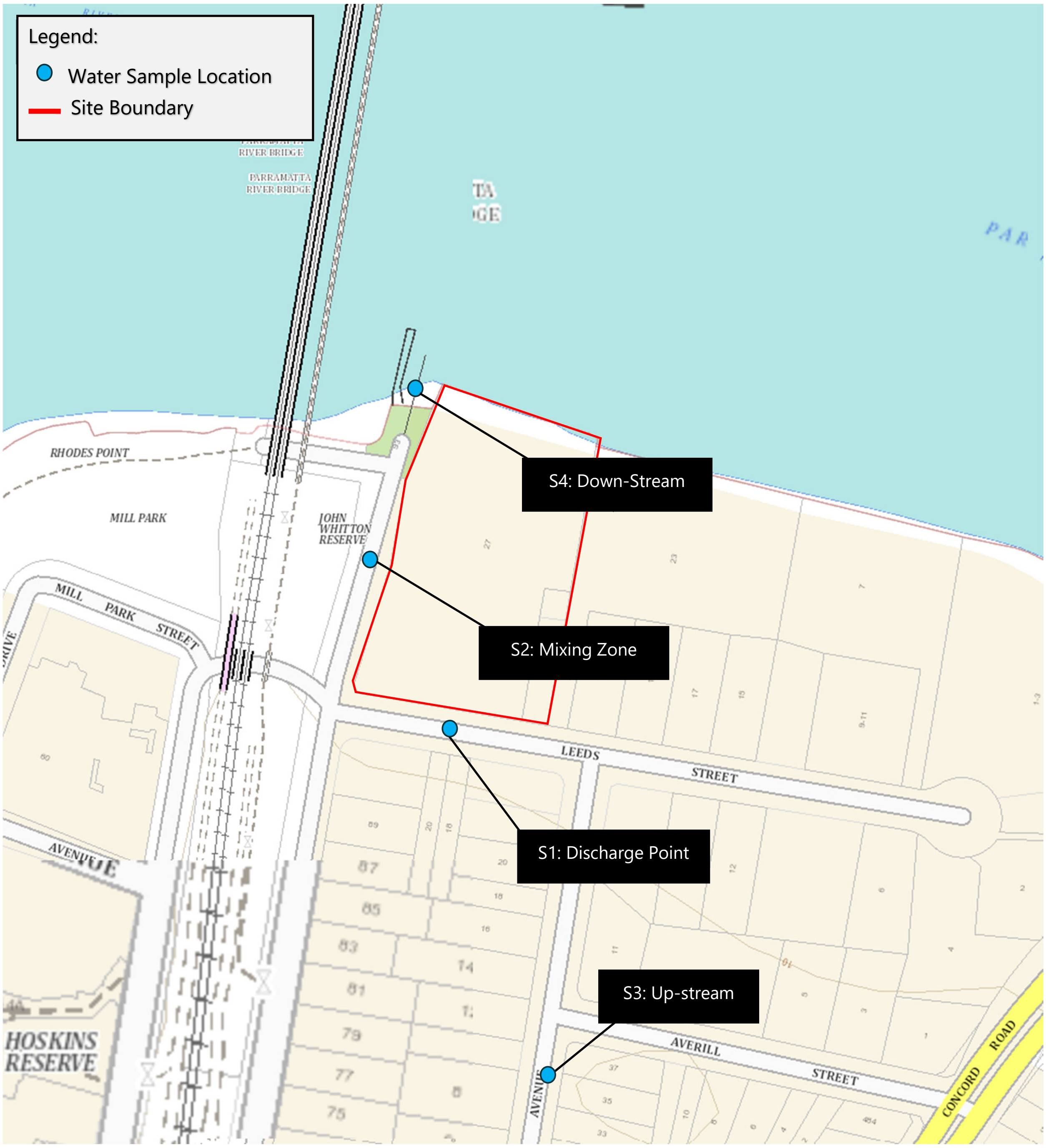


Figure 3. Proposed Water Quality Sample Locations, note these may need to be updated based on the as constructed discharge points.

13.2 Water Quality Monitoring Frequency and Analysis

Water quality treatment may be required prior to discharge of the extracted groundwater to the Council stormwater system.

Water quality monitoring would need to be performed prior to commencement of treated water discharge. This monitoring period is defined as the 'Stage 1: Initial Assessment / Trial Run Period' and will allow for assessment of water quality treatment performance, compliance against the adopted discharge criteria, establish if additional water treatment methods are required to achieve discharge criteria and establish background water quality in the event that deviations from the adopted discharge criteria are technically justifiable.

Subsequent ongoing monitoring will also be required to confirm the on-site treatment system is functioning as intended. This monitoring has been segmented into two stages, ‘Stage 2: Initial Operational Discharge Monitoring Period’ to establish treated water quality trends during continuous discharge, and ‘Stage 3: Ongoing Operational Discharge Monitoring Period’ with a lower testing frequency to confirm ongoing treatment performance once Stage 2 water quality trends have been established.

Council must be notified immediately of any pollution incidents as the regulator (including discharges above the set limits in **Table 15** to the stormwater and where any unacceptable impact to the receiving waters is identified).

13.2.1 STAGE 1: INITIAL COMMISSIONING ASSESSMENT/TRIAL RUN PERIOD

An initial sampling program must be conducted during the installation and commissioning of the dewatering pumping and treatment system, prior to any discharge of groundwater form the site. This will enable baseline discharge water quality to be established and determine if the employed level of groundwater treatment is suitable to ensure compliance with the adopted discharge criteria, prior to offsite discharge.

The initial commissioning sampling program should be completed on at least three (3) consecutive sampling events, and at minimum comprise two (2) representative samples, one collected prior to treatment, and one collected from the discharge line of the dewatering treatment system.

Representative samples of the receiving waters (S2, S3 and S4) should also be collected to establish baseline/ background conditions. This should include at least two (2) baseline sampling events, preferable one during drier periods and one during wetter periods.

The samples must be analysed for all water quality parameters as per below and as listed in **Table 16**.

Daily field monitoring of the following parameters from the inlet and outlet sides of the treatment system.

- pH
- Electrical Conductivity(EC)
- Dissolved oxygen (DO);
- Redox Potential (mV)
- Turbidity (NTU)

As per Appendix A of the NSW DPIE (2021) *Minimum Requirements for Building Site Groundwater Investigations and Reporting guidelines*, discharge water quality samples collected will be submitted for analysis to a NATA accredited laboratory for the following analytes listed in **Table 16** below.

Table 16. List of Required Laboratory Water Quality Tests and Schedule (NSW DPIE 2021 – Appendix A)

TYPE	CORRESPONDING LABORATORY ANALYSIS	TESTING REQUIREMENT
Physical Parameters	Alkalinity (bicarbonate, carbonate, hydroxide and total), electrical conductivity (EC), pH, redox potential (Eh), total dissolved solids (TDS), total hardness, temperature, dissolved oxygen (DO).	Mandatory
Other Physical Parameters	Turbidity* (NTU), total suspended solids* (TSS), total organic carbon* (TOC), sodium absorption ratio* (SAR)	Mandatory for discharge to any receiving waters
Major Anions	Sulfate (SO_4), chloride (Cl), carbonates (CO3), bromide (Br), fluoride (F)	Mandatory
Major Cations	Calcium (Ca), magnesium (Mg), sodium (Na), potassium (K)	Mandatory

TYPE	CORRESPONDING LABORATORY ANALYSIS	TESTING REQUIREMENT
Ionic Balance	Cation/Anion balance (as a percentage)	Mandatory
Dissolved Inorganics and Dissolved Heavy Metals	Aluminium (Al), antimony (Sb), arsenic (As), barium (Ba), beryllium (Be), boron (B), cadmium (Cd), chromium (Cr), cobalt (Co), copper (Cu), iron (Fe), lead (Pb), lithium (Li), manganese (Mn), mercury (Hg), molybdenum (Mo), nickel (Ni), selenium (Se), silica (dissolved SiO2), silver (Ag), strontium (Sr), uranium (U), vanadium (V), zinc (Zn)	Mandatory for baseline thereafter negotiable, depending on site setting unless otherwise required by another regulatory body
Nutrients	Ammonia (NH_3), nitrate (NO_3), total nitrogen (N), oxidised nitrogen (N), total phosphorus (P), reactive phosphorus (P)	Mandatory for baseline thereafter negotiable, depending on site setting unless otherwise required by another regulatory body
Microbiological organisms	Faecal coliforms, faecal streptococci, Escherichia coli	Mandatory for baseline thereafter negotiable, depending on site setting unless otherwise required by another regulatory body
Organics	Benzene toluene ethylbenzene xylene (BTEX), polycyclic aromatic hydrocarbons (PAHs), total recoverable hydrocarbons (TRHs)	Mandatory for baseline thereafter negotiable, depending on site contamination status unless otherwise required by another regulatory body.
Other	Range of analytes relevant to site-specific contaminants of environmental concern:	As required by the NSW EPA, on the advice of a specialist environmental consultant or as required by another regulatory body.

The sampling frequency should be maintained until the target parameters and chemical concentrations in treated water stabilised (i.e., consecutive tests are within ±10% of the observed results) and within the adopted discharge criteria for three consecutive periods.

Following completion of the initial baseline/trail run monitoring program, an assessment will be completed by a suitability qualified environmental consultant to determine that groundwater discharge will not pose an environmental risk and will not result in adverse environmental effects. If potential unacceptable impact to the receiving waters is identified, contingency groundwater treatment options should be considered and adopted where appropriate.

The Stage 1 Initial Assessment / Trial Run Period may be extended if stabilisation is not observed, or the treated water exiting the treatment system does not satisfy the adopted discharge criteria.

During the Stage 1 Initial Assessment / Trial Run Period, all collected groundwater seepage (including treated waters) must be retained/recirculated on-site and is not permitted to be discharged to Council Stormwater network until it is proven to meet the adopted discharge criteria or considered to not pose an unacceptable risk to the receiving waters.

13.2.2 STAGE 2: INITIAL OPERATIONAL DISCHARGE MONITORING PERIOD

After successful completion of the Stage 1 Trial Run period, treated groundwater may be continuously discharged directly to the Council Stormwater system.

A daily sampling frequency of the S1 discharge waters for a 2 week period is recommended during the Stage 2 Initial Operational Discharge of the onsite water treatment system.

The daily sampling program should at minimum comprise two (2) representative samples, one collected prior to treatment, and one collected from the discharge line of the dewatering treatment system.

Representative samples of the receiving waters (S2, S3 and S4) should also be collected to establish background conditions and allow assessment of any impact from the discharge.

The samples must be analysed for all water quality parameters as per below and as listed in **Table 16** above.

The daily sampling frequency should be maintained for a minimum of 2 weeks, until the target parameters and chemical concentrations in treated water stabilised (i.e., consecutive tests are within ±10% of the observed results) and within the adopted discharge criteria for five consecutive days.

Following completion of the initial operational period, an assessment will be completed by a suitability qualified environmental consultant to determine that groundwater discharge is not posing an environmental risk and is not resulting in adverse environmental effects. If an unacceptable impact to the receiving waters is identified, discharge of groundwater must stop, and contingency groundwater treatment options should be considered and adopted where appropriate.

Council must be notified immediately of any pollution incidents as the regulator (including discharges above the set limits in **Table 15** to the stormwater and where any unacceptable impact to the receiving waters is identified).

13.2.3 STAGE 3: ONGOING OPERATIONAL DISCHARGE MONITORING PERIOD

After successful completion of the Stage 2 Initial Operation Discharge period, treated groundwater may be continuously discharged directly to the Council Stormwater system.

Daily monitoring of pH and Turbidity of the Treated Discharge Waters (S1) must be maintained throughout the dewatering process. Daily field monitoring of the following parameters from the inlet and outlet sides of the treatment system.

- pH
- Turbidity (NTU)

The sampling program should at minimum comprise two (2) representative samples, one collected prior to treatment and one collected from the discharge line of the dewatering treatment system.

Representative samples of the receiving waters (S2, S3 and S4) should also be collected to establish background conditions and allow assessment of any impact from the discharge.

Weekly and then monthly water samples will be collected from the dewatering discharge point during the active construction dewatering and discharge activities, as listed in **Table 16** above.

The monthly sampling frequency should be maintained for the remainder of the dewatering and discharge program.

Monthly groundwater sampling is also required from the three (3) groundwater monitoring wells, with laboratory testing as per **Table 17** below.

Results of the monitoring must be reviewed by the appointed environmental consultant on a weekly basis to determine that groundwater discharge is not posing an environmental risk and is not resulting in adverse environmental effects. If an unacceptable impact to the receiving waters is identified, discharge of groundwater must stop and contingency groundwater treatment options should be considered and adopted where appropriate.

Council must be notified immediately of any pollution incidents as the regulator (including discharges above the set limits in **Table 15** to the stormwater and where any unacceptable impact to the receiving waters is identified).

13.3 Water Sample Collection

Discharge and receiving waters will be analysed in the field using a calibrated water quality meter to assess the EC, DO, pH, Turbidity, ORP and Temperature.

Water samples will be taken directly from the discharge line sample ports or using a surface water grab sampler for the remaining analytes mentioned in **Section 13.2** above.

Samples are to be placed directly into appropriately preserved, laboratory supplied sampling containers, labelled with the project identification, sample name/location, sample date and who collected the sample. Samples for dissolved heavy metal analysis shall be field filtered using 0.45um disposable filters.

Once samples are obtained, they are to be stored and transported in an ice cooled Esky to the laboratory under a chain-of-custody (CoC).

13.4 Monitoring of Discharge Flow Rate, Groundwater Drawdown & In-Situ Groundwater Quality

Discharge flow rates, as well as groundwater levels and groundwater quality outside the excavation shall be monitored in general accordance with the NSW DPIE (2021) *Minimum Requirements for Building Site Groundwater Investigations*, as per **Table 17** below.

Table 17. Monitoring Program for Discharge Flow Rates and Groundwater Levels

PARAMETER	LOCATION	FREQUENCY
Discharge Rates and Volumes	Calibrated flow meter (e.g. inline Magflow meter) on discharge pipeline	**Daily**
Groundwater Level	From all six (6) shallow groundwater monitoring wells located outside the excavation, location RW01 through to RW06 inclusive.	**Daily:** For 2 weeks prior to dewatering commencement. During the entire dewatering period For a minimum of two months following the cessation of pumping.
Groundwater In-situ Quality Measurements: • Electrical conductivity (specific conductance at 25°C). • Temperature, • pH. • Reduction-oxidation (redox) potential. • Dissolved oxygen.	From three (3) groundwater monitoring wells located outside the excavation.	**Weekly:** For 2 weeks prior to dewatering commencement. During the entire dewatering period For a minimum of two months following the cessation of pumping.
Groundwater Quality Testing: As per **Table 16**		Monthly: At least 2 sampling rounds prior to commencing dewatering to establish baseline conditions.

13.5 Contingencies

Based on the above proposed management and mitigation measures to be employed during the dewatering activities, the DMP should be effective to manage the potential impacts, however contingent actions may be required should the scenarios listed in **Table 18** below arise.

Table 18. Mitigation Measures for Potential Dewatering Issues

POTENTIAL SCENARIO	MITIGATION MEASURES
Treated water does not achieve the adopted discharge criteria following completion of the Stage 1 monitoring period.	Implementation/adjustment of physical and/or treatment processes and/or installation of larger retention structures should be completed. As per **Section 12.2.3**, additional water treatment measures may include Media Filtration Units (Sand, GAC or Ionic Resins), Air-stripping Units or pH/Eh modification.

POTENTIAL SCENARIO	MITIGATION MEASURES
	Once additional treatment technologies are installed, the Stage 1 monitoring period should be repeated to confirm that the adopted discharge criteria will be achieved. Council must be notified immediately of any pollution incidents as the regulator (including discharges above the set limits in **Table 15** to the stormwater and where any unacceptable impact to the receiving waters is identified).
During the Stage 2 and Stage 3 monitoring periods, if quality of treated water does not meet the adopted discharge criteria.	Discharge to the stormwater system must be suspended, tail water should be retained onsite and stored in appropriate bulk containers for further on-site treatment and sampling until it is proven to meet the adopted discharge criteria. If unexpected monitoring results indicate that the quality of the receiving water has changed (as a direct result of the dewatering activities), modification of management practices must be implemented, including up-scaling of the treatment measures. Implementation/adjustment of physical and/or treatment processes and/or installation of larger retention structures should be completed as an initial procedure to mitigate unacceptable levels of chemical contaminants (e.g., dissolved heavy metals, petroleum hydrocarbons, VOCs or pesticides). Where increased dissolved oxygen of the discharge waters is required, an aerator should be installed within the treatment line. Where implemented contingencies prove ineffective at mitigating risks to the receiving water way, ceasing dewatering may be the only options until such time that other management techniques can be applied. To avoid potential damage to the constructed basement in such a situation, consideration should be given to obtaining an Emergency Permit to discharge to sewer with Sydney Water. Otherwise, it may be necessary to have collected waters removed by a licenced liquid waste contractor should quantities accumulate beyond the onsite storage capacity. Council must be notified immediately of any pollution incidents as the regulator (including discharges above the set limits in Table 18 to the stormwater and where any unacceptable impact to the receiving waters is identified).
The treated groundwater quality cannot satisfy the nominated discharge criteria.	Should all feasible onsite water treatment options become exhausted, application to Council for a Trade Waste Licence could potentially be obtained for discharge to sewer. Alternatively, an Environmental Protection Licence (EPL) may be applied for with the NSW EPA for direct discharge into Broad Water.
Excessive groundwater drawdown (>1m) or other drawdown as determined by geotechnical/ structural engineer, resulting in unacceptable offsite settlement.	If offsite drawdown is <1.0 m but approaching 1.0 m is identified in the monitoring points outside the excavation, or if groundwater quality is observed to change beyond 'pre-dewatering' baseline conditions, consideration should be given to control of the off-site water table depression (i.e., through re-injection). This is likely to have in implication on the costs of the project but is recommended in order to reduce the risk of damage to adjacent buildings and roadways. The primary control method of reinjection would require some injection well to be installed outside the excavation boundary and may require a variation to the dewatering licence obtained from the WaterNSW / NRAR. **If groundwater drawdown exceeds levels >1.0 m, immediately cease dewatering and contact hydrogeologist, geotechnical engineer and structural engineer.**

13.6 Principal Contractor Inspection Requirements

The Principal Contractor will be responsible for the following inspection activities and reporting requirements:

- Perform daily visual inspection of groundwater discharge stream at the stormwater connection point for any signs of unexpected conditions (e.g., discolouration, odours, sheens, oils, sediment).
- Routine maintenance of the groundwater dewatering system will be required to ensure optimum performance. The discharge pipeline and any protective structures, such as driveway ramps/culverts, must be checked for leaks and damage on a regular basis. Retention structures must also be inspected regularly to ensure adequate performance and structural integrity.
- Record and report any incidents of poor drainage, uncontrolled discharge or spills within the basement drainage system capture zone. Groundwater discharge must be immediately suspended in the event of any spills or environmental incidents and immediately reported to a suitability qualified environmental consultant. Groundwater discharge must not re-commence until discharge quality can be demonstrated to not result in unacceptable adverse environmental impact.
- Maintain erosion and sediment control measures in a functioning condition until all earthwork activities are completed.
- Devise and implement appropriate remedial measures where any controls or devices are not functioning effectivity or are inappropriate.
- The site manager will maintain records and comments on the condition of existing erosion and run-off controls (drains, silt fences, catch drains etc) dewatering procedures and test results, discharge rates and volumes, groundwater level and pH measurements, and any site instruction issued to contractors to undertake works on the dewatering and treatment equipment.
- Maintain rainfall data, to be filled onsite.
- All daily inspection reports, environmental incidents and controlled discharge records will be maintained and the information provided within monitoring assessment reports.
- Council must be notified immediately of any pollution incidents as the regulator including discharges above the set limits in **Table 15** to the stormwater and where any unacceptable impact to the receiving waters is identified).

14 Records and Reporting

The Principal Contractor shall maintain a record of all water quality and groundwater level monitoring, along with details of corrective and preventative actions implemented in relation to the dewatering activity.

The following reports shall be prepared:

- Stage 1 & 2: A weekly (interim) report issued upon receipt of laboratory analysis results that identifies potential compliance issues or water quality impacts that require immediate action, and other recommended preventive/corrective actions.
- Stage 3: Monthly dewatering report summarising the water quality data and management strategies implemented during the entire works. The report shall include a summary of discharge and receiving waters quality results, a statistical appraisal of the data, control charts showing quality results, a compliance assessment, indications of potential environmental harm, and comments and/or corrective actions implemented during the works.

The following information must be maintained and may be required to be submitted to WaterNSW / NRAR on completion of construction dewatering as part of the "Completion Report" within six months of completion of the dewatering during construction:

- Volume of groundwater pumped, the volume discharged offsite (and/or reinjected if applicable), the discharge/ reinjection rate and the duration of pumping.
- Groundwater level monitoring data and water table map depicting the aquifer's settled groundwater conditions and a comparison to the baseline conditions.
- All water quality monitoring data including results of any water quality testing.
- Location and construction of groundwater extraction works that are abandoned after dewatering has ceased.
- A detailed interpreted hydrogeological report identifying all actual resource and third party impacts, including an assessment of altered groundwater flows and an assessment of any subsidence or excessive settlement induced in nearby buildings and property and infrastructure.

Reditus note that if approval is granted under the WMA 2000, it is likely that the dewatering works may require a Water Access License (WAL) as the predicted inflows are >3 ML/yr.

Reditus note that if approval is granted under the WMA 2000, an application for a "new water access licence with a zero share component" will typically be needed to be completed and a suitable groundwater entitlement will also need to be obtained from the market to account for the groundwater take during the construction phase (as total groundwater take during construction is predicted to be 7.049 ML). This entitlement must be obtained from within the same groundwater source. This will typically need to be obtained within three months of granting of the Zero Access Licence.

15 Limitations

The report or document does not purport to provide legal advice and any conclusions or recommendations made should not be relied upon as a substitute for such advice.

The report does not constitute a recommendation by Reditus for the client (Billbergia Pty Ltd) or any other party to engage in any commercial or financial transaction and any decision by the client or other party to engage in such activities is strictly a matter for the client.

The report relies upon data, surveys, measurements and results taken at or under the site at particular times and conditions specified herein. Any findings, conclusions or recommendations only apply to the aforementioned circumstances and no greater reliance should be assumed or drawn by the client. Furthermore, the report has been prepared solely for use by the client and Reditus accepts no responsibility for its use by other parties. The client agrees that Reditus' report or associated correspondence will not be used or reproduced in full or in part for promotional purposes and cannot be used or relied upon by any other individual, party, group or company in any prospectus or offering. Any individual, party, group or company seeking to rely this report cannot do so and should seek their own independent advice.

No warranties, express or implied, are made. Subject to the scope of work undertaken, Reditus assessment is limited strictly to identifying typical environmental conditions associated with the subject property based on the scope of work and testing undertaken and does not include an evaluation of the structural conditions of any buildings on the subject property or any other issues that relate to the operation of the site and operational compliance of the site with state or federal laws, guidelines, standards or other industry recommendations or best practice. Scope of work undertaken for assessments are agreed in advance with the client and may not necessarily comply with state or federal laws or industry guidelines for the type of assessment conducted.

Additionally, unless otherwise stated Reditus did not conduct soil, air or wastewater analyses including asbestos or perform contaminated sampling of any kind. Nor did Reditus investigate any waste material from the property that may have been disposed off the site, or undertake and assessment or review of related site waste management practices.

The results of this assessment are based upon (if undertaken as part of the scope work) a site inspection conducted by Reditus personnel and/or information from interviews with people who have knowledge of site conditions and/or information provided by regulatory agencies. All conclusions and recommendations regarding the property are the professional opinions of the Reditus personnel involved with the project, subject to the qualifications made above.

While normal assessments of data reliability have been made, Reditus assumes no responsibility or liability for errors in any data obtained from regulatory agencies, statements from sources outside of Reditus, or developments resulting from situations outside the scope of this project/assessment.

Reditus is not engaged in environmental auditing and/or reporting of any kind for the purpose of advertising sales promoting, or endorsement of any client's interests, including raising investment capital, recommending investment decisions, or other publicity purposes. Reditus assumes no responsibility or liability for errors in any data obtained from regulatory agencies, statements from sources outside of Reditus, or developments resulting from situations outside the scope of this project.

Information relating to soil, groundwater, waste, air or other matrix conditions in this document is considered to be accurate at the date of issue. Surface, subsurface and atmospheric conditions can vary across a particular site or region, which cannot be wholly defined by investigation. As a result, it is unlikely that the results and estimations presented in this report will represent the extremes of conditions within the site that may exist. Subsurface conditions including contaminant concentrations can change in a limited period of time and typically have a high level of spatial heterogeneity.

From a technical perspective, there is a high degree of uncertainty associated with the assessment of subsurface, aquatic and atmospheric environments. They are prone to be heterogeneous, complex environments, in which small subsurface features or changes in geologic conditions or other environmental anomalies can have substantial impact on water, air and chemical movement.

Major uncertainties can also occur with source characterisation, assessment of chemical fate and transport in the environment, assessment of exposure risks and health effects, and remedial action performance. These factors make uncertainty an inherent feature of potentially impacted sites. Technical uncertainties are characteristically several orders of magnitude greater at impacted sites than for other kinds of projects.

Reditus' professional opinions are based upon its professional judgment, experience, and training. These opinions are also based upon data derived from the limited testing and analysis described in this report or reports reviewed. It is possible that additional testing and analysis might produce different results and/or different opinions or other opinions. Reditus has limited its investigation(s) to the scope agreed upon with its client. Reditus believes that its opinions are reasonably supported by the testing and analysis that has been undertaken (if any), and that those opinions have been developed according to the professional standard of care for the environmental consulting profession in this area at this time. Other opinions and interpretations may be possible. That standard of care may change and new methods and practices of exploration, testing and analysis may develop in the future, which might produce different results.

16 References

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A

Figures

REDITUS

Map

22148_rp03_f01_siteloc_v01

Date of Export

18/09/2024

Author	**Approver**
JP	TS

Data Source

Metromap, Google Maps, Open Street Map, NSW Government

Legend

Legend	Watercourses
🟥 Site Boundary	━ Rivers
🟨 Lot Boundaries	━ Stream (Perennial)
— Major Roads	╌ Stream (Non-Perennial)
┼ Railways	╌ Unnamed Stream (Non-Perennial)
▭ Surface Water	╌ Other Channels

Figure 1 - Site Location

25-27 Leeds Street, Rhodes NSW 2138

22148 - Dewatering Management Plan

Billbergia Pty Ltd

Map	
22148_rp03_f02_sitelayout_v01	
Date of Export 18/09/2024	**Map Scale (approx. at A3)** 1:800
Author JP	**Approver** TS
Data Source Metromap, Google Maps, Open Street Map, Geoscience Australia	

Legend

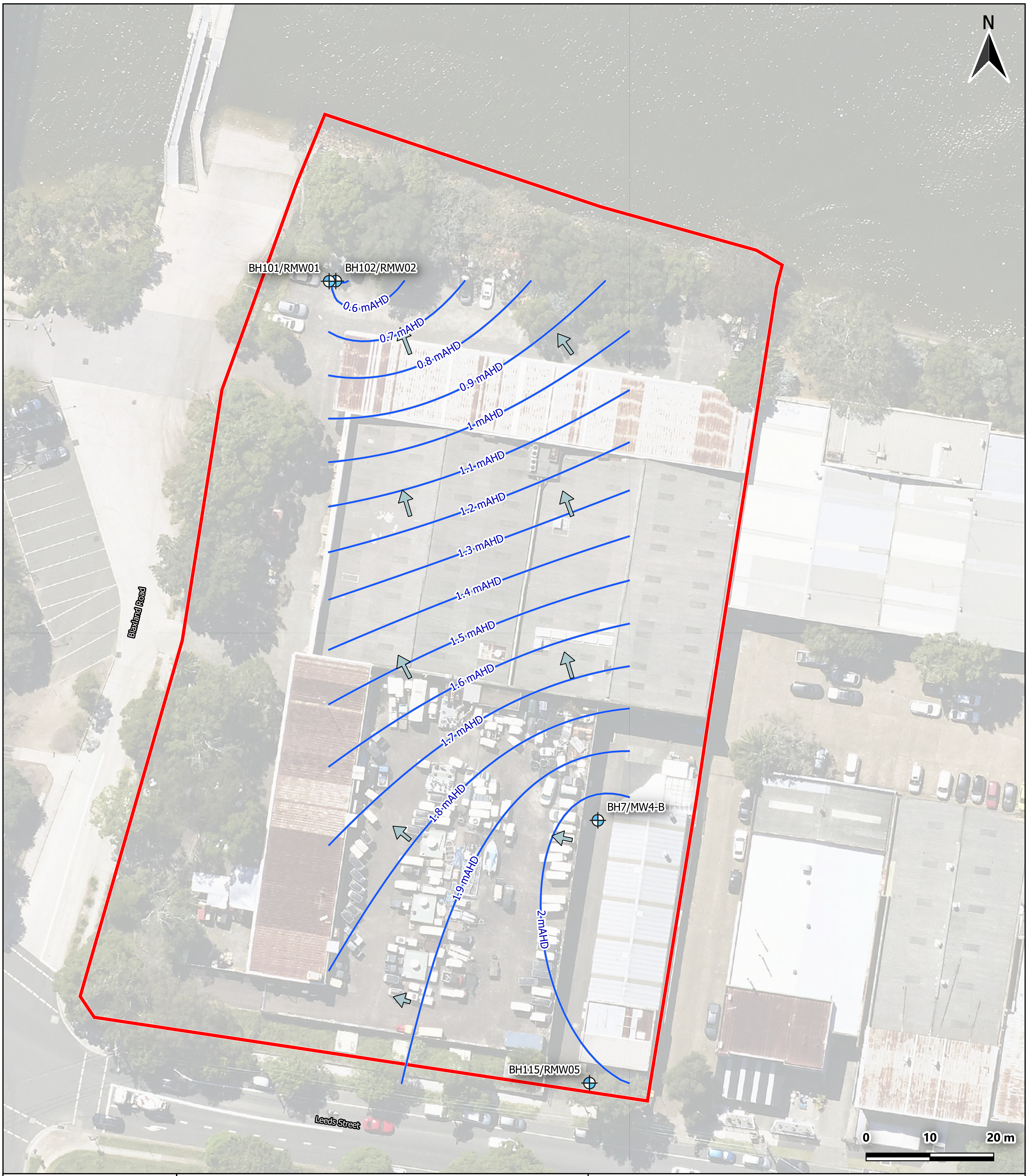
🟥 Site Boundary
🟨 Lot Boundaries

Figure 2 - Site Layout

25-27 Leeds Street, Rhodes NSW 2138

22148 - Dewatering Management Plan

Billbergia Pty Ltd



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Date of Export	02/10/2024
Map Scale (approx. at A3)	1:600
Author	JP
Approver	TS
Data Source	Metromap, Google Maps, Open Street Map, Geoscience Australia

Legend

- 🟥 Site Boundary
- 🟨 Lot Boundaries
- ⊕ Groundwater Monitoring Well
- — Inferred Groundwater Elevation Contours (m AHD)
- ⇨ Inferred Groundwater Flow Direction

Figure 3 - Groundwater Elevation Contours

25-27 Leeds Street, Rhodes NSW 2138

22148 - Dewatering Management Plan

Billbergia Pty Ltd

Map

22148_rp01_f04_bom bores_v01

Date of Export	**Map Scale (approx. at A3)**
04/10/2024	1:14,140
Author	**Approver**
NP	LD

Data Source

Metromap, Google Maps, Open Street Map, Geoscience Australia

Legend

🟥 Site Boundary

▭ 1 km buffer

Bureau of Meterology Groundwater Bores

⊕ Basic Land Rights (BLR) Bore

⊕ Monitoring Bores

Watercourses

— Rivers

— Stream (Perennial)

- - - Stream (Non-Perennial)

- - - Unnamed Stream (Non-Perennial

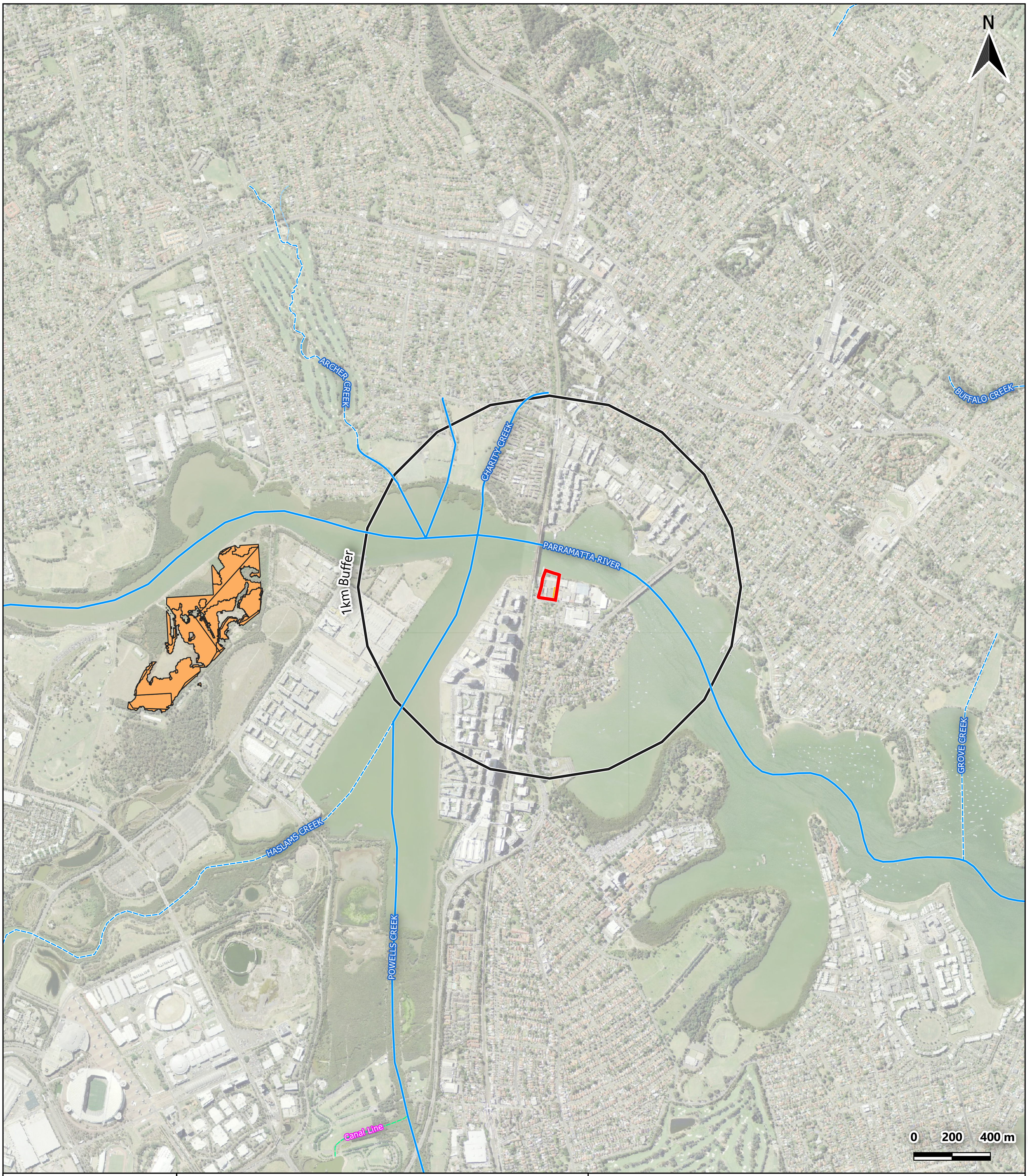
- - - Other Channels

Figure 4 - BOM Registered Groundwater Bores

25-27 Leeds Street, Rhodes NSW 2138

22148 - Dewatering Management Plan

Billbergia Pty Ltd



Map 22148_rp01_f05_GDE_v01	
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Author NP	**Approver** LD
Data Source Metromap, Google Maps, Open Street Map, Geoscience Australia	

Legend

🟥 Site Boundary

Watercourses
— Rivers
— Stream (Perennial)
- - Stream (Non-Perennial)
- - Unnamed Stream (Non-Perennial)
- - Other Channels

Groundwater Dependant Ecosystems High Ecological Value Aquatic Ecosystems (HAVAE)
🟧 High

Figure 5 - Groundwater Dependant Ecosystems

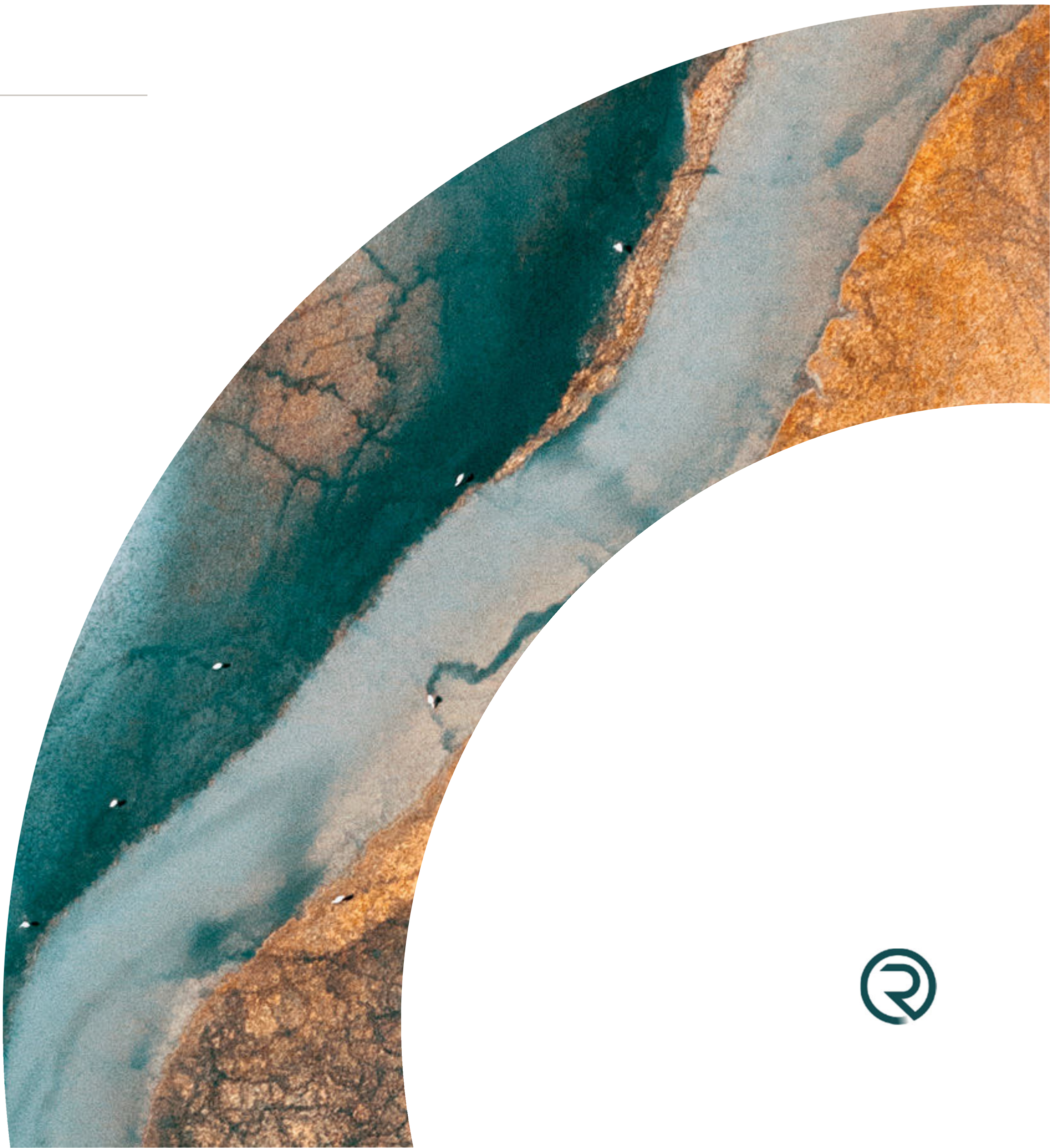
25-27 Leeds Street, Rhodes NSW 2138

22148 -Dewatering Management Plan

Billbergia Pty Ltd

B

Basement Development Plans



STORAGE TOTALS

Level	Count
BASEMENT 2	189
BASEMENT 1	104
BASEMENT 1 (1600)	50
A & B - GROUND	12
Grand total	355

PARKING TOTALS

PARKING TYPE	COUNT
VISITOR - ACCESSIBLE	2
VISITOR	15
RESIDENTIAL	350
RETAIL	17
RETAIL - ACCESSIBLE	2
CARSHARE	9
CAR WASH BAY	1
Grand total	396

PARKING BY LEVEL

PARKING TYPE	LEVEL	COUNT
A & B - GROUND		
CARSHARE	A & B - GROUND	9
RETAIL - ACCESSIBLE	A & B - GROUND	2
RETAIL	A & B - GROUND	17
RESIDENTIAL	A & B - GROUND	36
VISITOR	A & B - GROUND	15
VISITOR - ACCESSIBLE	A & B - GROUND	2
		81
BASEMENT 1		
RESIDENTIAL	BASEMENT 1	157
		157
BASEMENT 2		
CAR WASH BAY	BASEMENT 2	1

PARKING BY LEVEL

PARKING TYPE	LEVEL	COUNT
RESIDENTIAL	BASEMENT 2	157
		158
Grand total		396

MECHANICAL
RISER
LOVCATION TO
BE CONFIRMED

POTENTIAL TO
MOVE STORING
WALL SOUTH
7750MM ON
BASEMENT 02.
STRUCTURAL
ENGINEER TO
CONFIRM

PARKING LEGEND:
- ▨ RESIDENTIAL
- ▨ VISITOR
- ▨ RETAIL
- ▨ COMMUNITY
- ▨ SHARE SPACE

DRAFT: 17.04.2024

Nominated Architects: Adam Haddow-7188 | John Pradel-7004

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Rev	Date	Revision	By	Chk.

Client
Billbergia
creating communities®

Project
25-27 LEEDS STREET
25-27 LEEDS STREET, RHODES
Country: WANGAL
Drawing Name
BASEMENT 02

Date	Scale	Sheet Size
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Drawn	**Chk.**	**Job No.**
JR	NH	6924
Drawing No.		**Revision**
DA-1000		

SJB Architects
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2010 Australia
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www.sjb.com.au

STORAGE TOTALS

Level	Count
BASEMENT 2	189
BASEMENT 1	104
BASEMENT 1 (1600)	50
A & B - GROUND	12
Grand total	355

PARKING TOTALS

PARKING TYPE	COUNT
VISITOR - ACCESSIBLE	2
VISITOR	15
RESIDENTIAL	350
RETAIL	17
RETAIL - ACCESSIBLE	2
CARSHARE	9
CAR WASH BAY	1
Grand total	396

PARKING BY LEVEL

PARKING TYPE	LEVEL	COUNT
A & B - GROUND		
CARSHARE	A & B - GROUND	9
RETAIL - ACCESSIBLE	A & B - GROUND	2
RETAIL	A & B - GROUND	17
RESIDENTIAL	A & B - GROUND	36
VISITOR	A & B - GROUND	15
VISITOR - ACCESSIBLE	A & B - GROUND	2
		81
BASEMENT 1		
RESIDENTIAL	BASEMENT 1	157
		157
BASEMENT 2		
CAR WASH BAY	BASEMENT 2	1

PARKING BY LEVEL

PARKING TYPE	LEVEL	COUNT
RESIDENTIAL	BASEMENT 2	157
		158
Grand total		396

DRAFT: 17.04.2024

FOR APPROVAL

Nominated Architects: Adam Haddow-7188 | John Pradel-7004

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Rev	Date	Revision	By	Chk.

Client
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Project
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25-27 LEEDS STREET, RHODES
Country: WANGAL

Drawing Name
BASEMENT 01

Date	Scale	Sheet Size
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JR	NH	6924

Drawing No.	Revision
DA-1000A	

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STORAGE TOTALS

Level	Count
BASEMENT 2	189
BASEMENT 1	104
BASEMENT 1 (1600)	50
A & B - GROUND	12
Grand total	355

PARKING TOTALS

PARKING TYPE	COUNT
VISITOR - ACCESSIBLE	2
VISITOR	15
RESIDENTIAL	350
RETAIL	17
RETAIL - ACCESSIBLE	2
CARSHARE	9
CAR WASH BAY	1
Grand total	396

PARKING BY LEVEL

PARKING TYPE	LEVEL	COUNT
A & B - GROUND		
CARSHARE	A & B - GROUND	9
RETAIL - ACCESSIBLE	A & B - GROUND	2
RETAIL	A & B - GROUND	17
RESIDENTIAL	A & B - GROUND	36
VISITOR	A & B - GROUND	15
VISITOR - ACCESSIBLE	A & B - GROUND	2
		81
BASEMENT 1		
RESIDENTIAL	BASEMENT 1	157
		157
BASEMENT 2		
CAR WASH BAY	BASEMENT 2	1

PARKING BY LEVEL

PARKING TYPE	LEVEL	COUNT
RESIDENTIAL	BASEMENT 2	157
		158
Grand total		396

DRAFT: 17.04.2024

FOR APPROVAL

Nominated Architects: Adam Haddow-7188 | John Pradel-7004

0 2 4 10m
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Rev	Date	Revision	By	Chk.

Client

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Project
25-27 LEEDS STREET
25-27 LEEDS STREET, RHODES
Country: WANGAL

Drawing Name
GROUND FLOOR (LEVEL 01)

Date	Scale	Sheet Size
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Drawn	Chk.	Job No.
JR	NH	6924

Drawing No.	Revision
DA-1001	

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🟦	RESIDENTIAL
🟫	LOBBY
🟦	RETAIL
⬜	CARPARK

DRAFT: 17.04.2024

FOR APPROVAL

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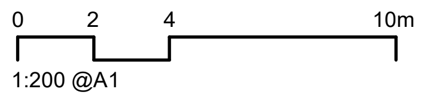

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Rev	Date	Revision	By	Chk.

Client

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Project
25-27 LEEDS STREET
25-27 LEEDS STREET, RHODES
Country: WANGAL

Drawing Name
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JR	NH	6924

Drawing No.	Revision
DA-1501	

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🟦 RESIDENTIAL

🟫 LOBBY

🟦 RETAIL

⬜ CARPARK

DRAFT: 17.04.2024

Nominated Architects: Adam Haddow-7188 | John Pradel-7004

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Rev	Date	Revision	By	Chk.

Client

Project
25-27 LEEDS STREET
25-27 LEEDS STREET, RHODES
Country: WANGAL

Drawing Name
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JR	NH	6924

Drawing No.
DA-1502

Revision

FOR APPROVAL

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🟦 RESIDENTIAL

🟫 LOBBY

🟦 RETAIL

⬜ CARPARK

DRAFT: 17.04.2024

Nominated Architects: Adam Haddow-7188 | John Pradel-7004

0 2 4 10m
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Rev	Date	Revision	By	Chk.

Client

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Project
25-27 LEEDS STREET
25-27 LEEDS STREET, RHODES
Country: WANGAL

Drawing Name
SECTION C

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Drawn	Chk.	Job No.
JR	NH	6924

Drawing No.	Revision
DA-1503	

FOR APPROVAL

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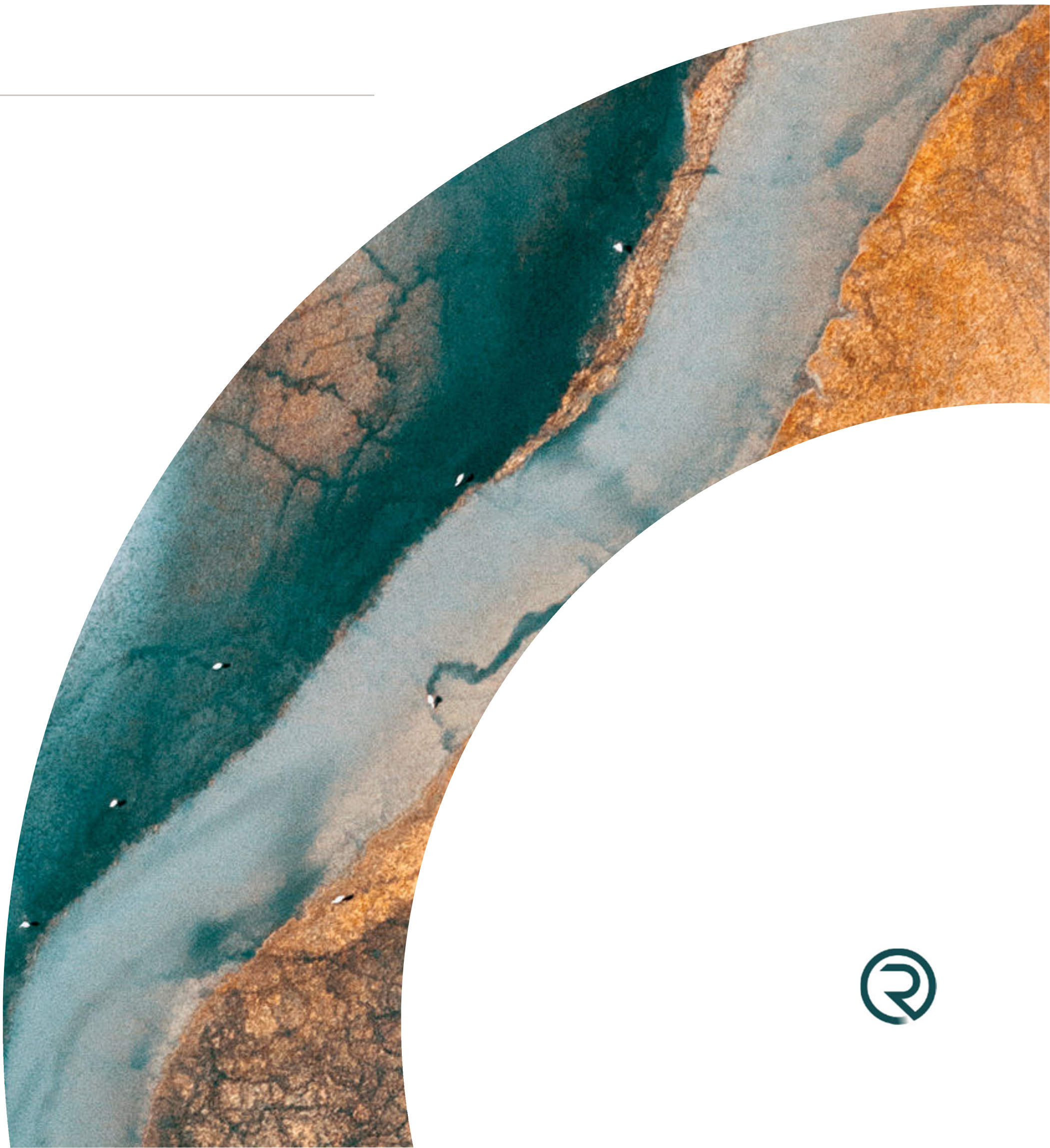
C

Borehole & Monitoring Well Logs

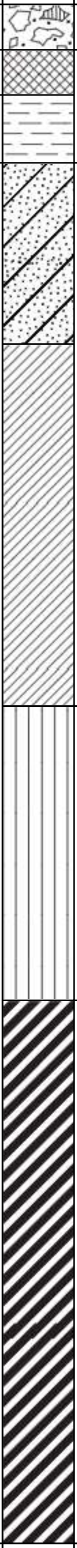


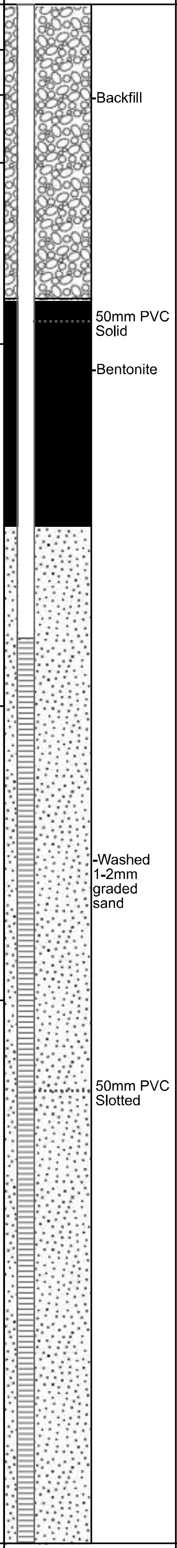
REDITUS

Reditus Consulting Pty Ltd
Lvl 1, Suite 1/29-33 Waratah St, Kirrawee NSW 2232, Australia
Phone: (02) 9521 6567

Boring No.: BH101/RMW01

Easting	: 0.00	**Drill Supplier**	: Stratacore Drilling Pty Ltd	**Job Number**	: 22148	**Sheet**	: 1 OF 1
Northing	: 0.00	**Driller Company**	: Stratacore Drilling Pty Ltd	**Client**	: Billbergia Pty Ltd		
Elevation	: Not Surveyed	**Logged By**	: Renee Ashton	**Project**	: Detailed Site Investigation		
Total Depth	: 6.8 m	**Date**	: 21/05/2024	**Location**	: 25-27 Leeds Street, Rhodes NSW		





Drilling Method	Depth (m)	Samples	PID (ppm)	Soil Origin	Graphic Log	Moisture	Material Description	Comments	Well Diagram	Water
				Non-Soil			Concrete			
				Fill		SL M	Fill. Gravelly SAND SP: very loose, dark brown, fine grained, fine sized gravel, slightly moist.			
				Reworked Natural			Reworked natural. Silty SAND SM: loose, pale yellow white, fine grained, slightly moist.			
	1			Natural		M	Natural. Clayey SAND SC: medium dense, low plasticity clay, pale brown, fine to medium grained, moist.			
	2 3						Natural. Sandy CLAY CI: soft, medium plasticity, pale brown grey yellow, fine to medium grained sand, inorganic, moist.			
	4					W	Natural. Sandy CLAY ML: soft, non-plastic, grey, fine to medium grained sand, organic, wet, carbonate materials (shells) present..	Carbonate materials (shells) present.		▽
	5 6					M	Natural. Sandy CLAY CI-CH: firm, medium to high plasticity, orangey red, fine grained sand, organic, moist.			
							BH101/RMW01 Terminated at 6.8m (Target Depth)			

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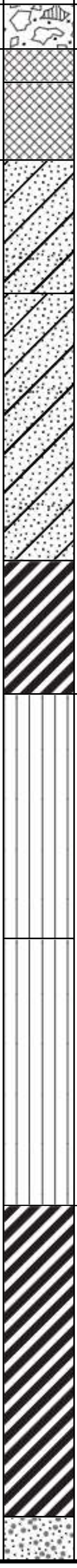
Phone: (02) 9521 6567

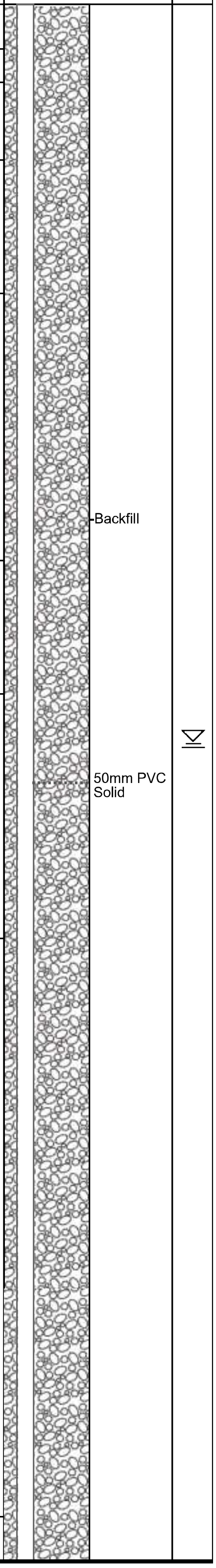
Boring No.: BH102/RMW02

Easting	: 0.00	**Drill Supplier**	: Stratacore Drilling Pty Ltd	**Job Number**	: 22148	**Sheet**	: 1 OF 2
Northing	: 0.00	**Driller Company**	: Stratacore Drilling Pty Ltd	**Client**	: Billbergia Pty Ltd		
Elevation	: Not Surveyed	**Logged By**	: Renee Ashton	**Project**	: Detailed Site Investigation		
Total Depth	: 10.2 m	**Date**	: 21/05/2024	**Location**	: 25-27 Leeds Street, Rhodes NSW		

Depth (m)	Samples Discrete	PID (ppm)
	0.3	0.3
	0.5	0.3
1	1.0	0.6
2	2.0	0.7
3	3.0	0.7
4	4.0	0.3
5	5.0	0.3
6	6.0	0.2

Soil Origin	Moisture	Material Description	Comments
Non-Soil		Concrete	
Fill	M	Fill. Gravelly SAND SW: loose, dark brown, medium to coarse grained, medium to coarse sized gravel, moist.	
		Fill. Silty SAND SM: loose, pale brown, medium grained, with fine sized gravel, moist.	
Natural		Natural. Clayey SAND SC: medium dense, low plasticity clay, reddish brown, medium grained, moist.	
		Natural. Clayey SAND SC: medium dense, low plasticity clay, brown pale brown, medium grained, moist.	
		Natural. Sandy CLAY CI-CH: soft, medium to high plasticity, mottled brown grey orange, medium grained sand, inorganic, moist.	
	W	Natural. Sandy CLAY ML: soft, non-plastic, grey, fine to medium grained sand, organic, wet, carbonate materials (shells) present..	Carbonate materials (shells) present.
		Natural. Sandy CLAY ML: soft, non-plastic, orangey red, fine grained sand, organic, wet, carbonate materials (shells) present..	Carbonate materials (shells) present.
	M	As above, but CI-CH: firm, medium to high plasticity, inorganic, moist.	
		Natural. SAND SP: loose, grey pale yellow, medium grained, moist.	





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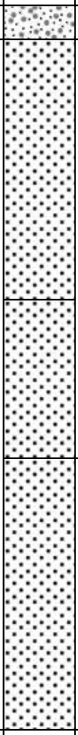
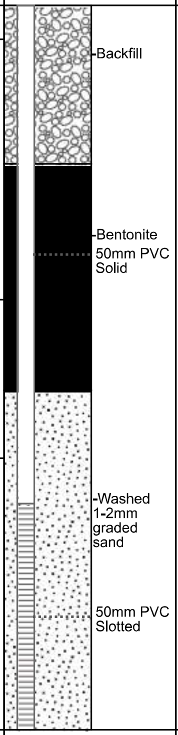
Phone: (02) 9521 6567

Boring No.: BH102/RMW02

Easting	: 0.00	**Drill Supplier**	: Stratacore Drilling Pty Ltd	**Job Number**	: 22148	**Sheet**	: 2 OF 2
Northing	: 0.00	**Driller Company**	: Stratacore Drilling Pty Ltd	**Client**	: Billbergia Pty Ltd		
Elevation	: Not Surveyed	**Logged By**	: Renee Ashton	**Project**	: Detailed Site Investigation		
Total Depth	: 10.2 m	**Date**	: 21/05/2024	**Location**	: 25-27 Leeds Street, Rhodes NSW		

Drilling Method	Depth (m)	Samples Discrete	PID (ppm)	Soil Origin	Graphic Log	Moisture	Material Description	Comments	Well Diagram	Water
							Natural. SAND SP: loose, grey pale yellow, medium grained, moist.			
	8	7.2 7.3	0.4	Rock		W	Rock. SANDSTONE: slightly weathered, very low strength, pale grey, fine grained, distinct, wet.			
							Rock. SANDSTONE: slightly weathered, very low strength, yellow brown, fine grained, bedding fabric, distinct, wet.			
	9 10					M	Rock. SANDSTONE: slightly weathered, medium strength, pale grey and orange, fine grained, distinct, moist.			
	11 12 13						**BH102/RMW02 Terminated at 10.2m (Target Depth)**			





REDITUS

Reditus Consulting Pty Ltd

Lvl 1, Suite 1/29-33 Waratah St, Kirrawee NSW 2232, Australia
Phone: (02) 9521 6567

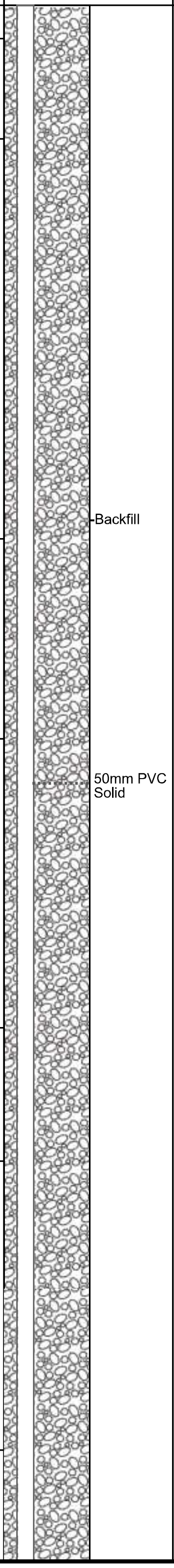
Boring No.: BH103/RMW03

Easting	: 0.00	Drill Supplier	: Stratacore Drilling Pty Ltd	Job Number	: 22148	Sheet	: 1 OF 2
Northing	: 0.00	Driller Company	: Stratacore Drilling Pty Ltd	Client	: Billbergia Pty Ltd		
Elevation	: Not Surveyed	Logged By	: Renee Ashton	Project	: Detailed Site Investigation		
Total Depth	: 10 m	Date	: 22/05/2024	Location	: 25-27 Leeds Street, Rhodes NSW		

Samples: Discrete	PID (ppm)
0.2	1.4
0.5	1.3
1.0	0.1
2.0	1.4
3.0	1.0
4.0	0.1
5.0	0.1
6.0	0.1

Soil Origin	Moisture	Material Description	Comments	Water
Non-Soil		Concrete		
Fill	SL M	Fill. Silty SAND SM: loose, dark brown, medium to coarse grained, trace fine sized gravel, slightly moist.		
		Fill. Silty SAND SM: medium dense, brown, medium grained, with fine sized gravel, trace low plasticity clay, slightly moist.		
		Fill. Silty SAND SM: medium dense, reddish brown, medium grained, with low plasticity clay, slightly moist.		
	W	Fill. Sandy CLAY CH: high plasticity, firm, dark grey, medium grained sand, organic, wet, carbonate materials (shells) present..	Carbonate materials (shells) present.	▽
	M	Fill. Sandy CLAY CH: high plasticity, firm, reddish brown, fine grained sand, organic, moist.		
Natural		Natural. Sandy CLAY CH: firm to stiff, high plasticity, mottled red pale grey, fine grained sand, inorganic, moist.		
Rock	SL M	Rock. SANDSTONE: highly weathered, very low strength, pale grey, medium to coarse grained, indistinct, slightly moist.		

Well Diagram



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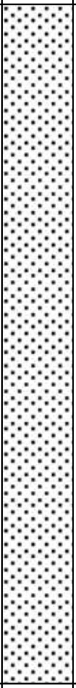
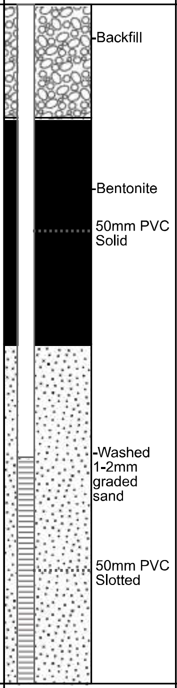
Phone: (02) 9521 6567

Boring No.: BH103/RMW03

Easting	: 0.00	**Drill Supplier**	: Stratacore Drilling Pty Ltd	**Job Number**	: 22148	**Sheet**	: 2 OF 2
Northing	: 0.00	**Driller Company**	: Stratacore Drilling Pty Ltd	**Client**	: Billbergia Pty Ltd		
Elevation	: Not Surveyed	**Logged By**	: Renee Ashton	**Project**	: Detailed Site Investigation		
Total Depth	: 10 m	**Date**	: 22/05/2024	**Location**	: 25-27 Leeds Street, Rhodes NSW		

Drilling Method	Depth (m)	Samples Discrete	PID (ppm)	Soil Origin	Graphic Log	Moisture	Material Description	Comments	Well Diagram	Water
	8 9	7.0	0.2	Rock		SL M	Rock. SANDSTONE: highly weathered, very low strength, pale grey, medium to coarse grained, indistinct, slightly moist.			
	10 11 12 13						**BH103/RMW03 Terminated at 10m (Target Depth)**			

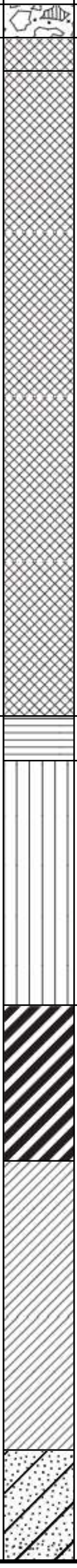
Reditus Consulting Pty Ltd
Lvl 1, Suite 1/29-33 Waratah St, Kirrawee NSW 2232, Australia
Phone: (02) 9521 6567

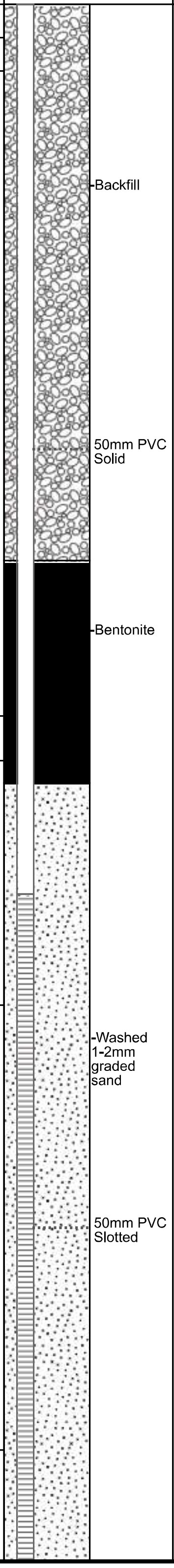
Boring No.: BH104/RMW04

Easting	: 0.00	**Drill Supplier**	: Stratacore Drilling Pty Ltd	**Job Number**	: 22148
Northing	: 0.00	**Driller Company**	: Stratacore Drilling Pty Ltd	**Client**	: Billbergia Pty Ltd
Elevation	: Not Surveyed	**Logged By**	: Renee Ashton	**Project**	: Detailed Site Investigation
Total Depth	: 7 m	**Date**	: 22/05/2024	**Location**	: 25-27 Leeds Street, Rhodes NSW

Sheet : 1 OF 1

Drilling Method	Depth (m)	Samples	PID (ppm)	Soil Origin	Graphic Log	Moisture	Material Description	Comments	Well Diagram	Water
				Non-Soil			Concrete			
				Fill		SL M	Fill. Silty SAND SM: loose, dark brown, coarse grained, trace coarse sized gravel, slightly moist.			
	1 2 3						Fill. Silty SAND SM: loose, brown, medium to coarse grained, with medium to coarse sized gravel, trace low plasticity clay, slightly moist.			
				Natural		M	Natural. Sandy CLAY CL: firm, low plasticity, red pale grey, medium grained sand, inorganic, moist.			
	4					W	Natural. Sandy CLAY ML: soft, non-plastic, dark grey, medium grained sand, organic, wet, carbonate materials (shells) present..	Carbonate materials (shells) present.		▽
	5					M	Natural. Sandy CLAY CI-CH: firm to stiff, medium to high plasticity, red grey mottled, fine grained sand, organic, moist, carbonate materials (shells) present..	Carbonate materials (shells) present.		
	6						As above, but CL-CI: stiff to very stiff, low to medium plasticity.			
							Natural. Clayey SAND SC: medium dense, low plasticity clay, red white pale grey mottled, medium grained, moist. **BH104/RMW04 refusal at 7m (Refusal on rock at 7.0m)**			





Reditus Consulting Pty Ltd
Lvl 1, Suite 1/29-33 Waratah St, Kirrawee NSW 2232, Australia
Phone: (02) 9521 6567

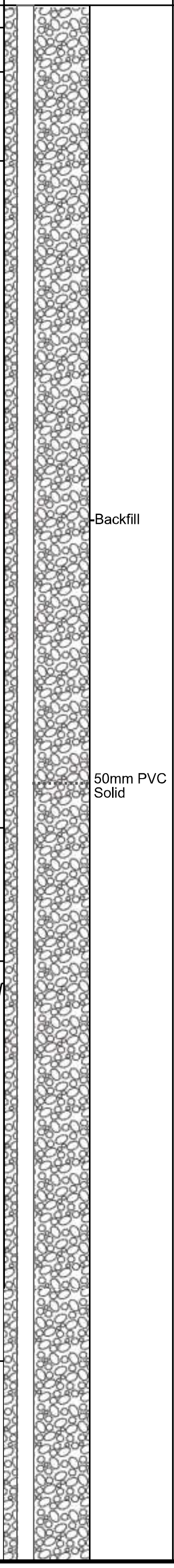
Boring No.: BH115/RMW05

Easting	: 0.00	**Drill Supplier**	: Stratacore Drilling Pty Ltd	**Job Number**	: 22148
Northing	: 0.00	**Driller Company**	: Stratacore Drilling Pty Ltd	**Client**	: Billbergia Pty Ltd
Elevation	: Not Surveyed	**Logged By**	: Renee Ashton	**Project**	: Detailed Site Investigation
Total Depth	: 12.1 m	**Date**	: 23/05/2024	**Location**	: 25-27 Leeds Street, Rhodes NSW

Sheet : 1 OF 2

Samples – Discrete	PID (ppm)
0.2	0.5
0.5	0.3
1.0	0.6
2.0	0.6
3.0	0.8
4.0	0.3
5.1	

Soil Origin	Moisture	Material Description	Comments
Non-Soil		Concrete	
Fill	SL M	Fill. Silty SAND SM: loose, dark brown, medium to coarse grained, with medium to coarse sized gravel, slightly moist.	
		Fill. Silty SAND SM: loose, red brown, medium grained, slightly moist, potentially reworked natural.	Potentially Reworked Natural
Rock		Rock. SANDSTONE: moderately weathered, low strength, red brown, fine grained, indistinct.	
		As above, but medium grained, pale brown grain inclusions.	Pale brown grain inclusions
		As above, but highly weathered, red pale grey mottled.	
		Rock. SANDSTONE: highly weathered, low strength, grey light brown, fine grained, indistinct.	
		Rock. SANDSTONE: moderately weathered, medium strength, red orange brown, fine grained, bedding fabric, distinct, sub-vertical fracture, cross-bedded, iron staining.	sub-vertical fracture, cross-bedded, iron staining
		Rock. SANDSTONE: slightly weathered, high strength, orange brown pale grey, fine grained, bedding fabric, distinct, cross-bedded, iron staining. evidence of clay bands. some sub-horizontal fractures, but mostly competent rock. heavy iron staining and clay bands at 4.9 m, followed by pale grey orange fine grained sandstone, cross-bedded with some sub-horizontal fractures. competent rock except for fractures and clay layers at 5.7 m & 5.9 m..	Cross-bedded, iron staining. Evidence of clay bands. Some sub-horizontal fractures, but mostly competent rock. Heavy iron staining and clay bands at 4.9 m, followed by pale grey orange fine grained sandstone, cross-bedded with some sub-horizontal fractures. competent rock except for fractures and clay layers at 5.7 m & 5.9 m.
		Rock. SANDSTONE: fresh weathered, high strength, grey, fine grained, bedding fabric, distinct, competent, minor sub-horizontal fractures.	Competent, minor sub-horizontal fractures

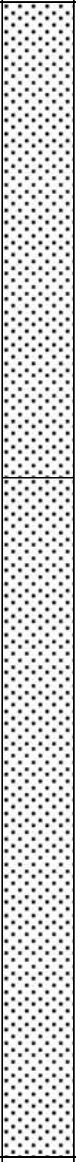
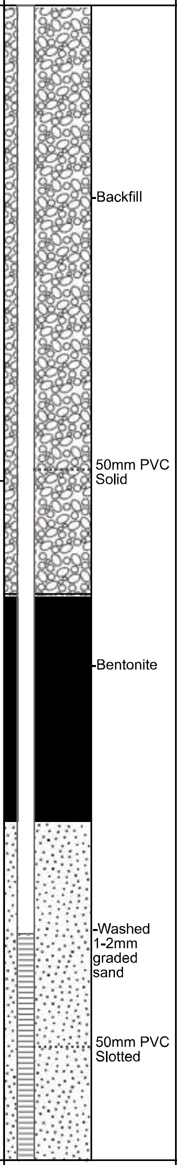


Reditus Consulting Pty Ltd

Lvl 1, Suite 1/29-33 Waratah St, Kirrawee NSW 2232, Australia
Phone: (02) 9521 6567

Boring No.: BH115/RMW05

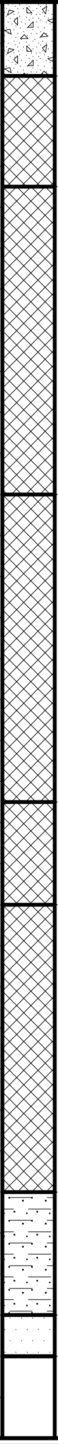
Easting	: 0.00	**Drill Supplier**	: Stratacore Drilling Pty Ltd	**Job Number**	: 22148	**Sheet**	: 2 OF 2
Northing	: 0.00	**Driller Company**	: Stratacore Drilling Pty Ltd	**Client**	: Billbergia Pty Ltd		
Elevation	: Not Surveyed	**Logged By**	: Renee Ashton	**Project**	: Detailed Site Investigation		
Total Depth	: 12.1 m	**Date**	: 23/05/2024	**Location**	: 25-27 Leeds Street, Rhodes NSW		

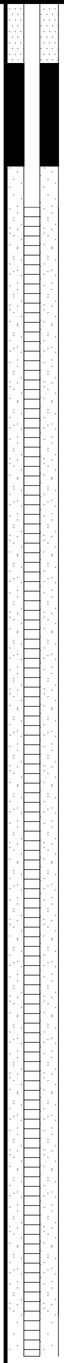
Drilling Method	Depth (m)	Samples Discrete	PID (ppm)	Soil Origin	Graphic Log	Moisture	Material Description	Comments	Well Diagram	Water
	8 9						Rock. SANDSTONE: fresh weathered, high strength, grey, fine grained, bedding fabric, distinct, competent, minor sub-horizontal fractures.	Competent, minor sub-horizontal fractures		
	10 11 12	10.7					Rock. SANDSTONE: fresh weathered, high strength, pale grey grey, fine grained, bedding fabric, distinct, coaly tracing, minor sub-horizontal fractures, mostly competent rock, some clay layers at depths of 10.3, 10.4, 10.7 & 11.6 m.	Coaly tracing, minor sub-horizontal fractures, mostly competent rock, some clay layers at depths of 10.3, 10.4, 10.7 & 11.6 m		
	13						**BH115/RMW05 Terminated at 12.1m (BH terminated at 12.1 m)**			

BOREHOLE No. BH14/MW14

Project: Rhodes East	Client: RobertsDay	Driller: Terratest	Northings: 6255757 mN		
Location: 23 Leeds Street	Start - Finish Date: 19/8/16 - 19/8/16	Rig: Geoprobe	Eastings: 323239 mE	Logged: KM	
Job No: IA102900	Bore dia: 110	Surface Conditions: Concrete	RL: 3.58 (Gatic)	Checked: DL	

FIELD DATA								SOIL DESCRIPTION	SOIL CONDITION		COMMENTS
PID (ppm)	visual ranking	odour ranking	field test XRF (ppm)	sample ID	sample type field tests	ground water	depth (m)	soil type, unified classification, colour, structure, particle characteristics, minor components	consistency/ density	moisture condition	drilling method, well construction, water and additional observations
								Concrete			Grout
0.3		A		BH14_0.1-0.3	○			Fill: Clayey sands, brown, loose, poorly sorted, fine to medium coarse grained, very soft, moist, no odour. Clay content increasing with depth and fine to medium coarse gravels and crushed sandstone present form 0.4 to 0.45 mbgl.	VS	M	Bentonite
								Fill: Sandy clay mixed with crushed sandstone and rock, grey / brown, dense, soft to firm, slightly moist, no odour.	F	Sl. M	Drill method: Concrete coring / Push Tube
							1				
								Crushed sandstone and rock.	H	Sl. M	Sand
0.4		A		BH14_1.3-1.5	○						Screen
						▼					
							2	Fill: Clayey sand, black, loose to medium dense, very soft, very moist, no odour.	VS	M	
0.2		A		BH14_1.95-2.15	○						
0.4		A		BH14_2.2-2.5	○	▽		Sand, brown / grey, loose, medium coarse grained, wet, no odout. Saturated at 2.3 mbgl.		W	
								Sandy clay, white / grey, dense, stiff, moist, no odour.	St	M	
0.5		A		BH14_2.9-3.1	○		3				
								Sandstone	H		
								End of borehole. Refusal on sandstone bedrock at 3.3 mbgl.			





VISUAL RANKING
0 No visible evidence of contamination
1 Slight visible contamination
2 Visible contamination
3 Significant visible contamination

ODOUR RANKING
A No Non-Natural odours
B Slight Non-Natural odours
C Moderate Non-Natural odours
D Strong Non-Natural odours

FIELD DATA ABBREVIATIONS
Suv = Uncorrected vane shear (kPa)
Sup = Pocket penetrometer (kPa)
N = SPT blows per 300mm
FPM = Field permeability
PID = Photoionisation detector reading (ppm, V/V)

GROUNDWATER SYMBOLS
▼ = Water level (static)
▽ = Water level (during drilling)
◄ ► = Outflow / Inflow

FIELD DATA SYMBOLS
× = Shear vane test
⊥ = Pocket Penetrometer test
▽ = Standard Penetration Test (SPT top = start of N blowcount)
▼ = SPT Spoon Sample (Pushed)
■ = Undisturbed Tube Sample
● = Disturbed Sample
▐ = Bulk Sample

DENSITY (N-value)

VL	(very loose)	<10
L	(loose)	10 - 20
MD	(medium dense)	20 - 30
D	(dense)	30 - 50
VD	(very dense)	>50
CO	(compact)	>50/150mm

MOISTURE CONDITION
D = Dry M = Moist W = Wet

CONSISTENCY (Su)

VS	(very soft)	< 12 kPa
S	(soft)	12 - 25
F	(firm)	25 - 50
St	(stiff)	50 - 100
VSt	(very stiff)	100 - 200
H	(hard)	> 200 kPa

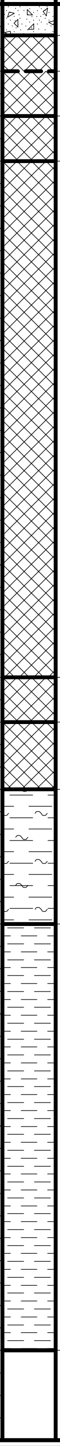
BOREHOLE No. BH01/MW01

Project:	Rhodes East	Client: RobertsDay		Driller: Terratest	Northings:	6255822 mN	
Location:	27 Leeds Street	Start - Finish Date:	18/8/16 - 18/8/16	Rig: Geoprobe	Eastings:	323183 mE	Logged: KM
Job No:	IA102900	Bore dia: 110		Surface Conditions: Concrete	RL:	2.90 (Gatic)	Checked: DL

FIELD DATA

PID (ppm)	visual ranking	odour ranking	field test XRF (ppm)	sample ID	sample type	field tests	ground water	depth (m)
0.3		A		BH01_0.3-0.5	○			
								1
0.7		A		BH01_1.7-1.9	○			
							▼	2
0.5		A		BH01_2.4-2.6	○			
								3
0.2		A		BH01_3.1-3.2	○		▽	
0.7		A		BH01_3.6-3.8	○			
								4
								5
0.8		A		BH01_5.0-5.2	○			
								6

graphic log

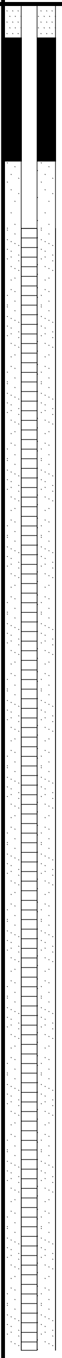


SOIL DESCRIPTION

soil type, unified classification, colour, structure, particle characteristics, minor components	consistency/ density	moisture condition
Concrete		
Fill: Gravelly silty clay, dark brown, gravels sub-rounded and fine. Clay loose and soft, moist. Fragements of crushed rock and rootlets present, no odour.	S	M
Fill: Silty clay, light brown, medium dense, firm, slightly moist. Minor gravels, crushed rock and rootlets present, no odour. Layer of rock from 0.35 to 0.45 mbgl.	F	Sl. M
Fill: Gravelly sands, brown, medium to coarse grained, loose, poorly sorted, slightly moist, no odour. Gravels fine. Pieces of clay and rootlets present.		Sl. M
Fill: Silty sandy clay, varied colour (brown, grey, red), medium dense, soft, no odour. Heterogeneous with crushed sandstone and rock throughout. Small fragments of brick, fine gravels and rootlets from 2.7 to 2.9 mbgl. Weathered sandstone from 2.9 to 3.0 mbgl. Becoming denser with increasing depth.	S	M
Fill: Silty clay, black with red , grey and brown speckling, dense, soft, high plasticity, no odour.	S	M
Saturated at 3.2 mbgl.		W
Fill: Gravelly sandy silt, light brown, very wet, no odour.		
Silty clay, dark grey, dense, very soft, high plasticity, saturatated, no odour. Shells present throughout.	VS	W
Clay, grey with red and brown, very dense, soft to firm to 5.7 mbgl and mediums stiff to stiff from 5.7 mbgl, no odour.	F	Sl. M
End of Borehole. Limit of investigation.		

COMMENTS

drilling method, well construction, water and additional observations



Grout

Bentonite

Drill method: Concrete Coring / Push Tube

Sand

Screen

VISUAL RANKING	
0	No visible evidence of contamination
1	Slight visible contamination
2	Visible contamination
3	Significant visible contamination

ODOUR RANKING	
A	No Non-Natural odours
B	Slight Non-Natural odours
C	Moderate Non-Natural odours
D	Strong Non-Natural odours

FIELD DATA ABBREVIATIONS
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Sup = Pocket penetrometer (kPa)
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▽ = Water level (during drilling)
◄ ► = Outflow / Inflow

FIELD DATA SYMBOLS
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⊥ = Pocket Penetrometer test
▽ = Standard Penetration Test (SPT top = start of N blowcount)
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■ = Undisturbed Tube Sample
● = Disturbed Sample
▌ = Bulk Sample

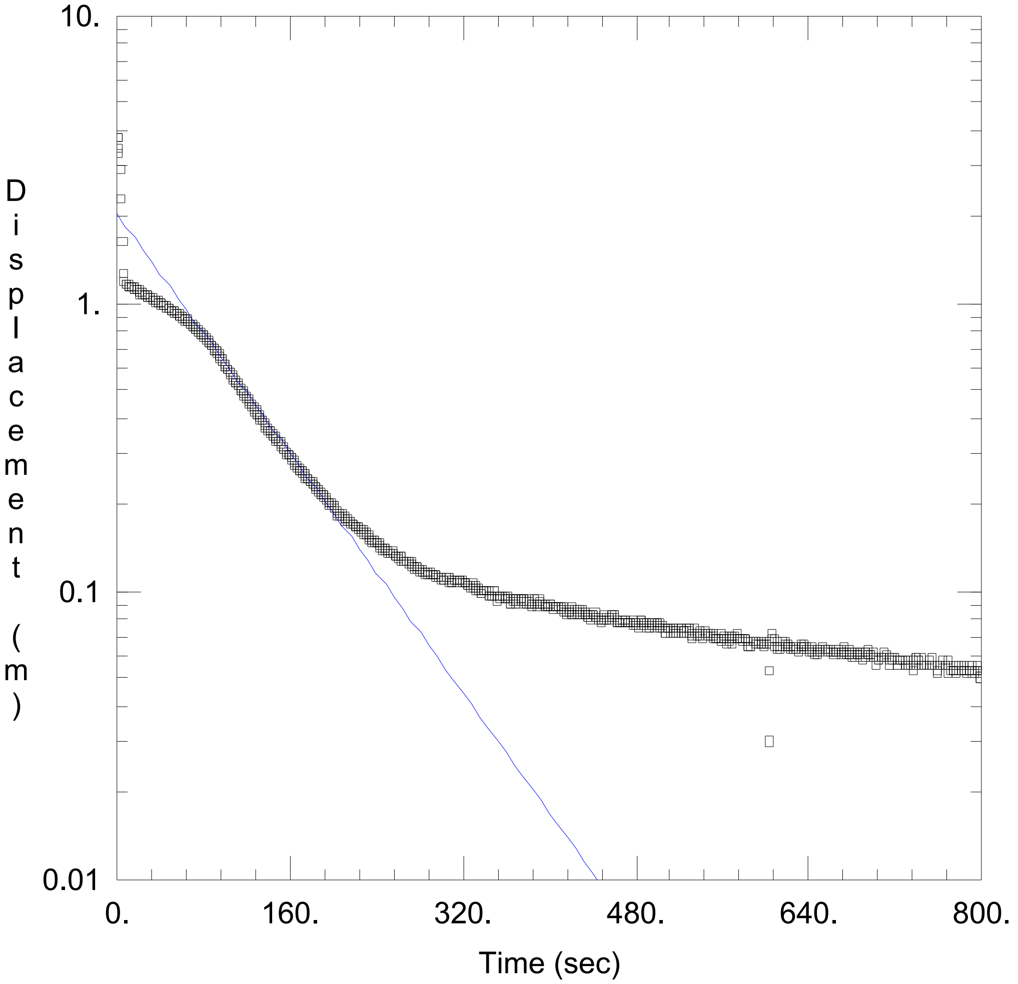
DENSITY (N-value)		
VL	(very loose)	<10
L	(loose)	10 - 20
MD	(medium dense)	20 - 30
D	(dense)	30 - 50
VD	(very dense)	>50
CO	(compact)	>50/150mm

MOISTURE CONDITION
D = Dry M = Moist W = Wet

CONSISTENCY (Su)		
VS	(very soft)	< 12 kPa
S	(soft)	12 - 25
F	(firm)	25 - 50
St	(stiff)	50 - 100
VSt	(very stiff)	100 - 200
H	(hard)	> 200 kPa

D

Rising Head Test Analysis



WELL TEST ANALYSIS

Data Set: C:\...\RMW01_HG.aqt
Date: 09/12/24
Time: 11:52:41

PROJECT INFORMATION

Project: 22148
Location: RMW01
Test Well: RMW01

AQUIFER DATA

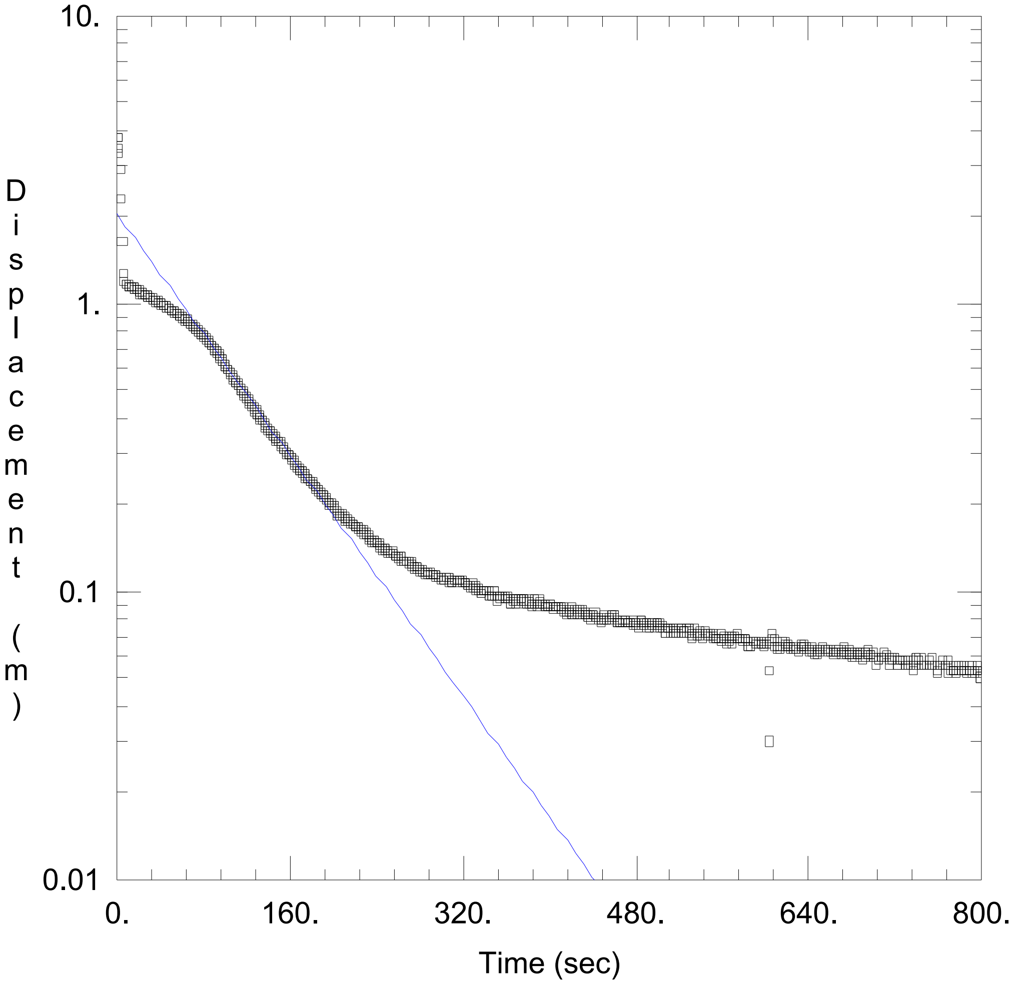
Saturated Thickness: 10. m
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (RMW01)

Initial Displacement: 3.8 m
Static Water Column Height: 4.525 m
Total Well Penetration Depth: 4.525 m
Screen Length: 4. m
Casing Radius: 0.025 m
Well Radius: 0.075 m

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 0.219 m/day
y0 = 2.056 m



WELL TEST ANALYSIS

Data Set: C:\...\RMW01_HG.aqt
Date: 09/12/24 Time: 11:51:36

PROJECT INFORMATION

Project: 22148
Location: RMW01
Test Well: RMW01

AQUIFER DATA

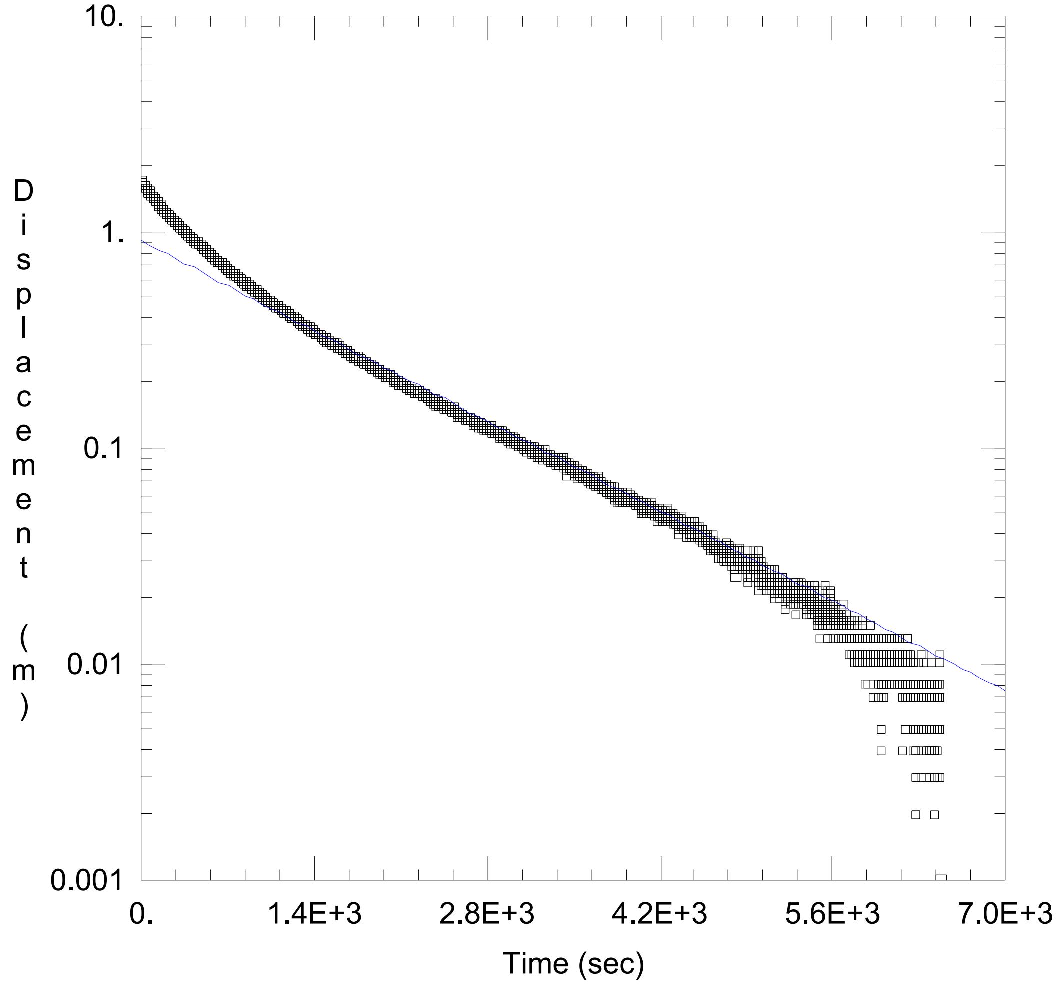
Saturated Thickness: 10. m
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (RMW01)

Initial Displacement: 3.8 m
Static Water Column Height: 4.525 m
Total Well Penetration Depth: 4.525 m
Screen Length: 4. m
Casing Radius: 0.025 m
Well Radius: 0.075 m

SOLUTION

Aquifer Model: Confined
Solution Method: Hvorslev
K = 0.3235 m/day
y0 = 2.052 m



WELL TEST ANALYSIS

Data Set: C:\...\RMW02_HG.aqt
Date: 09/12/24 Time: 11:57:51

PROJECT INFORMATION

Project: 22148
Location: RMW02
Test Well: RMW02

AQUIFER DATA

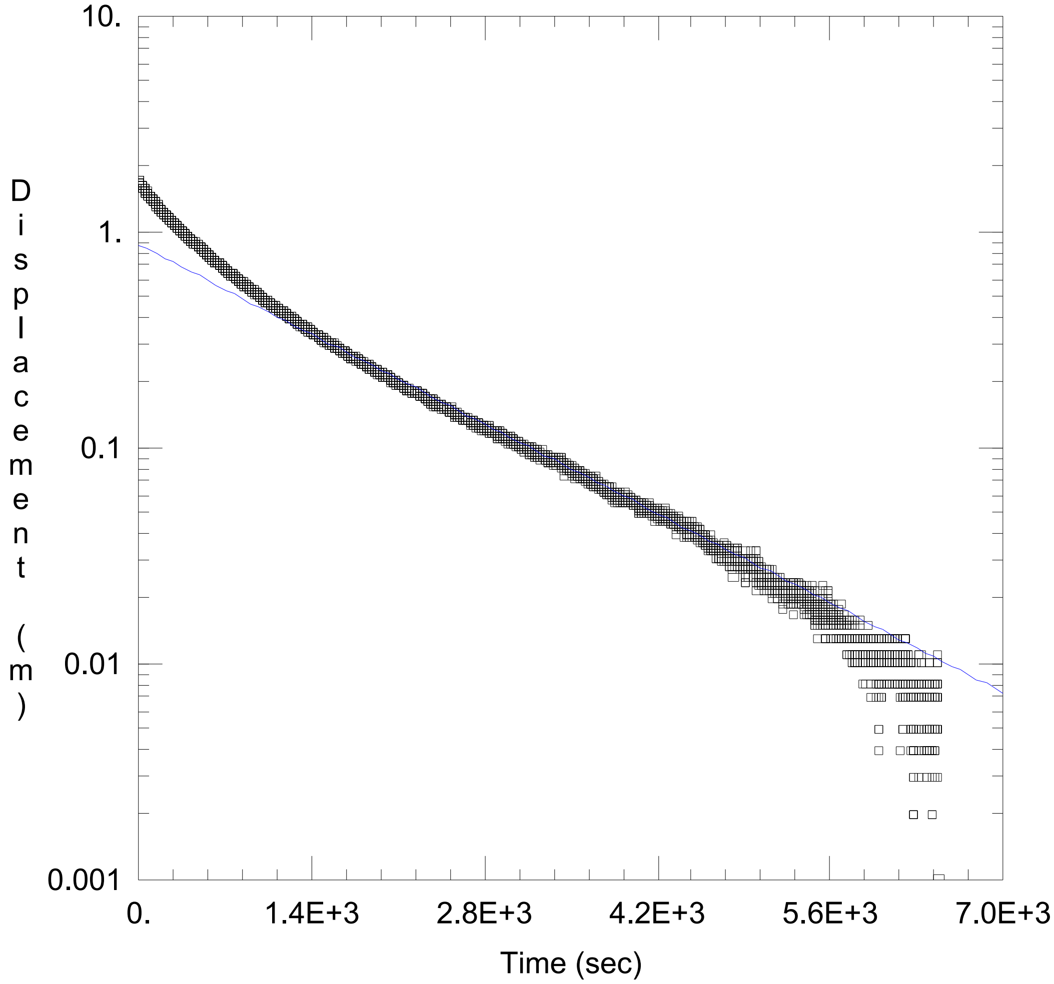
Saturated Thickness: 10. m
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (RMW02)

Initial Displacement: 1.721 m
Static Water Column Height: 7.97 m
Total Well Penetration Depth: 10.2 m
Screen Length: 1. m
Casing Radius: 0.025 m
Well Radius: 0.075 m

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 0.0558 m/day
y0 = 0.9042 m



WELL TEST ANALYSIS

Data Set: C:\...\RMW02_HG.aqt
Date: 09/12/24 Time: 11:57:05

PROJECT INFORMATION

Project: 22148
Location: RMW02
Test Well: RMW02

AQUIFER DATA

Saturated Thickness: 10. m
Anisotropy Ratio (Kz/Kr): 1.

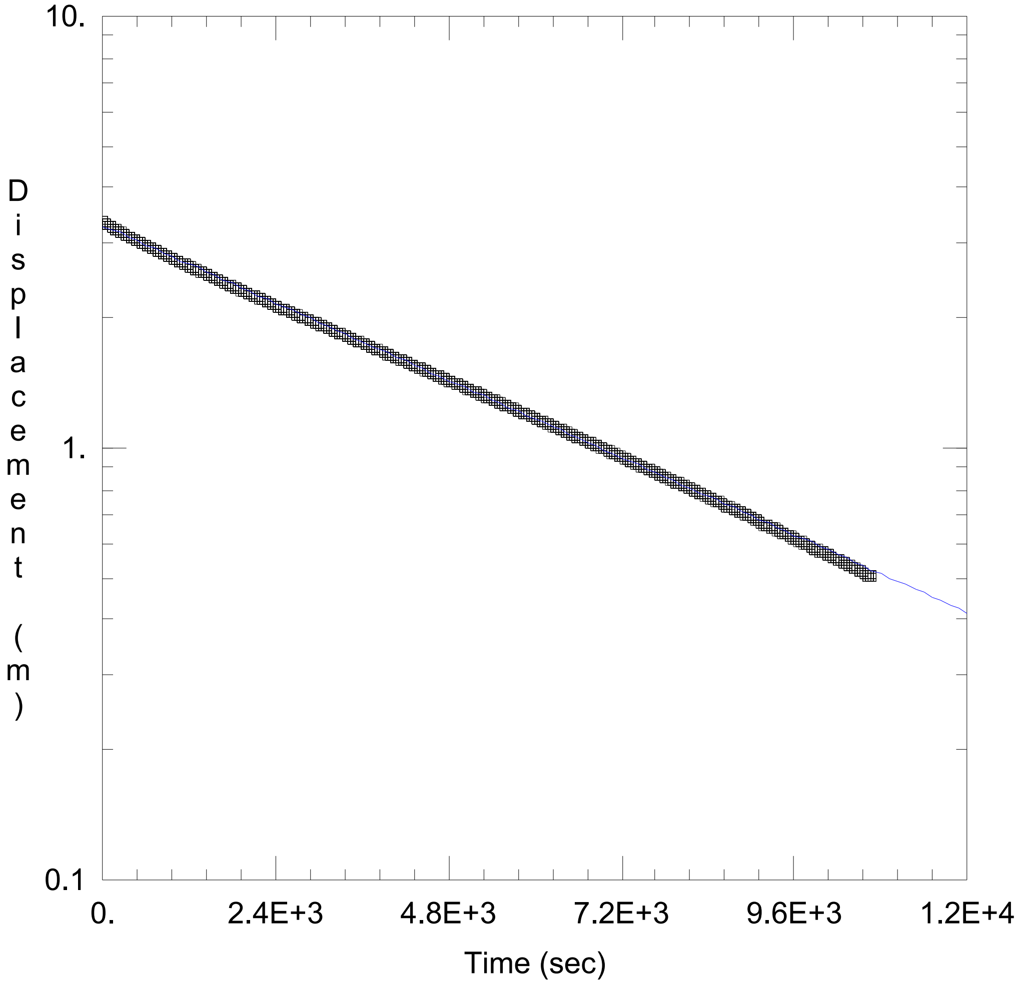
WELL DATA (RMW02)

Initial Displacement: 1.721 m
Static Water Column Height: 7.97 m
Total Well Penetration Depth: 10.2 m
Screen Length: 1. m
Casing Radius: 0.025 m
Well Radius: 0.075 m

SOLUTION

Aquifer Model: Confined
Solution Method: Hvorslev

K = 0.06054 m/day
y0 = 0.8725 m



WELL TEST ANALYSIS

Data Set: C:\...\RMW03_HG.aqt
Date: 09/12/24 Time: 12:06:30

PROJECT INFORMATION

Project: 22148
Location: RMW04
Test Well: RMW04

AQUIFER DATA

Saturated Thickness: 20. m
Anisotropy Ratio (Kz/Kr): 1.

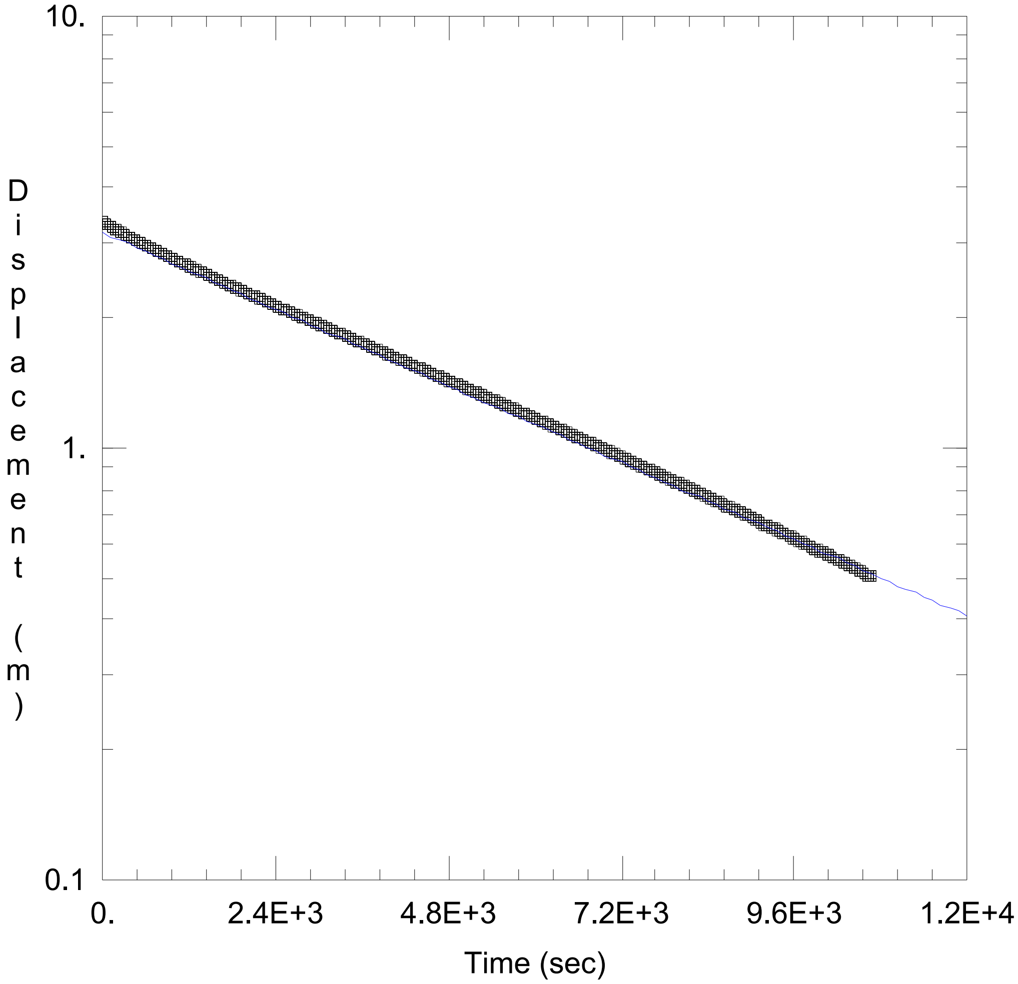
WELL DATA (RMW03)

Initial Displacement: 3.355 m
Static Water Column Height: 7.44 m
Total Well Penetration Depth: 7.44 m
Screen Length: 1. m
Casing Radius: 0.025 m
Well Radius: 0.075 m

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

K = 0.009307 m/day
y0 = 3.269 m



WELL TEST ANALYSIS

Data Set: C:\...\RMW03_HG.aqt
Date: 09/12/24 Time: 12:05:01

PROJECT INFORMATION

Project: 22148
Location: RMW04
Test Well: RMW04

AQUIFER DATA

Saturated Thickness: 20. m
Anisotropy Ratio (Kz/Kr): 1.

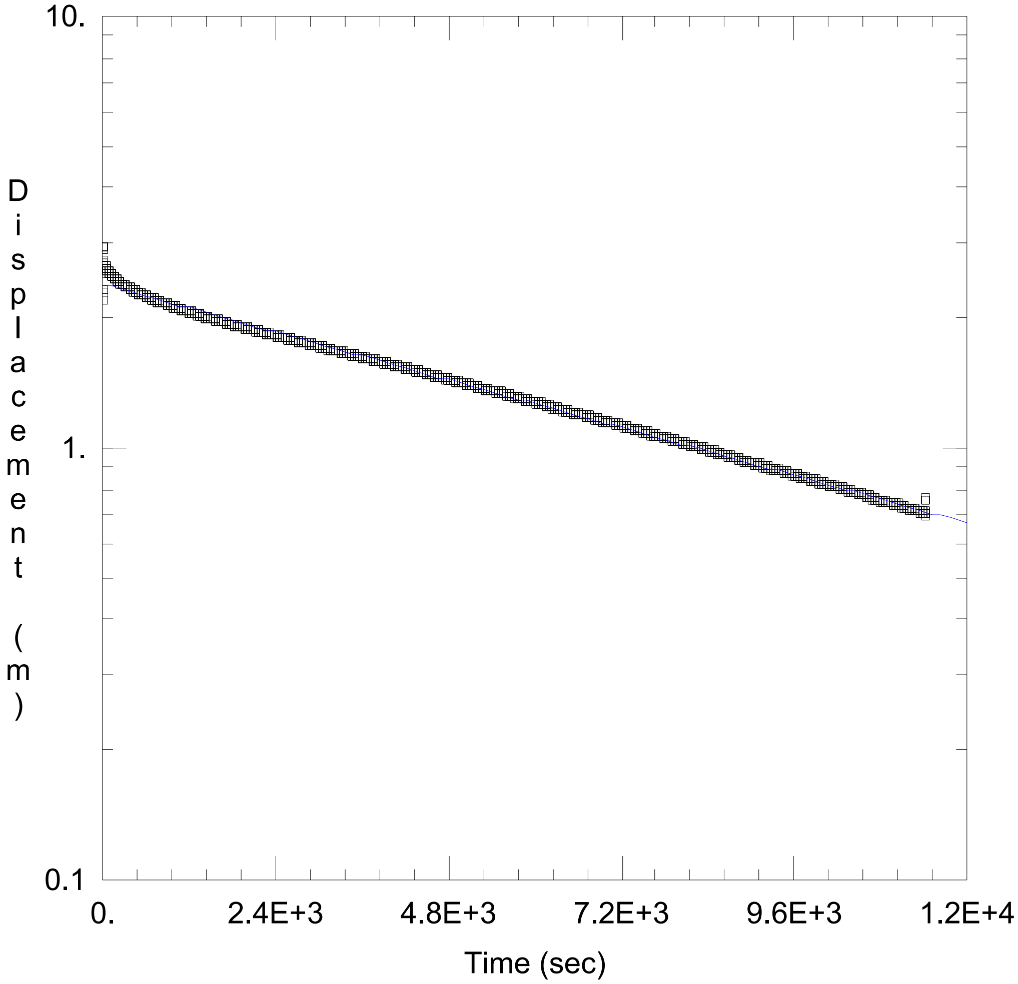
WELL DATA (RMW03)

Initial Displacement: 3.355 m
Static Water Column Height: 7.44 m
Total Well Penetration Depth: 7.44 m
Screen Length: 1. m
Casing Radius: 0.025 m
Well Radius: 0.075 m

SOLUTION

Aquifer Model: Confined
Solution Method: Hvorslev

K = 0.01193 m/day
y0 = 3.146 m



WELL TEST ANALYSIS

Data Set: C:\...\RMW04_HG.aqt
Date: 09/12/24 Time: 12:14:10

PROJECT INFORMATION

Project: 22148
Location: RMW03
Test Well: RMW03

AQUIFER DATA

Saturated Thickness: 20. m
Anisotropy Ratio (Kz/Kr): 1.

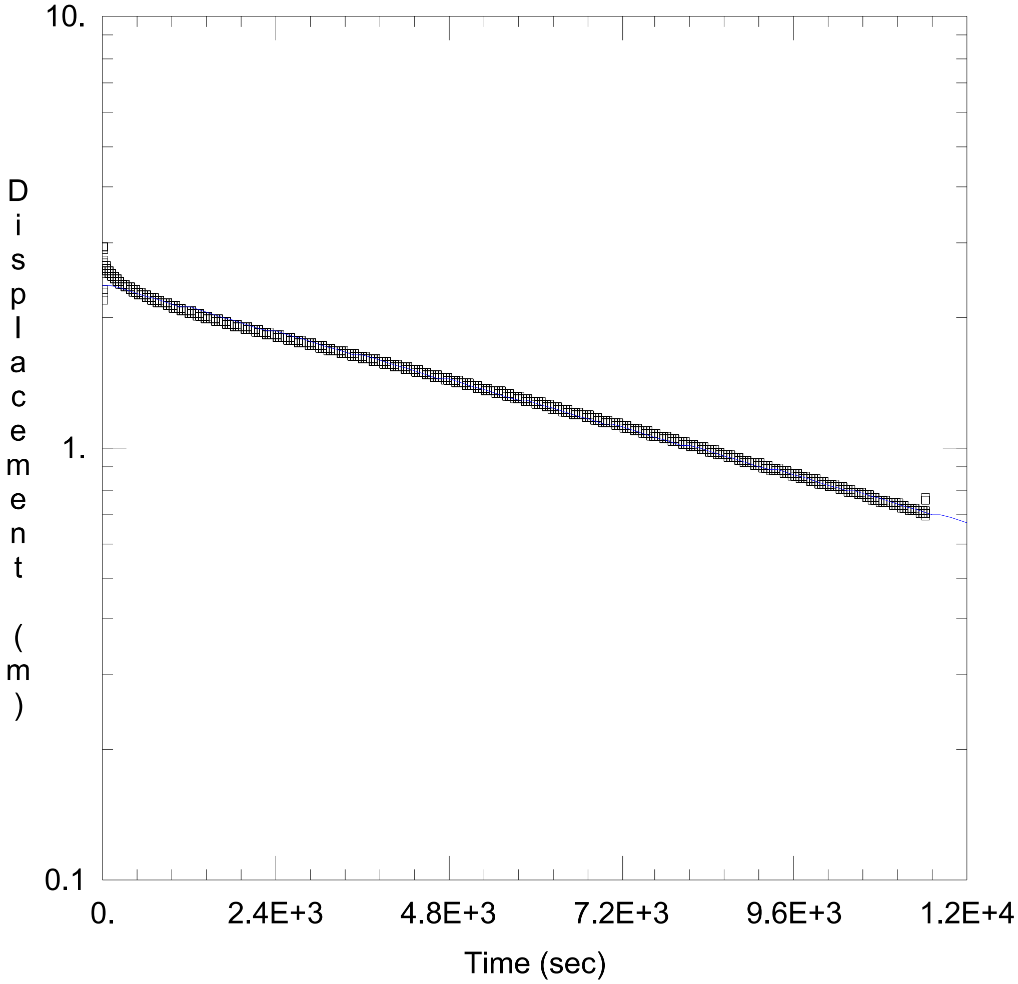
WELL DATA (RMW03)

Initial Displacement: 2.908 m
Static Water Column Height: 3.915 m
Total Well Penetration Depth: 1.915 m
Screen Length: 1. m
Casing Radius: 0.025 m
Well Radius: 0.075 m

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

K = 0.004725 m/day
y0 = 2.391 m



WELL TEST ANALYSIS

Data Set: C:\...\RMW04_HG.aqt
Date: 09/12/24
Time: 12:14:51

PROJECT INFORMATION

Project: 22148
Location: RMW03
Test Well: RMW03

AQUIFER DATA

Saturated Thickness: 20. m
Anisotropy Ratio (Kz/Kr): 1.

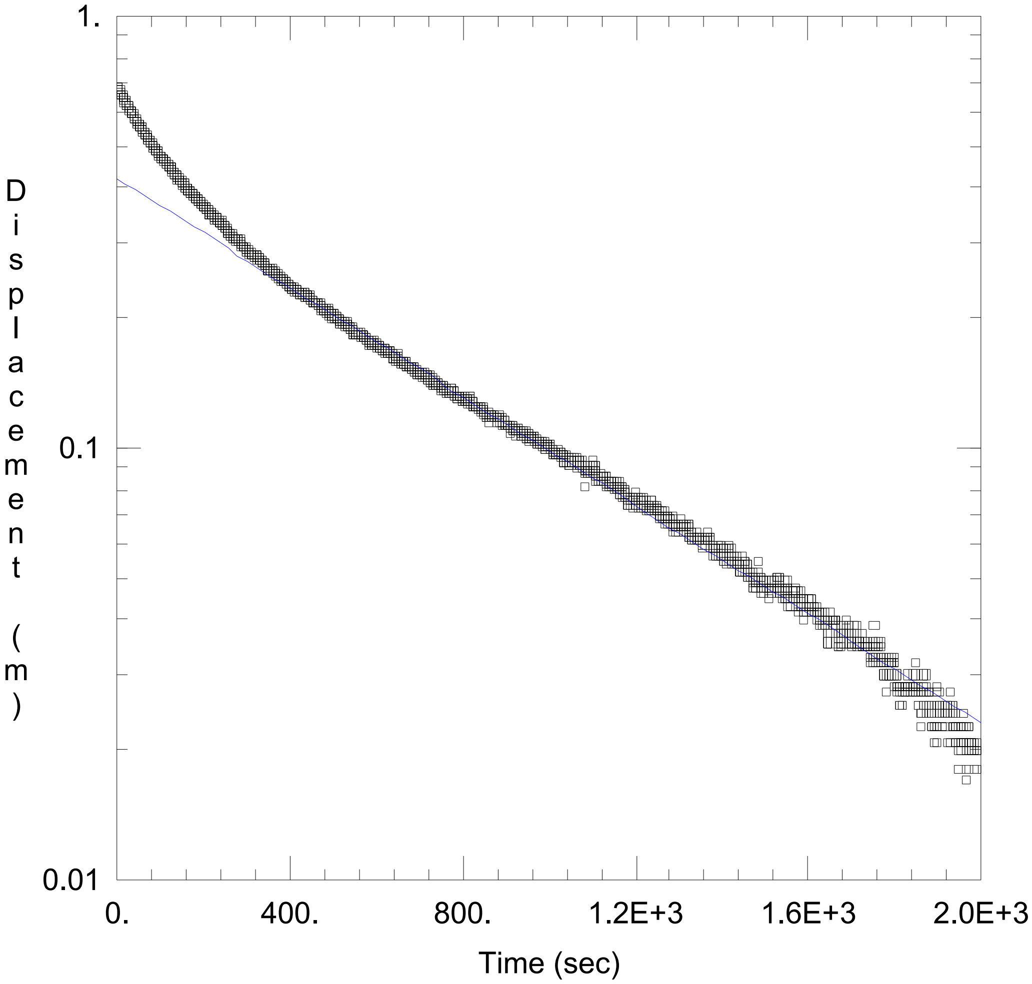
WELL DATA (RMW03)

Initial Displacement: 2.908 m
Static Water Column Height: 3.915 m
Total Well Penetration Depth: 1.915 m
Screen Length: 1. m
Casing Radius: 0.025 m
Well Radius: 0.075 m

SOLUTION

Aquifer Model: Confined
Solution Method: Hvorslev

K = 0.00744 m/day
y0 = 2.391 m



WELL TEST ANALYSIS

Data Set: C:\...\RMW05_HG.aqt
Date: 09/12/24
Time: 12:24:46

PROJECT INFORMATION

Project: 22148
Location: RMW05
Test Well: RMW05

AQUIFER DATA

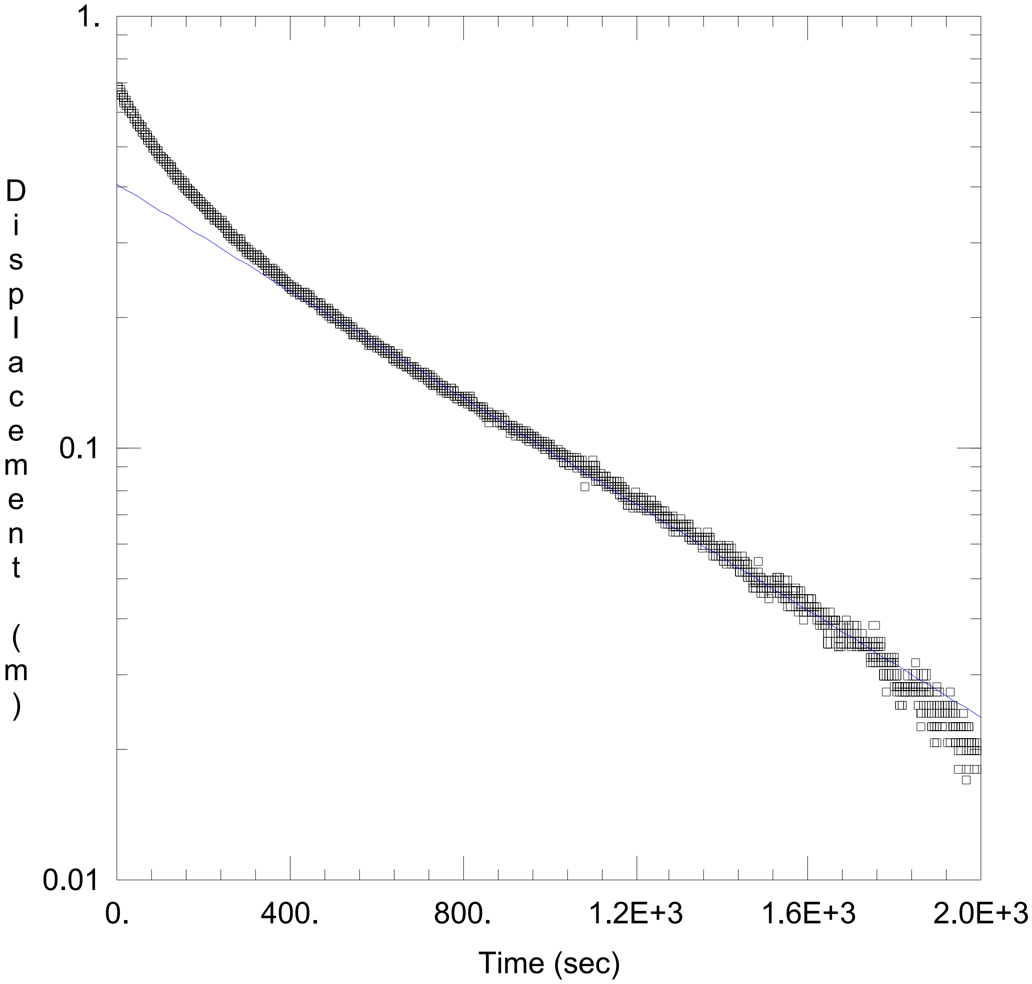
Saturated Thickness: 20. m
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (RMW05)

Initial Displacement: 0.6862 m
Static Water Column Height: 7.08 m
Total Well Penetration Depth: 6.98 m
Screen Length: 1. m
Casing Radius: 0.025 m
Well Radius: 0.075 m

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 0.07799 m/day
y0 = 0.42 m



WELL TEST ANALYSIS

Data Set: C:\...\RMW05_HG.aqt
Date: 09/12/24
Time: 12:24:04

PROJECT INFORMATION

Project: 22148
Location: RMW05
Test Well: RMW05

AQUIFER DATA

Saturated Thickness: 20. m
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (RMW05)

Initial Displacement: 0.6862 m
Static Water Column Height: 7.08 m
Total Well Penetration Depth: 6.98 m
Screen Length: 1. m
Casing Radius: 0.025 m
Well Radius: 0.075 m

SOLUTION

Aquifer Model: Confined
Solution Method: Hvorslev

K = 0.09942 m/day
y0 = 0.4071 m

E

Tabulated Groundwater Analytical Data

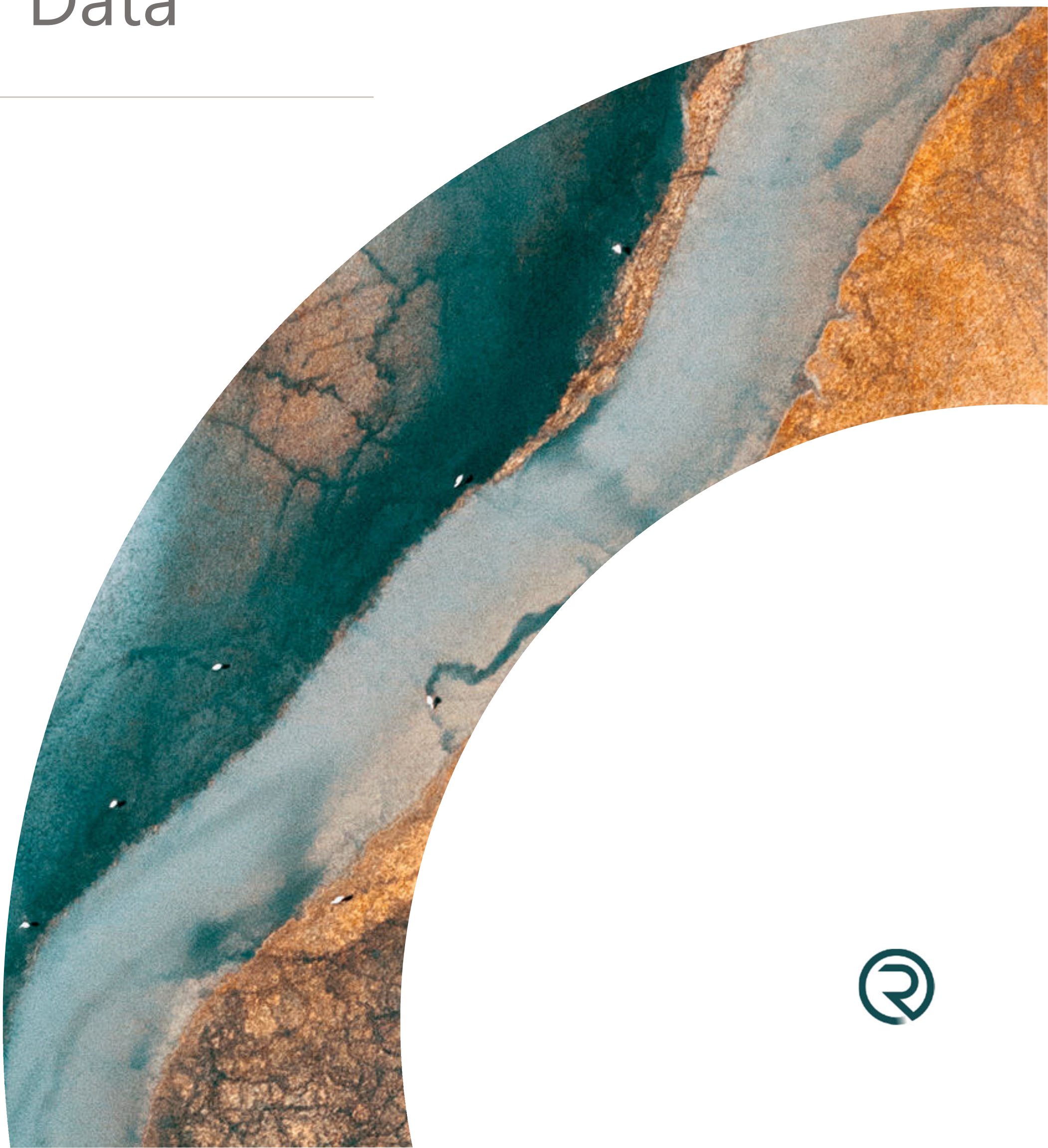


Table 3
Groundwater Analytical Results Summary

			BTEX								TRH						
			Naphthalene (BTEX)	Benzene	Toluene	Ethylbenzene	Xylene (m & p)	Xylene (o)	Xylene Total	Total BTEX	C6-C10 Fraction (F1)	C6-C10 (F1 minus BTEX)	>C10-C16 Fraction (F2)	>C10-C16 Fraction (F2 minus Naphthalene)	>C16-C34 Fraction (F3)	>C34-C40 Fraction (F4)	>C10-C40 Fraction (Sum)
			µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL			1	1	1	1	2	1	2	1	10	10	50	50	100	100	50
ANZG Marine Water Toxicant DGVs LOSP 95% (July 2023)			70	700	180	80											
ANZG 2023 Dioxins in Freshwater Technical Brief 95% Species Protection																	
NEPM 2013 Table 1A(4) Res HSL A & B GW for Vapour Intrusion, Sand >=2m, <4m			NL	800	NL	NL			NL			1,000		1,000			
PFAS NEMP 2020 Recreational Water																	
PFAS NEMP 2020 Interim Marine 95%																	
PFAS NEMP 2020 Interim Marine 99%																	
Field ID	**Date**	**Lab Report Number**															
EW1	**31 May 2024**	**352854-A**	<1	<1	<1	<1	<2	<1	-	-	<10	<10	<50	<50	<100	<100	<50
MW1-B	**31 May 2024**	**352854-A**	<1	<1	<1	<1	<2	<1	-	-	<10	<10	<50	<50	<100	<100	<50
MW2-B	**31 May 2024**	**352854-A**	<1	<1	<1	<1	<2	<1	-	-	<10	<10	<50	<50	<100	<100	<50
MW3-B	**30 May 2024**	**352732-A / PFF0035**	<1	<1	<1	<1	<2	<1	-	-	<10	<10	<50	<50	<100	<100	<50
MW4-B	**31 May 2024**	**352854-A**	<1	<1	<1	<1	<2	<1	-	-	**50**	**50**	<50	<50	<100	<100	<50
RMW01	**30 May 2024**	**352732-A / PFF0035**	<1	<1	<1	<1	<2	<1	-	-	<10	<10	<50	<50	<100	<100	<50
RMW02	**30 May 2024**	**352732-A**	<1	<1	**46**	<1	<2	<1	-	-	**93**	**47**	<50	<50	<100	<100	<50
RMW03	**30 May 2024**	**352732-A**	<1	<1	<1	<1	<2	<1	-	-	<10	<10	<50	<50	<100	<100	<50
RMW04	**30 May 2024**	**352732-A / PFF0035**	<1	<1	<1	<1	<2	<1	-	-	<10	<10	<50	<50	<100	<100	<50
RMW05	**31 May 2024**	**352854-A**	<1	<1	<1	<1	<2	<1	-	-	<10	<10	<50	<50	<100	<100	<50
DUP1 (MW1-B)	**31 May 2024**	**352854-A**	<1	<1	<1	<1	<2	<1	-	-	<10	<10	<50	<50	<100	<100	<50
DUP2 (EW1)	**31 May 2024**	**352854-A**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TRIP1 (MW1-B)	**31 May 2024**	**ES2418204**	<5	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100
TRIP2 (EW1)	**31 May 2024**	**ES2418204**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

^ Chromium (III+VI) concentrations have been compared to Chromium (VI) ANZG criteria

Table 3
Groundwater Analytical Results Summary

Field ID	Date	Lab Report Number	Benzo(b+j+k)fluoranthene	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a) pyrene	Benzo(b+j)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	Phenanthrene	Pyrene	Benzo(a)pyrene TEQ	PAHs (Sum of total)	PAHs (Sum of positives)
			PAH																			
			µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL			0.2	0.1	0.1	0.1	0.1	0.1	1	0.1	1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.5	0.5	0.1
ANZG Marine Water Toxicant DGVs LOSP 95% (July 2023)						0.4		0.2						1.4			70	2				
ANZG 2023 Dioxins in Freshwater Technical Brief 95% Species Protection																						
NEPM 2013 Table 1A(4) Res HSL A & B GW for Vapour Intrusion, Sand																	NL | NL | NL					
>=2m, <4m																	NL					
PFAS NEMP 2020 Recreational Water																						
PFAS NEMP 2020 Interim Marine 95%																						
PFAS NEMP 2020 Interim Marine 99%																						
Field ID	**Date**	**Lab Report Number**																				
EW1	**31 May 2024**	**352854-A**	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	-	<0.1
MW1-B	**31 May 2024**	**352854-A**	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	-	<0.1
MW2-B	**31 May 2024**	**352854-A**	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	-	<0.1
MW3-B	**30 May 2024**	**352732-A / PFF0035**	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	-	<0.1
MW4-B	**31 May 2024**	**352854-A**	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	-	<0.1
RMW01	**30 May 2024**	**352732-A / PFF0035**	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	-	<0.1
RMW02	**30 May 2024**	**352732-A**	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	**0.2**	<0.1	<0.1	<0.5	-	**0.22**
RMW03	**30 May 2024**	**352732-A**	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	-	<0.1
RMW04	**30 May 2024**	**352732-A / PFF0035**	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	-	<0.1
RMW05	**31 May 2024**	**352854-A**	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	-	<0.1
DUP1 (MW1-B)	**31 May 2024**	**352854-A**	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	-	<0.1
DUP2 (EW1)	**31 May 2024**	**352854-A**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TRIP1 (MW1-B)	**31 May 2024**	**ES2418204**	-	<1.0	<1.0	<1.0	<1.0	<0.5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	<0.5	-
TRIP2 (EW1)	**31 May 2024**	**ES2418204**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

^ Chromium (III+VI) concentrations have been compared to Chromium (VI) ANZG criteria

Table 3
Groundwater Analytical Results Summary

	Inorganics																		
	Hardness (filtered)	Alkalinity (Bicarbonate as CaCO3)	Alkalinity (Carbonate as CaCO3)	Alkalinity (Hydroxide) as CaCO3	Alkalinity (total) as CaCO3	Ammonia as N (filtered)	Chloride	Ionic Balance	Kjeldahl Nitrogen Total	Nitrate (as N) (filtered)	Nitrite (as N) (filtered)	Organic Nitrogen as N	Nitrogen (Total Oxidised)	Nitrogen (Total)	Total Phosphorus (Organic Phosphate)	Reactive Phosphorus as P (Orthophosphate as P) (filtered)	Sodium (filtered)	Sulphate	Total Dissolved Solids (Lab)
	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	%	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL	3,000	5,000	5,000	5,000	5,000	5	1,000		100	5	5	200	5	100	50	5	500	1,000	5,000
ANZG Marine Water Toxicant DGVs LOSP 95% (July 2023)						910													
ANZG 2023 Dioxins in Freshwater Technical Brief 95% Species Protection																			
NEPM 2013 Table 1A(4) Res HSL A & B GW for Vapour Intrusion, Sand >=2m, <4m																			
PFAS NEMP 2020 Recreational Water																			
PFAS NEMP 2020 Interim Marine 95%																			
PFAS NEMP 2020 Interim Marine 99%																			

Field ID	Date	Lab Report Number	Hardness (filtered)	Alkalinity (Bicarbonate as CaCO3)	Alkalinity (Carbonate as CaCO3)	Alkalinity (Hydroxide) as CaCO3	Alkalinity (total) as CaCO3	Ammonia as N (filtered)	Chloride	Ionic Balance	Kjeldahl Nitrogen Total	Nitrate (as N) (filtered)	Nitrite (as N) (filtered)	Organic Nitrogen as N	Nitrogen (Total Oxidised)	Nitrogen (Total)	Total Phosphorus (Organic Phosphate)	Reactive Phosphorus as P (Orthophosphate as P) (filtered)	Sodium (filtered)	Sulphate	Total Dissolved Solids (Lab)
EW1	**31 May 2024**	**352854-A**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW1-B	**31 May 2024**	**352854-A**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW2-B	**31 May 2024**	**352854-A**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW3-B	**30 May 2024**	**352732-A / PFF0035**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW4-B	**31 May 2024**	**352854-A**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
RMW01	**30 May 2024**	**352732-A / PFF0035**	**2,500,000**	<5,000	<5,000	<5,000	<5,000	**210**	**6,500,000**	**-3.0**	**1,100**	<5	<5	**900**	<5	**1,100**	<50	<5	**3,200,000**	**980,000**	**11,000,000**
RMW02	**30 May 2024**	**352732-A**	**1,500,000**	<5,000	<5,000	<5,000	<5,000	**130**	**6,300,000**	**0**	**300**	**10**	<5	<200	**10**	**300**	<50	<5	**4,000,000**	**1,400,000**	**12,000,000**
RMW03	**30 May 2024**	**352732-A**	**2,000,000**	<5,000	<5,000	<5,000	<5,000	**150**	**8,000,000**	**0**	**300**	**20**	**7**	<200	**30**	**400**	<50	<5	**5,000,000**	**1,600,000**	**16,000,000**
RMW04	**30 May 2024**	**352732-A / PFF0035**	**750,000**	**140,000**	<5,000	<5,000	**140,000**	**260**	**5,000,000**	**-6.0**	**300**	<5	<5	<200	**8**	**300**	<50	<5	**3,100,000**	**1,200,000**	**9,400,000**
RMW05	**31 May 2024**	**352854-A**	**520,000**	**75,000**	<5,000	<5,000	**75,000**	**16**	**1,500,000**	**-3.0**	**200**	**310**	**21**	<200	**300**	**500**	<50	<5	**850,000**	**310,000**	**3,100,000**
DUP1 (MW1-B)	**31 May 2024**	**352854-A**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DUP2 (EW1)	**31 May 2024**	**352854-A**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TRIP1 (MW1-B)	**31 May 2024**	**ES2418204**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TRIP2 (EW1)	**31 May 2024**	**ES2418204**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

^ Chromium (III+VI) concentrations have been compared to Chromium (VI) ANZG criteria

Table 3
Groundwater Analytical Results Summary

			Metals																			
			Aluminium (filtered)	Antimony (filtered)	Arsenic (filtered)	Barium (filtered)	Beryllium (filtered)	Boron (filtered)	Cadmium (filtered)	Calcium (filtered)	Chromium (III+VI) (filtered)	Cobalt (filtered)	Copper (filtered)	Iron (filtered)	Lead (filtered)	Lithium (filtered)	Magnesium (filtered)	Manganese (filtered)	Mercury (filtered)	Molybdenum (filtered)	Nickel (filtered)	Potassium (filtered)
			µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL			10	1	1	1	0.5	20	0.1	500	1	1	1	10	1	1	500	5	0.05	1	1	500
ANZG Marine Water Toxicant DGVs LOSP 95% (July 2023)									5.5		4.4^	1	1.3		4.4				0.4		70	
ANZG 2023 Dioxins in Freshwater Technical Brief 95% Species Protection																						
NEPM 2013 Table 1A(4) Res HSL A & B GW for Vapour Intrusion, Sand >=2m, <4m																						
PFAS NEMP 2020 Recreational Water																						
PFAS NEMP 2020 Interim Marine 95%																						
PFAS NEMP 2020 Interim Marine 99%																						
Field ID	**Date**	**Lab Report Number**																				
EW1	**31 May 2024**	**352854-A**	-	-	<1	-	-	-	<0.1	-	<1	-	<1	-	<1	-	-	-	<0.05	-	**120**	-
MW1-B	**31 May 2024**	**352854-A**	-	-	**2**	-	-	-	<0.1	-	<1	-	<1	-	<1	-	-	-	<0.05	-	**2**	-
MW2-B	**31 May 2024**	**352854-A**	-	-	**2**	-	-	-	<0.1	-	<1	-	<1	-	<1	-	-	-	<0.05	-	**25**	-
MW3-B	**30 May 2024**	**352732-A / PFF0035**	-	-	<1	-	-	-	**0.1**	-	<1	-	**1**	-	<1	-	-	-	<0.05	-	<1	-
MW4-B	**31 May 2024**	**352854-A**	-	-	<1	-	-	-	<0.1	-	<1	-	**2**	-	<1	-	-	-	<0.05	-	<1	-
RMW01	**30 May 2024**	**352732-A / PFF0035**	**9,200**	<1	**4**	**60**	**1**	**1,000**	**0.5**	**290,000**	**3**	**25**	<1	**120,000**	**3**	**4**	**430,000**	**480**	<0.05	<1	**30**	**96,000**
RMW02	**30 May 2024**	**352732-A**	**5,600**	<1	**4**	**25**	**5**	**1,600**	**0.9**	**91,000**	**1**	**73**	**12**	**66,000**	**44**	**21**	**310,000**	**2,500**	<0.05	<1	**61**	**120,000**
RMW03	**30 May 2024**	**352732-A**	**16,000**	<1	**9**	**96**	**6**	**1,400**	**1.1**	**130,000**	**3**	**92**	**120**	**50,000**	**19**	**24**	**400,000**	**2,600**	<0.05	<1	**130**	**120,000**
RMW04	**30 May 2024**	**352732-A / PFF0035**	**100**	<1	**3**	**46**	<0.5	**2,000**	<0.1	**71,000**	<1	**51**	<1	**31,000**	<1	**2**	**140,000**	**1,900**	<0.05	<1	**9**	**96,000**
RMW05	**31 May 2024**	**352854-A**	**60**	<1	<1	**50**	**3**	**60**	<0.1	**10,000**	<1	**91**	<1	**48,000**	<1	**36**	**120,000**	**4,300**	<0.05	<1	**94**	**7,800**
DUP1 (MW1-B)	**31 May 2024**	**352854-A**	-	-	**2**	-	-	-	<0.1	-	<1	-	<1	-	<1	-	-	-	<0.05	-	**2**	-
DUP2 (EW1)	**31 May 2024**	**352854-A**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TRIP1 (MW1-B)	**31 May 2024**	**ES2418204**	-	-	<1	-	-	-	<0.1	-	<1	-	<1	-	<1	-	-	-	<0.1	-	**2**	-
TRIP2 (EW1)	**31 May 2024**	**ES2418204**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

^ Chromium (III+VI) concentrations have been compared to Chromium (VI) ANZG criteria

Table 3
Groundwater Analytical Results Summary

								Dioxins & Furans												
	Selenium (filtered)	Silicon	Silver (filtered)	Strontium (filtered)	Uranium (filtered)	Vanadium (filtered)	Zinc (filtered)	2,3,7,8-TCDD	1,2,3,7,8-PeCDD	1,2,3,4,7,8-HxCDD	1,2,3,6,7,8-HxCDD	1,2,3,7,8,9-HxCDD	1,2,3,4,6,7,8-HpCDD	OCDD	2,3,7,8-TCDF	1,2,3,7,8-PeCDF	2,3,4,7,8-PeCDF	1,2,3,4,7,8-HxCDF	1,2,3,6,7,8-HxCDF	1,2,3,7,8,9-HxCDF
	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L
EQL	1	200	1	1	0.5	1	1	5	20	20	20	20	20	50	5	20	20	20	20	20
ANZG Marine Water Toxicant DGVs LOSP 95% (July 2023)			1.4			100	8													
ANZG 2023 Dioxins in Freshwater Technical Brief 95% Species Protection																				
NEPM 2013 Table 1A(4) Res HSL A & B GW for Vapour Intrusion, Sand >=2m, <4m																				
PFAS NEMP 2020 Recreational Water																				
PFAS NEMP 2020 Interim Marine 95%																				
PFAS NEMP 2020 Interim Marine 99%																				

Field ID	Date	Lab Report Number	Selenium (filtered)	Silicon	Silver (filtered)	Strontium (filtered)	Uranium (filtered)	Vanadium (filtered)	Zinc (filtered)	2,3,7,8-TCDD	1,2,3,7,8-PeCDD	1,2,3,4,7,8-HxCDD	1,2,3,6,7,8-HxCDD	1,2,3,7,8,9-HxCDD	1,2,3,4,6,7,8-HpCDD	OCDD	2,3,7,8-TCDF	1,2,3,7,8-PeCDF	2,3,4,7,8-PeCDF	1,2,3,4,7,8-HxCDF	1,2,3,6,7,8-HxCDF	1,2,3,7,8,9-HxCDF
EW1	**31 May 2024**	**352854-A**	-	-	-	-	-	-	**68**	-	-	-	-	-	-	-	-	-	-	-	-	-
MW1-B	**31 May 2024**	**352854-A**	-	-	-	-	-	-	**9**	-	-	-	-	-	-	-	-	-	-	-	-	-
MW2-B	**31 May 2024**	**352854-A**	-	-	-	-	-	-	**4**	-	-	-	-	-	-	-	-	-	-	-	-	-
MW3-B	**30 May 2024**	**352732-A / PFF0035**	-	-	-	-	-	-	**32**	<5	<20	<20	<20	<20	<20	**57**	<5	<20	<20	<20	<20	<20
MW4-B	**31 May 2024**	**352854-A**	-	-	-	-	-	-	**7**	-	-	-	-	-	-	-	-	-	-	-	-	-
RMW01	**30 May 2024**	**352732-A / PFF0035**	<1	**15,000**	<1	**5,200**	<0.5	**5**	**490**	<5	<20	<20	<20	<20	<20	**120**	<5	<20	<20	<20	<20	<20
RMW02	**30 May 2024**	**352732-A**	<1	**12,000**	<1	**1,800**	**2.0**	<1	**420**	-	-	-	-	-	-	-	-	-	-	-	-	-
RMW03	**30 May 2024**	**352732-A**	<1	**12,000**	<1	**2,700**	**1.3**	**4**	**620**	-	-	-	-	-	-	-	-	-	-	-	-	-
RMW04	**30 May 2024**	**352732-A / PFF0035**	<1	**3,700**	<1	**1,000**	<0.5	<1	**32**	<5	<20	<20	<20	<20	<20	<50	<5	<20	<20	<20	<20	<20
RMW05	**31 May 2024**	**352854-A**	<1	**11,000**	<1	**88**	<0.5	<1	**400**	-	-	-	-	-	-	-	-	-	-	-	-	-
DUP1 (MW1-B)	**31 May 2024**	**352854-A**	-	-	-	-	-	-	**6**	-	-	-	-	-	-	-	-	-	-	-	-	-
DUP2 (EW1)	**31 May 2024**	**352854-A**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TRIP1 (MW1-B)	**31 May 2024**	**ES2418204**	-	-	-	-	-	-	<5	-	-	-	-	-	-	-	-	-	-	-	-	-
TRIP2 (EW1)	**31 May 2024**	**ES2418204**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

^ Chromium (III+VI) concentrations have been compared to Chromium (VI) ANZG criteria

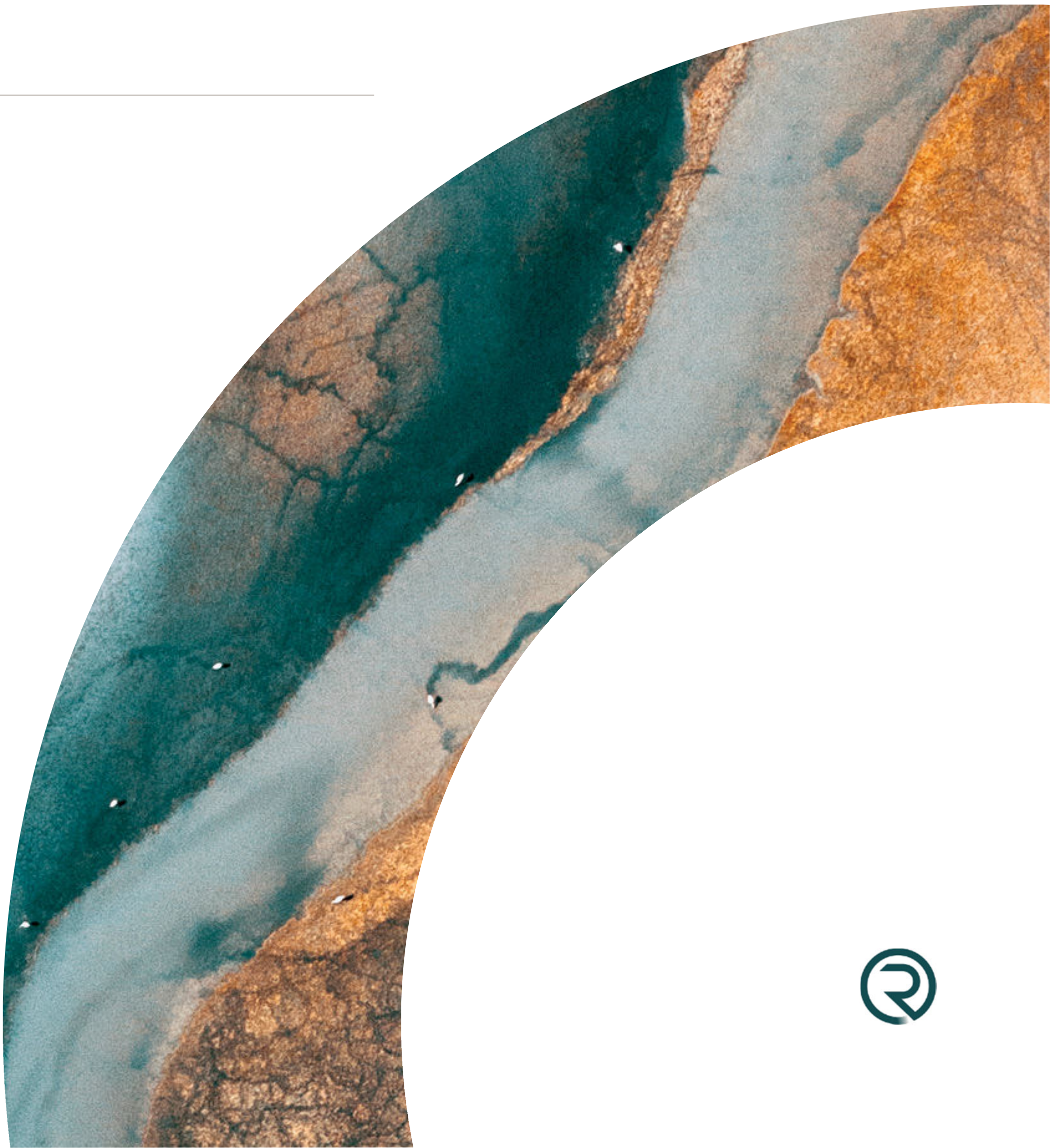
Table 3
Groundwater Analytical Results Summary

								PFAS														
			2,3,4,6,7,8-HxCDF	1,2,3,4,6,7,8-HpCDF	1,2,3,4,7,8,9-HpCDF	OCDF	Dioxins and Furans TEQ (Detects)	Perfluorobutane sulfonic acid (PFBS)	Perfluorohexane sulfonic acid (PFHxS)	Perfluorooctane sulfonic acid (PFOS)	Perfluorobutanoic acid (PFBA)	Perfluorohexanoic acid (PFHxA)	Perfluoropentanoic acid (PFPeA)	Perfluoroheptanoic acid (PFHpA)	Perfluorooctanoic acid (PFOA)	4:2 Fluorotelomer sulfonic acid (4:2 FTS)	6:2 Fluorotelomer sulfonic acid (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	10:2 Fluorotelomer sulfonic acid (10:2 FTS)	Sum of PFHxS and PFOS	Sum of PFAS	Sum of PFAS (PFOS + PFOA)
			pg/L	pg/L	pg/L	pg/L	pg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL			20	20	20	50	-	0.02	0.0002	0.0002	0.1	0.02	0.02	0.02	0.0002	0.05	0.0004	0.0004	0.05	0.0002	0.0002	0.0002
ANZG Marine Water Toxicant DGVs LOSP 95% (July 2023)																						
ANZG 2023 Dioxins in Freshwater Technical Brief 95% Species Protection							5															
NEPM 2013 Table 1A(4) Res HSL A & B GW for Vapour Intrusion, Sand >=2m, <4m																						
PFAS NEMP 2020 Recreational Water									2	2					10					2		
PFAS NEMP 2020 Interim Marine 95%										0.13					220							
PFAS NEMP 2020 Interim Marine 99%										0.00023					19							
Field ID	**Date**	**Lab Report Number**																				
EW1	**31 May 2024**	**352854-A**	-	-	-	-	-	-	<0.0002	<0.0002	-	-	-	-	<0.0002	-	<0.0004	<0.0004	-	<0.0002	<0.0002	<0.0002
MW1-B	**31 May 2024**	**352854-A**	-	-	-	-	-	-	**0.0081**	**0.001**	-	-	-	-	**0.0023**	-	**0.0007**	<0.0004	-	**0.0094**	**0.012**	**0.0035**
MW2-B	**31 May 2024**	**352854-A**	-	-	-	-	-	-	**0.001**	**0.002**	-	-	-	-	**0.0020**	-	**0.0007**	<0.0004	-	**0.0032**	**0.0060**	**0.0038**
MW3-B	**30 May 2024**	**352732-A / PFF0035**	<20	<20	<20	<50	**0.017**	-	**0.002**	**0.010**	-	-	-	-	**0.002**	-	<0.0004	<0.0004	-	**0.012**	**0.014**	**0.012**
MW4-B	**31 May 2024**	**352854-A**	-	-	-	-	-	-	**0.0039**	**0.013**	-	-	-	-	**0.018**	-	<0.0004	<0.0004	-	**0.017**	**0.035**	**0.031**
RMW01	**30 May 2024**	**352732-A / PFF0035**	<20	<20	<20	<50	**0.036**	-	**0.068**	**0.0031**	-	-	-	-	**0.0029**	-	<0.0004	<0.0004	-	**0.071**	**0.074**	**0.0060**
RMW02	**30 May 2024**	**352732-A**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
RMW03	**30 May 2024**	**352732-A**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
RMW04	**30 May 2024**	**352732-A / PFF0035**	<20	<20	<20	<50	-	-	<0.0002	**0.0003**	-	-	-	-	**0.0002**	-	<0.0004	<0.0004	-	**0.0003**	**0.0006**	**0.0006**
RMW05	**31 May 2024**	**352854-A**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DUP1 (MW1-B)	**31 May 2024**	**352854-A**	-	-	-	-	-	-	**0.0074**	**0.001**	-	-	-	-	**0.0021**	-	**0.0005**	<0.0004	-	**0.0085**	**0.011**	**0.0031**
DUP2 (EW1)	**31 May 2024**	**352854-A**	-	-	-	-	-	-	<0.0002	**0.0002**	-	-	-	-	<0.0002	-	<0.0004	<0.0004	-	**0.0002**	**0.0002**	**0.0002**
TRIP1 (MW1-B)	**31 May 2024**	**ES2418204**	-	-	-	-	-	**0.03**	<0.01	<0.01	<0.1	<0.02	**0.04**	<0.02	<0.01	<0.05	<0.05	<0.05	<0.05	<0.01	-	-
TRIP2 (EW1)	**31 May 2024**	**ES2418204**	-	-	-	-	-	<0.02	<0.01	<0.01	<0.1	<0.02	<0.02	<0.02	<0.01	<0.05	<0.05	<0.05	<0.05	<0.01	-	-

^ Chromium (III+VI) concentrations have been compared to Chromium (VI) ANZG criteria

F

Groundwater Sample Laboratory Reports



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CERTIFICATE OF ANALYSIS 352732-A

Client Details

Client	Reditus Consulting
Attention	Toby Scrivener
Address	Shop 1, 29-33 Waratah St, KIRRAWEE, NSW, 2232

Sample Details

Your Reference	**22148**
Number of Samples	Additional analysis
Date samples received	30/05/2024
Date completed instructions received	03/06/2024

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	13/06/2024
Date of Issue	13/06/2024

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Results Approved By
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Dragana Tomas, Senior Chemist
Giovanni Agosti, Group Technical Manager
Sean McAlary, Chemist (FAS)
Stuart Chen, Asbestos Approved Identifier/Report coordinator
Timothy Toll, Senior Chemist

Authorised By
Nancy Zhang, Laboratory Manager

Client Reference: 22148

vTRH(C6-C10)/BTEXN in Water						
Our Reference	UNITS	352732-A-1	352732-A-2	352732-A-3	352732-A-4	352732-A-5
Your Reference		RMW01	RMW02	RMW03	RMW04	MW3-B
Date Sampled		30/05/2024	30/05/2024	30/05/2024	30/05/2024	30/05/2024
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	11/06/2024	11/06/2024	11/06/2024	11/06/2024	11/06/2024
Date analysed	-	11/06/2024	11/06/2024	11/06/2024	11/06/2024	11/06/2024
TRH C_6 - C_9	µg/L	<10	81	<10	<10	<10
TRH C_6 - C_{10}	µg/L	<10	93	<10	<10	<10
TRH C_6 - C_{10} less BTEX (F1)	µg/L	<10	47	<10	<10	<10
Benzene	µg/L	<1	<1	<1	<1	<1
Toluene	µg/L	<1	46	<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	%	116	111	117	118	118
Surrogate Toluene-d8	%	99	99	99	98	99
Surrogate 4-Bromofluorobenzene	%	99	99	99	98	98

svTRH (C10-C40) in Water						
Our Reference		352732-A-1	352732-A-2	352732-A-3	352732-A-4	352732-A-5
Your Reference	UNITS	RMW01	RMW02	RMW03	RMW04	MW3-B
Date Sampled		30/05/2024	30/05/2024	30/05/2024	30/05/2024	30/05/2024
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	04/06/2024	04/06/2024	04/06/2024	04/06/2024	04/06/2024
Date analysed	-	05/06/2024	05/06/2024	05/06/2024	05/06/2024	05/06/2024
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	%	73	87	91	100	79

PAHs in Water						
Our Reference		352732-A-1	352732-A-2	352732-A-3	352732-A-4	352732-A-5
Your Reference	UNITS	RMW01	RMW02	RMW03	RMW04	MW3-B
Date Sampled		30/05/2024	30/05/2024	30/05/2024	30/05/2024	30/05/2024
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	04/06/2024	04/06/2024	04/06/2024	04/06/2024	04/06/2024
Date analysed	-	04/06/2024	04/06/2024	04/06/2024	04/06/2024	04/06/2024
Naphthalene	µg/L	<0.1	0.2	<0.1	<0.1	<0.1
Acenaphthylene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Anthracene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Pyrene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)anthracene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Chrysene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(b,j+k)fluoranthene	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Benzo(a)pyrene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Indeno(1,2,3-c,d)pyrene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)pyrene TEQ	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Total +ve PAH's	µg/L	<0.1	0.22	<0.1	<0.1	<0.1
Surrogate p-Terphenyl-d14	%	62	68	72	76	81

All metals in water-dissolved						
Our Reference		352732-A-1	352732-A-2	352732-A-3	352732-A-4	352732-A-5
Your Reference	UNITS	RMW01	RMW02	RMW03	RMW04	MW3-B
Date Sampled		30/05/2024	30/05/2024	30/05/2024	30/05/2024	30/05/2024
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	05/06/2024	05/06/2024	05/06/2024	05/06/2024	05/06/2024
Date analysed	-	05/06/2024	05/06/2024	05/06/2024	05/06/2024	05/06/2024
Aluminium-Dissolved	μg/L	9,200	5,600	16,000	100	[NA]
Antimony-Dissolved	μg/L	<1	<1	<1	<1	[NA]
Arsenic-Dissolved	μg/L	4	4	9	3	<1
Barium-Dissolved	μg/L	60	25	96	46	[NA]
Beryllium-Dissolved	μg/L	1	5	6	<0.5	[NA]
Boron-Dissolved	μg/L	1,000	1,600	1,400	2,000	[NA]
Cadmium-Dissolved	μg/L	0.5	0.9	1.1	<0.1	0.1
Chromium-Dissolved	μg/L	3	1	3	<1	<1
Cobalt-Dissolved	μg/L	25	73	92	51	[NA]
Copper-Dissolved	μg/L	<1	12	120	<1	1
Iron-Dissolved	μg/L	120,000	66,000	50,000	31,000	[NA]
Lead-Dissolved	μg/L	3	44	19	<1	<1
Lithium-Dissolved	μg/L	4	21	24	2	[NA]
Manganese-Dissolved	μg/L	480	2,500	2,600	1,900	[NA]
Mercury-Dissolved	μg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Molybdenum-Dissolved	μg/L	<1	<1	<1	<1	[NA]
Nickel-Dissolved	μg/L	30	61	130	9	<1
Selenium-Dissolved	μg/L	<1	<1	<1	<1	[NA]
Silver-Dissolved	μg/L	<1	<1	<1	<1	[NA]
Strontium-Dissolved	μg/L	5,200	1,800	2,700	1,000	[NA]
Uranium-Dissolved	μg/L	<0.5	2.0	1.3	<0.5	[NA]
Vanadium-Dissolved	μg/L	5	<1	4	<1	[NA]
Zinc-Dissolved	μg/L	490	420	620	32	32

Ion Balance					
Our Reference		352732-A-1	352732-A-2	352732-A-3	352732-A-4
Your Reference	UNITS	RMW01	RMW02	RMW03	RMW04
Date Sampled		30/05/2024	30/05/2024	30/05/2024	30/05/2024
Type of sample		Water	Water	Water	Water
Date prepared	-	07/06/2024	07/06/2024	07/06/2024	07/06/2024
Date analysed	-	07/06/2024	07/06/2024	07/06/2024	07/06/2024
Calcium - Dissolved	mg/L	290	91	130	71
Potassium - Dissolved	mg/L	96	120	120	96
Sodium - Dissolved	mg/L	3,200	4,000	5,000	3,100
Magnesium - Dissolved	mg/L	430	310	400	140
Hardness (calc) equivalent $CaCO_3$	mg/L	2,500	1,500	2,000	750
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	<5	<5	<5	<5
Bicarbonate Alkalinity as $CaCO_3$	mg/L	<5	<5	<5	140
Carbonate Alkalinity as $CaCO_3$	mg/L	<5	<5	<5	<5
Total Alkalinity as $CaCO_3$	mg/L	<5	<5	<5	140
Sulphate, SO4	mg/L	980	1,400	1,600	1,200
Chloride, Cl	mg/L	6,500	6,300	8,000	5,000
Ionic Balance	%	-3.0	0	0	-6.0

Miscellaneous Inorganics					
Our Reference		352732-A-1	352732-A-2	352732-A-3	352732-A-4
Your Reference	UNITS	RMW01	RMW02	RMW03	RMW04
Date Sampled		30/05/2024	30/05/2024	30/05/2024	30/05/2024
Type of sample		Water	Water	Water	Water
Date prepared	-	03/06/2024	03/06/2024	03/06/2024	03/06/2024
Date analysed	-	03/06/2024	03/06/2024	03/06/2024	03/06/2024
Total Dissolved Solids (grav)	mg/L	11,000	12,000	16,000	9,400
Ammonia as N in water	mg/L	0.21	0.13	0.15	0.26
Nitrate as N in water	mg/L	<0.005	0.01	0.02	<0.005
Nitrite as N in water	mg/L	<0.005	<0.005	0.007	<0.005
NOx as N in water	mg/L	<0.005	0.01	0.03	0.008
Total Nitrogen in water	mg/L	1.1	0.3	0.4	0.3
TKN in water	mg/L	1.1	0.3	0.3	0.3
Phosphate as P in water	mg/L	<0.005	<0.005	<0.005	<0.005
Organic Nitrogen as N	mg/L	0.9	<0.2	<0.2	<0.2

Metals in Waters - Acid extractable					
Our Reference		352732-A-1	352732-A-2	352732-A-3	352732-A-4
Your Reference	UNITS	RMW01	RMW02	RMW03	RMW04
Date Sampled		30/05/2024	30/05/2024	30/05/2024	30/05/2024
Type of sample		Water	Water	Water	Water
Date prepared	-	05/06/2024	05/06/2024	05/06/2024	05/06/2024
Date analysed	-	05/06/2024	05/06/2024	05/06/2024	05/06/2024
Phosphorus - Total	mg/L	<0.05	<0.05	<0.05	<0.05

Metals in Water - Dissolved					
Our Reference		352732-A-1	352732-A-2	352732-A-3	352732-A-4
Your Reference	UNITS	RMW01	RMW02	RMW03	RMW04
Date Sampled		30/05/2024	30/05/2024	30/05/2024	30/05/2024
Type of sample		Water	Water	Water	Water
Date digested	-	04/06/2024	04/06/2024	04/06/2024	04/06/2024
Date analysed	-	04/06/2024	04/06/2024	04/06/2024	04/06/2024
Silicon*- Dissolved	mg/L	15	12	12	3.7

PFAS in Water TRACE Short

Our Reference		352732-A-1	352732-A-4	352732-A-5
Your Reference	UNITS	RMW01	RMW04	MW3-B
Date Sampled		30/05/2024	30/05/2024	30/05/2024
Type of sample		Water	Water	Water
Date prepared	-	05/06/2024	05/06/2024	05/06/2024
Date analysed	-	05/06/2024	05/06/2024	05/06/2024
Perfluorohexanesulfonic acid - PFHxS	µg/L	0.068	<0.0002	0.002
Perfluorooctanesulfonic acid PFOS	µg/L	0.0031	0.0003	0.010
Perfluorooctanoic acid PFOA	µg/L	0.0029	0.0002	0.002
6:2 FTS	µg/L	<0.0004	<0.0004	<0.0004
8:2 FTS	µg/L	<0.0004	<0.0004	<0.0004
Surrogate $^{13}C_8$ *PFOS*	%	94	95	102
Surrogate $^{13}C_2$ *PFOA*	%	92	92	94
Extracted ISTD $^{18}O_2$ *PFHxS*	%	81	82	88
Extracted ISTD $^{13}C_4$ *PFOS*	%	77	83	74
Extracted ISTD $^{13}C_4$ *PFOA*	%	107	100	126
Extracted ISTD$^{13}C_2$ *6:2FTS*	%	153	125	177
Extracted ISTD $^{13}C_2$ *8:2FTS*	%	173	191	#
Total Positive PFHxS & PFOS	µg/L	0.071	0.0003	0.012
Total Positive PFOS & PFOA	µg/L	0.0060	0.0006	0.012
Total Positive PFAS	µg/L	0.074	0.0006	0.014

Dioxins and Furans				
Our Reference		352732-A-1	352732-A-4	352732-A-5
Your Reference	UNITS	RMW01	RMW04	MW3-B
Date Sampled		30/05/2024	30/05/2024	30/05/2024
Type of sample		Water	Water	Water
See attached report		#	#	#

Method ID	Methodology Summary
Inorg-006	Alkalinity - determined titrimetrically in accordance with APHA latest edition, 2320-B.
Inorg-018	Total Dissolved Solids - determined gravimetrically. The solids are dried at 180+/-10°C. NOTE: Where the EC of the sample is <100µS/cm, the TDS will typically be below 70mg/L (as the sample is very likely to be at least drinking water quality). Therefore to ensure data quality for TDS, the TDS is typically calculated as per the equation below:- TDS = EC * 0.6
Inorg-040	The concentrations of the major ions (mg/L) are converted to milliequivalents and summed. The ionic balance should be within +/- 15% ie total anions = total cations +/-15%.
Inorg-055	Nitrate - determined colourimetrically. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a water extraction.
Inorg-055	Nitrite - determined colourimetrically based on APHA latest edition NO2- B. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a water extraction.
Inorg-055/062/127	Total Nitrogen - Calculation sum of TKN and oxidised Nitrogen. Alternatively analysed by combustion and chemiluminescence.
Inorg-057	Ammonia - determined colourimetrically, based on APHA latest edition 4500-NH3 F. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a KCl extraction.
Inorg-060	Phosphate determined colourimetrically based on EPA365.1 and APHA latest edition 4500 P E. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a water extraction.
Inorg-062	TKN - determined colourimetrically based on APHA latest edition 4500 Norg. Alternatively, TKN can be derived from calculation (Total N - NOx).
Inorg-081	Anions - a range of Anions are determined by Ion Chromatography, in accordance with APHA latest edition, 4110-B. Waters samples are filtered on receipt prior to analysis. Alternatively determined by colourimetry/turbidity using Discrete Analyser.
Metals-020	Determination of various metals by ICP-AES.
Metals-021	Determination of Mercury by Cold Vapour AAS.
Metals-022	Determination of various metals by ICP-MS. Please note for Bromine and Iodine, any forms of these elements that are present are included together in the one result reported for each of these two elements. Salt forms (e.g. FeO, PbO, ZnO) are determined stoichiometrically from the base metal concentration.
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.

Method ID	Methodology Summary
Org-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS/GC-MSMS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013.
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.
Org-029	Soil samples are extracted with basified Methanol. Waters and soil extracts are directly injected and/or concentrated/extracted using SPE. TCLPs/ASLP leachates are centrifuged, the supernatant is then analysed (including amendment with solvent) - as per the option in AS4439.3. Analysis is undertaken with LC-MS/MS. PFAS results include the sum of branched and linear isomers where applicable. Please note that PFAS results are corrected for Extracted Internal Standards (QSM 5.4 Table B-15 terminology), which are mass labelled analytes added prior to sample preparation to assess matrix effects and verify processing of the sample. PFAS analytes without a commercially available mass labelled analogue are corrected vs a closely eluting mass labelled PFAS compound. Surrogates are also reported, in this context they are mass labelled PFAS compounds added prior to extraction but are used as monitoring compounds only (not used for result correction). Envicarb (or similar) is used discretionally to remove interfering matrix components. Please contact the laboratory if estimates of Measurement Uncertainty are required as per WA DER.

Method ID	Methodology Summary
ORG-038	Water samples are extracted with DCM and concentrated. The extract is analysed by GC/MSMS for selected Dioxin and Furans. Soils and Sorbents are solvent extracted, followed by an extract clean-up and GC/MSMS analysis. 1. I -TEQ(zero) and WHO-TEQ(zero) calculated where analyte components that are <PQL are considered to be zero in the TEQ calculation. Where all sample analyte results are <PQL, the calculated sample TEQ = 0, this is due to the calculation being an arithmetic formula and therefore does not reflect the associated PQLs. 2. I -TEQ(0.5) and WHO-TEQ(0.5) calculated where analyte components that are <PQL are considered to be 0.5 * the component PQL in the TEQ calculation. 3. I-TEQ(PQL) and WHO-TEQ(PQL) calculated where analyte components that are <PQL are considered to be equal to the component PQL in the TEQ calculation. 13C Rec is the recovery of Isotopically labelled compound added by the Laboratory for quantification and to measure extraction efficiency. I-TEF - International toxic equivalency factor I-TEQ - International toxic equivalence WHO-TEF - World Health Organisation toxic equivalency factor WHO-TEQ - World Health Organisation toxic equivalence

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Water					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			11/06/2024	[NT]	[NT]	[NT]	[NT]	11/06/2024	[NT]
Date analysed	-			11/06/2024	[NT]	[NT]	[NT]	[NT]	11/06/2024	[NT]
TRH C_6 - C_9	µg/L	10	Org-023	<10	[NT]	[NT]	[NT]	[NT]	83	[NT]
TRH C_6 - C_{10}	µg/L	10	Org-023	<10	[NT]	[NT]	[NT]	[NT]	83	[NT]
Benzene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	85	[NT]
Toluene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	84	[NT]
Ethylbenzene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	82	[NT]
m+p-xylene	µg/L	2	Org-023	<2	[NT]	[NT]	[NT]	[NT]	83	[NT]
o-xylene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	82	[NT]
Naphthalene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate Dibromofluoromethane	%		Org-023	109	[NT]	[NT]	[NT]	[NT]	129	[NT]
Surrogate Toluene-d8	%		Org-023	100	[NT]	[NT]	[NT]	[NT]	108	[NT]
Surrogate 4-Bromofluorobenzene	%		Org-023	98	[NT]	[NT]	[NT]	[NT]	106	[NT]

QUALITY CONTROL: svTRH (C10-C40) in Water					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	352732-A-2
Date extracted	-			04/06/2024	1	04/06/2024	04/06/2024		04/06/2024	04/06/2024
Date analysed	-			05/06/2024	1	05/06/2024	05/06/2024		05/06/2024	05/06/2024
TRH C_{10} - C_{14}	µg/L	50	Org-020	<50	1	<50	<50	0	98	92
TRH C_{15} - C_{28}	µg/L	100	Org-020	<100	1	<100	<100	0	103	97
TRH C_{29} - C_{36}	µg/L	100	Org-020	<100	1	<100	<100	0	100	80
TRH >C_{10} - C_{16}	µg/L	50	Org-020	<50	1	<50	<50	0	98	92
TRH >C_{16} - C_{34}	µg/L	100	Org-020	<100	1	<100	<100	0	103	97
TRH >C_{34} - C_{40}	µg/L	100	Org-020	<100	1	<100	<100	0	100	80
Surrogate o-Terphenyl	%		Org-020	90	1	73	60	20	113	96

QUALITY CONTROL: PAHs in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	352732-A-2
Date extracted	-			04/06/2024	1	04/06/2024	04/06/2024		04/06/2024	04/06/2024
Date analysed	-			04/06/2024	1	04/06/2024	04/06/2024		04/06/2024	04/06/2024
Naphthalene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	109	120
Acenaphthylene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Acenaphthene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	115	118
Fluorene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	108	121
Phenanthrene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	110	106
Anthracene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Fluoranthene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	105	103
Pyrene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	103	102
Benzo(a)anthracene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Chrysene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	103	103
Benzo(b,j+k)fluoranthene	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Benzo(a)pyrene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	91	98
Indeno(1,2,3-c,d)pyrene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Dibenzo(a,h)anthracene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Benzo(g,h,i)perylene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	85	1	62	62	0	81	78

QUALITY CONTROL: All metals in water-dissolved					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W4	352732-A-2
Date prepared	-			05/06/2024	1	05/06/2024	05/06/2024		05/06/2024	05/06/2024
Date analysed	-			05/06/2024	1	05/06/2024	05/06/2024		05/06/2024	05/06/2024
Aluminium-Dissolved	µg/L	10	Metals-022	<10	1	9200	9300	1	96	[NT]
Antimony-Dissolved	µg/L	1	Metals-022	<1	1	<1	<1	0	94	[NT]
Arsenic-Dissolved	µg/L	1	Metals-022	<1	1	4	4	0	101	[NT]
Barium-Dissolved	µg/L	1	Metals-022	<1	1	60	58	3	107	[NT]
Beryllium-Dissolved	µg/L	0.5	Metals-022	<0.5	1	1	1	0	83	[NT]
Boron-Dissolved	µg/L	20	Metals-022	<20	1	1000	1100	10	112	[NT]
Cadmium-Dissolved	µg/L	0.1	Metals-022	<0.1	1	0.5	0.5	0	98	[NT]
Chromium-Dissolved	µg/L	1	Metals-022	<1	1	3	3	0	98	[NT]
Cobalt-Dissolved	µg/L	1	Metals-022	<1	1	25	26	4	103	[NT]
Copper-Dissolved	µg/L	1	Metals-022	<1	1	<1	<1	0	98	[NT]
Iron-Dissolved	µg/L	10	Metals-022	<10	1	120000	140000	15	99	[NT]
Lead-Dissolved	µg/L	1	Metals-022	<1	1	3	3	0	98	[NT]
Lithium-Dissolved	µg/L	1	Metals-022	<1	1	4	4	0	92	[NT]
Manganese-Dissolved	µg/L	5	Metals-022	<5	1	480	490	2	97	[NT]
Mercury-Dissolved	µg/L	0.05	Metals-021	<0.05	1	<0.05	<0.05	0	101	77
Molybdenum-Dissolved	µg/L	1	Metals-022	<1	1	<1	<1	0	99	[NT]
Nickel-Dissolved	µg/L	1	Metals-022	<1	1	30	30	0	101	[NT]
Selenium-Dissolved	µg/L	1	Metals-022	<1	1	<1	<1	0	98	[NT]
Silver-Dissolved	µg/L	1	Metals-022	<1	1	<1	<1	0	104	[NT]
Strontium-Dissolved	µg/L	1	Metals-022	<1	1	5200	5200	0	99	[NT]
Uranium-Dissolved	µg/L	0.5	Metals-022	<0.5	1	<0.5	<0.5	0	91	[NT]
Vanadium-Dissolved	µg/L	1	Metals-022	<1	1	5	5	0	99	[NT]
Zinc-Dissolved	µg/L	1	Metals-022	<1	1	490	500	2	98	[NT]

QUALITY CONTROL: Ion Balance					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date prepared	-			07/06/2024	[NT]	[NT]	[NT]	[NT]	07/06/2024	[NT]
Date analysed	-			07/06/2024	[NT]	[NT]	[NT]	[NT]	07/06/2024	[NT]
Calcium - Dissolved	mg/L	0.5	Metals-020	<0.5	[NT]	[NT]	[NT]	[NT]	105	[NT]
Potassium - Dissolved	mg/L	0.5	Metals-020	<0.5	[NT]	[NT]	[NT]	[NT]	98	[NT]
Sodium - Dissolved	mg/L	0.5	Metals-020	<0.5	[NT]	[NT]	[NT]	[NT]	101	[NT]
Magnesium - Dissolved	mg/L	0.5	Metals-020	<0.5	[NT]	[NT]	[NT]	[NT]	102	[NT]
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	5	Inorg-006	<5	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Bicarbonate Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Carbonate Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Total Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	[NT]	[NT]	[NT]	[NT]	109	[NT]
Sulphate, SO4	mg/L	1	Inorg-081	<1	[NT]	[NT]	[NT]	[NT]	115	[NT]
Chloride, Cl	mg/L	1	Inorg-081	<1	[NT]	[NT]	[NT]	[NT]	109	[NT]

QUALITY CONTROL: Miscellaneous Inorganics					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	352732-A-2
Date prepared	-			03/06/2024	1	03/06/2024	03/06/2024		03/06/2024	03/06/2024
Date analysed	-			03/06/2024	1	03/06/2024	03/06/2024		03/06/2024	03/06/2024
Total Dissolved Solids (grav)	mg/L	5	Inorg-018	<5	1	11000	[NT]		96	[NT]
Ammonia as N in water	mg/L	0.005	Inorg-057	<0.005	1	0.21	0.23	9	90	#
Nitrate as N in water	mg/L	0.005	Inorg-055	<0.005	1	<0.005	<0.005	0	95	#
Nitrite as N in water	mg/L	0.005	Inorg-055	<0.005	1	<0.005	<0.005	0	99	#
NOx as N in water	mg/L	0.005	Inorg-055	<0.005	1	<0.005	<0.005	0	95	#
Total Nitrogen in water	mg/L	0.1	Inorg-055/062/127	<0.1	1	1.1	1.1	0	89	[NT]
TKN in water	mg/L	0.1	Inorg-062	<0.1	1	1.1	1.1	0	[NT]	[NT]
Phosphate as P in water	mg/L	0.005	Inorg-060	<0.005	1	<0.005	<0.005	0	107	#
Organic Nitrogen as N	mg/L	0.2	Inorg-055/062/127	<0.2	1	0.9	0.8	12	[NT]	[NT]

QUALITY CONTROL: Metals in Waters - Acid extractable					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date prepared	-			05/06/2024	1	05/06/2024	05/06/2024		05/06/2024	[NT]
Date analysed	-			05/06/2024	1	05/06/2024	05/06/2024		05/06/2024	[NT]
Phosphorus - Total	mg/L	0.05	Metals-020	<0.05	1	<0.05	<0.05	0	93	[NT]

Client Reference: 22148

QUALITY CONTROL: Metals in Water - Dissolved					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date digested	-			04/06/2024	[NT]	[NT]	[NT]	[NT]	04/06/2024	[NT]
Date analysed	-			04/06/2024	[NT]	[NT]	[NT]	[NT]	04/06/2024	[NT]
Silicon*- Dissolved	mg/L	0.2	Metals-020	<0.2	[NT]	[NT]	[NT]	[NT]	96	[NT]

QUALITY CONTROL: PFAS in Water TRACE Short						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	[NT]
Date prepared	-			05/06/2024	[NT]	[NT]	[NT]	[NT]	05/06/2024	[NT]
Date analysed	-			05/06/2024	[NT]	[NT]	[NT]	[NT]	05/06/2024	[NT]
Perfluorohexanesulfonic acid - PFHxS	µg/L	0.0002	Org-029	<0.0002	[NT]	[NT]	[NT]	[NT]	100	[NT]
Perfluorooctanesulfonic acid PFOS	µg/L	0.0002	Org-029	<0.0002	[NT]	[NT]	[NT]	[NT]	101	[NT]
Perfluorooctanoic acid PFOA	µg/L	0.0002	Org-029	<0.0002	[NT]	[NT]	[NT]	[NT]	100	[NT]
6:2 FTS	µg/L	0.0004	Org-029	<0.0004	[NT]	[NT]	[NT]	[NT]	96	[NT]
8:2 FTS	µg/L	0.0004	Org-029	<0.0004	[NT]	[NT]	[NT]	[NT]	92	[NT]
Surrogate $^{13}C_8$ *PFOS*	%		Org-029	98	[NT]	[NT]	[NT]	[NT]	99	[NT]
Surrogate $^{13}C_2$ *PFOA*	%		Org-029	99	[NT]	[NT]	[NT]	[NT]	95	[NT]
Extracted ISTD $^{18}O_2$ *PFHxS*	%		Org-029	83	[NT]	[NT]	[NT]	[NT]	83	[NT]
Extracted ISTD $^{13}C_4$ *PFOS*	%		Org-029	69	[NT]	[NT]	[NT]	[NT]	75	[NT]
Extracted ISTD $^{13}C_4$ *PFOA*	%		Org-029	110	[NT]	[NT]	[NT]	[NT]	111	[NT]
Extracted ISTD$^{13}C_2$ *6:2FTS*	%		Org-029	175	[NT]	[NT]	[NT]	[NT]	164	[NT]
Extracted ISTD $^{13}C_2$ *8:2FTS*	%		Org-029	190	[NT]	[NT]	[NT]	[NT]	186	[NT]

Client Reference: 22148

QUALITY CONTROL: Dioxins and Furans					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
See attached report			ORG-038	#	[NT]	[NT]	[NT]	[NT]	[NT]	[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.

Report Comments

NO2/NO3/PO4 - out of recommended holding time

MISC_INORG: # Percent recovery not reported due to matrix interferences. Samples were diluted and reanalysed and the poor recovery was confirmed. However, an acceptable recovery was obtained for the LCS.

Total metals: no unfiltered, preserved sample was received, therefore analysis was conducted from the unpreserved sample bottle. Note: there is a possibility some elements may be underestimated.

For PFAS Extracted Internal Standards denoted with # or outside the 50-150% acceptance range, the respective target analyte results may be unaffected, in other circumstances the PQL has been raised to accommodate the outlier(s).

Dioxins analysed by MPL Laboratories. Report no. PFF0035.

Envirolab Services (WA) Pty Ltd trading as MPL Laboratories
ABN 53 140 099 207
16-18 Hayden Court Myaree WA 6154
ph +61 8 9317 2505
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Certificate of Analysis PFF0035

Client Details

Client	Envirolab (Sydney)
Contact	Results Receivable
Address	12 Ashley St, Chatswood, NSW, 2067

Sample Details

Your Reference	352732
Number of Samples	3 Water
Date Samples Received	04/06/2024
Date Instructions Received	04/06/2024

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	13/06/2024
Date of Issue	13/06/2024

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

Authorisation Details

Results Approved By	Huong Patfield, Organics Chemist
Laboratory Manager	Michael Kubiak

Certificate of Analysis PFF0035

Samples in this Report

Envirolab ID	Sample ID	Matrix	Date Sampled	Date Received
PFF0035-01	352732-1	Water	04/06/2024	04/06/2024
PFF0035-02	352732-4	Water	04/06/2024	04/06/2024
PFF0035-03	352732-5	Water	04/06/2024	04/06/2024

Sample Comments

General Comment	No sampling date(s) was/were provided by client. Therefore the sampling date(s) is/are assigned as the date(s) of sample receipt to the laboratory.

Certificate of Analysis PFF0035

Dioxins/Furans (Water)

Envirolab ID:	PFF0035-01	**Date Sampled:**	04/06/2024
Client ID:	352732-1		

Analyte	PQL	Units	Result	*WHO-TEF*	*WHO-TEQ1*	*WHO-TEQ2*	*WHO-TEQ3*	*I-TEF*	*I-TEQ1*	*I-TEQ2*	*I-TEQ3*	*Recovery*
2,3,7,8-TCDD	5.00	pg/L	<5.0	*1*	*0.0*	*2.5*	*5.0*	*1*	*0.0*	*2.5*	*5.0*	*80.2%*
1,2,3,7,8-PeCDD	20.00	pg/L	<20	*1*	*0.0*	*10*	*20*	*0.5*	*0.0*	*5.0*	*10*	*88.9%*
1,2,3,4,7,8-HxCDD	20.00	pg/L	<20	*0.1*	*0.0*	*1.0*	*2.0*	*0.1*	*0.0*	*1.0*	*2.0*	*83.8%*
1,2,3,6,7,8-HxCDD	20.00	pg/L	<20	*0.1*	*0.0*	*1.0*	*2.0*	*0.1*	*0.0*	*1.0*	*2.0*	*98.1%*
1,2,3,7,8,9-HxCDD	20.00	pg/L	<20	*0.1*	*0.0*	*1.0*	*2.0*	*0.1*	*0.0*	*1.0*	*2.0*	-
1,2,3,4,6,7,8-HpCDD	20.00	pg/L	<20	*0.01*	*0.0*	*0.10*	*0.20*	*0.01*	*0.0*	*0.10*	*0.20*	*87.0%*
OCDD	50.00	pg/L	120	*0.0003*	*0.036*	*0.036*	*0.036*	*0.001*	*0.12*	*0.12*	*0.12*	*86.8%*
2,3,7,8-TCDF	5.00	pg/L	<5.0	*0.1*	*0.0*	*0.25*	*0.50*	*0.1*	*0.0*	*0.25*	*0.50*	*79.4%*
1,2,3,7,8-PeCDF	20.00	pg/L	<20	*0.03*	*0.0*	*0.30*	*0.60*	*0.05*	*0.0*	*0.50*	*1.0*	*84.2%*
2,3,4,7,8-PeCDF	20.00	pg/L	<20	*0.3*	*0.0*	*3.0*	*6.0*	*0.5*	*0.0*	*5.0*	*10*	*91.8%*
1,2,3,4,7,8-HxCDF	20.00	pg/L	<20	*0.1*	*0.0*	*1.0*	*2.0*	*0.1*	*0.0*	*1.0*	*2.0*	*90.0%*
1,2,3,6,7,8-HxCDF	20.00	pg/L	<20	*0.1*	*0.0*	*1.0*	*2.0*	*0.1*	*0.0*	*1.0*	*2.0*	*95.4%*
1,2,3,7,8,9-HxCDF	20.00	pg/L	<20	*0.1*	*0.0*	*1.0*	*2.0*	*0.1*	*0.0*	*1.0*	*2.0*	*91.5%*
2,3,4,6,7,8-HxCDF	20.00	pg/L	<20	*0.1*	*0.0*	*1.0*	*2.0*	*0.1*	*0.0*	*1.0*	*2.0*	*91.8%*
1,2,3,4,6,7,8-HpCDF	20.00	pg/L	<20	*0.01*	*0.0*	*0.10*	*0.20*	*0.01*	*0.0*	*0.10*	*0.20*	*89.6%*
1,2,3,4,7,8,9-HpCDF	20.00	pg/L	<20	*0.01*	*0.0*	*0.10*	*0.20*	*0.01*	*0.0*	*0.10*	*0.20*	*87.4%*
OCDF	50.00	pg/L	<50	*0.0003*	*0.0*	*0.0075*	*0.015*	*0.001*	*0.0*	*0.025*	*0.050*	-

Certificate of Analysis PFF0035

Envirolab ID:	PFF0035-02	**Date Sampled:**	04/06/2024
Client ID:	352732-4		

Analyte	PQL	Units	Result	WHO-TEF	WHO-TEQ1	WHO-TEQ2	WHO-TEQ3	I-TEF	I-TEQ1	I-TEQ2	I-TEQ3	Recovery
2,3,7,8-TCDD	5.00	pg/L	<5.0	*1*	*0.0*	*2.5*	*5.0*	*1*	*0.0*	*2.5*	*5.0*	*92.5%*
1,2,3,7,8-PeCDD	20.00	pg/L	<20	*1*	*0.0*	*10*	*20*	*0.5*	*0.0*	*5.0*	*10*	*102%*
1,2,3,4,7,8-HxCDD	20.00	pg/L	<20	*0.1*	*0.0*	*1.0*	*2.0*	*0.1*	*0.0*	*1.0*	*2.0*	*99.3%*
1,2,3,6,7,8-HxCDD	20.00	pg/L	<20	*0.1*	*0.0*	*1.0*	*2.0*	*0.1*	*0.0*	*1.0*	*2.0*	*110%*
1,2,3,7,8,9-HxCDD	20.00	pg/L	<20	*0.1*	*0.0*	*1.0*	*2.0*	*0.1*	*0.0*	*1.0*	*2.0*	-
1,2,3,4,6,7,8-HpCDD	20.00	pg/L	<20	*0.01*	*0.0*	*0.10*	*0.20*	*0.01*	*0.0*	*0.10*	*0.20*	*107%*
OCDD	50.00	pg/L	<50	*0.0003*	*0.0079*	*0.0079*	*0.0079*	*0.001*	*0.026*	*0.026*	*0.026*	*103%*
2,3,7,8-TCDF	5.00	pg/L	<5.0	*0.1*	*0.0*	*0.25*	*0.50*	*0.1*	*0.0*	*0.25*	*0.50*	*92.6%*
1,2,3,7,8-PeCDF	20.00	pg/L	<20	*0.03*	*0.0*	*0.30*	*0.60*	*0.05*	*0.0*	*0.50*	*1.0*	*100%*
2,3,4,7,8-PeCDF	20.00	pg/L	<20	*0.3*	*0.0*	*3.0*	*6.0*	*0.5*	*0.0*	*5.0*	*10*	*102%*
1,2,3,4,7,8-HxCDF	20.00	pg/L	<20	*0.1*	*0.0*	*1.0*	*2.0*	*0.1*	*0.0*	*1.0*	*2.0*	*112%*
1,2,3,6,7,8-HxCDF	20.00	pg/L	<20	*0.1*	*0.0*	*1.0*	*2.0*	*0.1*	*0.0*	*1.0*	*2.0*	*108%*
1,2,3,7,8,9-HxCDF	20.00	pg/L	<20	*0.1*	*0.0*	*1.0*	*2.0*	*0.1*	*0.0*	*1.0*	*2.0*	*98.2%*
2,3,4,6,7,8-HxCDF	20.00	pg/L	<20	*0.1*	*0.0*	*1.0*	*2.0*	*0.1*	*0.0*	*1.0*	*2.0*	*105%*
1,2,3,4,6,7,8-HpCDF	20.00	pg/L	<20	*0.01*	*0.0*	*0.10*	*0.20*	*0.01*	*0.0*	*0.10*	*0.20*	*109%*
1,2,3,4,7,8,9-HpCDF	20.00	pg/L	<20	*0.01*	*0.0*	*0.10*	*0.20*	*0.01*	*0.0*	*0.10*	*0.20*	*103%*
OCDF	50.00	pg/L	<50	*0.0003*	*0.0*	*0.0075*	*0.015*	*0.001*	*0.0*	*0.025*	*0.050*	-

Certificate of Analysis PFF0035

Envirolab ID:	PFF0035-03	**Date Sampled:**	04/06/2024
Client ID:	352732-5		

Analyte	PQL	Units	Result	WHO-TEF	WHO-TEQ1	WHO-TEQ2	WHO-TEQ3	I-TEF	I-TEQ1	I-TEQ2	I-TEQ3	Recovery
2,3,7,8-TCDD	5.00	pg/L	<5.0	*1*	*0.0*	*2.5*	*5.0*	*1*	*0.0*	*2.5*	*5.0*	*112%*
1,2,3,7,8-PeCDD	20.00	pg/L	<20	*1*	*0.0*	*10*	*20*	*0.5*	*0.0*	*5.0*	*10*	*112%*
1,2,3,4,7,8-HxCDD	20.00	pg/L	<20	*0.1*	*0.0*	*1.0*	*2.0*	*0.1*	*0.0*	*1.0*	*2.0*	*120%*
1,2,3,6,7,8-HxCDD	20.00	pg/L	<20	*0.1*	*0.0*	*1.0*	*2.0*	*0.1*	*0.0*	*1.0*	*2.0*	*124%*
1,2,3,7,8,9-HxCDD	20.00	pg/L	<20	*0.1*	*0.0*	*1.0*	*2.0*	*0.1*	*0.0*	*1.0*	*2.0*	-
1,2,3,4,6,7,8-HpCDD	20.00	pg/L	<20	*0.01*	*0.0*	*0.10*	*0.20*	*0.01*	*0.0*	*0.10*	*0.20*	*113%*
OCDD	50.00	pg/L	57	*0.0003*	*0.017*	*0.017*	*0.017*	*0.001*	*0.057*	*0.057*	*0.057*	*108%*
2,3,7,8-TCDF	5.00	pg/L	<5.0	*0.1*	*0.0*	*0.25*	*0.50*	*0.1*	*0.0*	*0.25*	*0.50*	*116%*
1,2,3,7,8-PeCDF	20.00	pg/L	<20	*0.03*	*0.0*	*0.30*	*0.60*	*0.05*	*0.0*	*0.50*	*1.0*	*118%*
2,3,4,7,8-PeCDF	20.00	pg/L	<20	*0.3*	*0.0*	*3.0*	*6.0*	*0.5*	*0.0*	*5.0*	*10*	*121%*
1,2,3,4,7,8-HxCDF	20.00	pg/L	<20	*0.1*	*0.0*	*1.0*	*2.0*	*0.1*	*0.0*	*1.0*	*2.0*	*119%*
1,2,3,6,7,8-HxCDF	20.00	pg/L	<20	*0.1*	*0.0*	*1.0*	*2.0*	*0.1*	*0.0*	*1.0*	*2.0*	*114%*
1,2,3,7,8,9-HxCDF	20.00	pg/L	<20	*0.1*	*0.0*	*1.0*	*2.0*	*0.1*	*0.0*	*1.0*	*2.0*	*111%*
2,3,4,6,7,8-HxCDF	20.00	pg/L	<20	*0.1*	*0.0*	*1.0*	*2.0*	*0.1*	*0.0*	*1.0*	*2.0*	*119%*
1,2,3,4,6,7,8-HpCDF	20.00	pg/L	<20	*0.01*	*0.0*	*0.10*	*0.20*	*0.01*	*0.0*	*0.10*	*0.20*	*117%*
1,2,3,4,7,8,9-HpCDF	20.00	pg/L	<20	*0.01*	*0.0*	*0.10*	*0.20*	*0.01*	*0.0*	*0.10*	*0.20*	*112%*
OCDF	50.00	pg/L	<50	*0.0003*	*0.0*	*0.0075*	*0.015*	*0.001*	*0.0*	*0.025*	*0.050*	-

Method Summary

Method ID	Methodology Summary
ORG-025	Determination of semi-volatile organic compounds (SVOCs) by GC-MS-MS. Water samples are extracted by LLE and soils/solids/biota using DCM/Acetone/Methanol.
ORG-025_DIOXIN	Water samples are extracted with DCM and concentrated. The extract is analysed by GC-MSMS for Dioxin and Furans. Soils, Biota and Sorbents are solvent extracted, followed by clean-up and GC-MSMS analysis. 1. I -TEQ(zero) and WHO-TEQ(zero) calculated where analyte components that are <PQL are considered to be zero in the TEQ calculation. Where all sample analyte results are <PQL, the calculated sample TEQ = 0, this is due to the calculation being an arithmetic formula and therefore does not reflect the associated PQLs. 2. I -TEQ(0.5) and WHO-TEQ(0.5) calculated where analyte components that are <PQL are considered to be 0.5 * the component PQL in the TEQ calculation. 3. I-TEQ(PQL) and WHO-TEQ(PQL) calculated where analyte components that are <PQL are considered to be equal to the component PQL in the TEQ calculation. 13C12 Rec is the recovery of Isotopically labelled compound added by the Laboratory for quantification and to measure extraction efficiency. I-TEF - International toxic equivalency factor I-TEQ - International toxic equivalence WHO-TEF - World Health Organisation toxic equivalency factor WHO-TEQ - World Health Organisation toxic equivalence TEQ values are rounded to the same number of significant figures as the raw results for consistency and therefore may not calculate out exactly as PQL * TEF, given rounded up or down as appropriate.

Result Definitions

Identifier	Description
NR	Not reported
NEPM	National Environment Protection Measure
NS	Not specified
LCS	Laboratory Control Sample
RPD	Relative Percent Difference
>	Greater than
<	Less than
PQL	Practical Quantitation Limit
INS	Insufficient sample for this test
NA	Test not required
NT	Not tested
DOL	Samples rejected due to particulate overload (air filters only)
RFD	Samples rejected due to filter damage (air filters only)
RUD	Samples rejected due to uneven deposition (air filters only)
##	Indicates a laboratory acceptance criteria outlier, for further details, see Result Comments and/or QC Comments

Quality Control Definitions

Blank

This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, and is determined by processing solvents and reagents in exactly the same manner as for samples.

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.

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.

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.

Duplicate

This is the complete duplicate analysis of a sample from the process batch. The sample selected should be one where the analyte concentration is easily measurable.

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.

General Acceptance Criteria (GAC) - Analyte specific criteria applies for some analytes and is reflected in QC recovery tables.

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 QAQC tables for details (available on request); <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; 60-140% for organics (+/-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 typically insufficient in order to satisfy laboratory QA/QC protocols.

Miscellaneous Information

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. We have taken the sampling date as being the date received at the laboratory.

Two significant figures are reported for the majority of tests and with a high degree of confidence, for results <10*PQL, the second significant figure may be in doubt i.e. has a relatively high degree of uncertainty and is provided for information only.

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 or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS where sediment/solids are included by default.

Urine Analysis - The BEI values listed are taken from the 2022 edition of *TLVs and BEIs Threshold Limits by ACGIH*.

Air volume measurements are not covered by Envirolab's NATA accreditation.

Data Quality Assessment Summary PFF0035

Client Details

Client	Envirolab (Sydney)
Your Reference	352732
Date Issued	13/06/2024

Recommended Holding Time Compliance

No recommended holding time exceedances

Quality Control and QC Frequency

QC Type	Compliant	Details
Blank	Yes	No Outliers
LCS	Yes	No Outliers
Duplicates	Yes	No Outliers
Matrix Spike	Yes	No Outliers
Surrogates / Extracted Internal Standards	Yes	No Outliers
QC Frequency	Yes	No Outliers

Surrogates/Extracted Internal Standards, Duplicates and/or Matrix Spikes are not always relevant/applicable to certain analyses and matrices. Therefore, said QC measures are deemed compliant in these situations by default. See Laboratory Acceptance Criteria for more information

Data Quality Assessment Summary PFF0035

Recommended Holding Time Compliance

Analysis	Sample Number(s)	Date Sampled	Date Extracted	Date Analysed	Compliant
1,2,3,4,6,7,8-HpCDD | Water	1-2	04/06/2024	07/06/2024	12/06/2024	Yes
	3	04/06/2024	07/06/2024	13/06/2024	Yes
1,2,3,4,6,7,8-HpCDF | Water	1-2	04/06/2024	07/06/2024	12/06/2024	Yes
	3	04/06/2024	07/06/2024	13/06/2024	Yes
1,2,3,4,7,8,9-HpCDF | Water	1-2	04/06/2024	07/06/2024	12/06/2024	Yes
	3	04/06/2024	07/06/2024	13/06/2024	Yes
1,2,3,4,7,8-HxCDD | Water	1-2	04/06/2024	07/06/2024	12/06/2024	Yes
	3	04/06/2024	07/06/2024	13/06/2024	Yes
1,2,3,4,7,8-HxCDF | Water	1-2	04/06/2024	07/06/2024	12/06/2024	Yes
	3	04/06/2024	07/06/2024	13/06/2024	Yes
1,2,3,6,7,8-HxCDD | Water	1-2	04/06/2024	07/06/2024	12/06/2024	Yes
	3	04/06/2024	07/06/2024	13/06/2024	Yes
1,2,3,6,7,8-HXCDF | Water	1-2	04/06/2024	07/06/2024	12/06/2024	Yes
	3	04/06/2024	07/06/2024	13/06/2024	Yes
1,2,3,7,8,9-HxCDD | Water	1-2	04/06/2024	07/06/2024	12/06/2024	Yes
	3	04/06/2024	07/06/2024	13/06/2024	Yes
1,2,3,7,8,9-HxCDF | Water	1-2	04/06/2024	07/06/2024	12/06/2024	Yes
	3	04/06/2024	07/06/2024	13/06/2024	Yes
1,2,3,7,8-PeCDD | Water	1-2	04/06/2024	07/06/2024	12/06/2024	Yes
	3	04/06/2024	07/06/2024	13/06/2024	Yes
1,2,3,7,8-PeCDF | Water	1-2	04/06/2024	07/06/2024	12/06/2024	Yes
	3	04/06/2024	07/06/2024	13/06/2024	Yes
2,3,4,6,7,8-HxCDF | Water	1-2	04/06/2024	07/06/2024	12/06/2024	Yes
	3	04/06/2024	07/06/2024	13/06/2024	Yes
2,3,4,7,8-PeCDF | Water	1-2	04/06/2024	07/06/2024	12/06/2024	Yes
	3	04/06/2024	07/06/2024	13/06/2024	Yes
2,3,7,8-TCDD | Water	1-2	04/06/2024	07/06/2024	12/06/2024	Yes
	3	04/06/2024	07/06/2024	13/06/2024	Yes
2,3,7,8-TCDF | Water	1-2	04/06/2024	07/06/2024	12/06/2024	Yes
	3	04/06/2024	07/06/2024	13/06/2024	Yes
OCDD | Water	1-2	04/06/2024	07/06/2024	12/06/2024	Yes
	3	04/06/2024	07/06/2024	13/06/2024	Yes
OCDF | Water	1-2	04/06/2024	07/06/2024	12/06/2024	Yes
	3	04/06/2024	07/06/2024	13/06/2024	Yes

No sampling date(s) was/were provided by client. Therefore the sampling date(s) is/are assigned as the date(s) of sample receipt to the laboratory.

Quality Control PFF0035

ORG-025_DIOXIN | Dioxins/Furans (Water) | Batch BFF0816

Analyte	Units	PQL	Blank	DUP1 PFF0035-01 Samp | QC | RPD %	LCS %	Spike % PFF0035-02
2,3,7,8-TCDD	pg/L	5.0	<5.0	<5.0 | <5.0 | [NA]	97.1	98.0
Surrogate 13C-2,3,7,8-TCDD	*%*		*97.9*	*80.2 | 84.3*	*97.1*	*61.2*
2,3,7,8-TCDD WHO-TEQ1	pg/L		0.00	0.00 | 0.00 | [NA]	[NA]	[NA]
2,3,7,8-TCDD WHO-TEQ2	pg/L		2.50	2.50 | 2.50 | 0.00	[NA]	[NA]
2,3,7,8-TCDD WHO-TEQ3	pg/L		5.00	5.00 | 5.00 | 0.00	[NA]	[NA]
2,3,7,8-TCDD I-TEQ1	pg/L		0.00	0.00 | 0.00 | [NA]	[NA]	[NA]
2,3,7,8-TCDD I-TEQ2	pg/L		2.50	2.50 | 2.50 | 0.00	[NA]	[NA]
2,3,7,8-TCDD I-TEQ3	pg/L		5.00	5.00 | 5.00 | 0.00	[NA]	[NA]
1,2,3,7,8-PeCDD	pg/L	20	<20	<20 | <20 | [NA]	100	83.0
Surrogate 13C-1,2,3,7,8-PeCDD	*%*		*90.5*	*88.9 | 90.6*	*95.2*	*72.9*
1,2,3,7,8-PeCDD WHO-TEQ1	pg/L		0.00	0.00 | 0.00 | [NA]	[NA]	[NA]
1,2,3,7,8-PeCDD WHO-TEQ2	pg/L		10.0	10.0 | 10.0 | 0.00	[NA]	[NA]
1,2,3,7,8-PeCDD WHO-TEQ3	pg/L		20.0	20.0 | 20.0 | 0.00	[NA]	[NA]
1,2,3,7,8-PeCDD I-TEQ1	pg/L		0.00	0.00 | 0.00 | [NA]	[NA]	[NA]
1,2,3,7,8-PeCDD I-TEQ2	pg/L		5.00	5.00 | 5.00 | 0.00	[NA]	[NA]
1,2,3,7,8-PeCDD I-TEQ3	pg/L		10.0	10.0 | 10.0 | 0.00	[NA]	[NA]
1,2,3,4,7,8-HxCDD	pg/L	20	<20	<20 | <20 | [NA]	99.7	75.3
Surrogate 13C-1,2,3,4,7,8-HxCDD	*%*		*102*	*83.8 | 88.7*	*91.9*	*73.9*
1,2,3,4,7,8-HxCDD WHO-TEQ1	pg/L		0.00	0.00 | 0.00 | [NA]	[NA]	[NA]
1,2,3,4,7,8-HxCDD WHO-TEQ2	pg/L		1.00	1.00 | 1.00 | 0.00	[NA]	[NA]
1,2,3,4,7,8-HxCDD WHO-TEQ3	pg/L		2.00	2.00 | 2.00 | 0.00	[NA]	[NA]
1,2,3,4,7,8-HxCDD I-TEQ1	pg/L		0.00	0.00 | 0.00 | [NA]	[NA]	[NA]
1,2,3,4,7,8-HxCDD I-TEQ2	pg/L		1.00	1.00 | 1.00 | 0.00	[NA]	[NA]
1,2,3,4,7,8-HxCDD I-TEQ3	pg/L		2.00	2.00 | 2.00 | 0.00	[NA]	[NA]
1,2,3,6,7,8-HxCDD	pg/L	20	<20	<20 | <20 | [NA]	96.5	73.7
Surrogate 13C-1,2,3,6,7,8-HxCDD	*%*		*89.7*	*98.1 | 101*	*98.8*	*83.2*
1,2,3,6,7,8-HxCDD WHO-TEQ1	pg/L		0.00	0.00 | 0.00 | [NA]	[NA]	[NA]
1,2,3,6,7,8-HxCDD WHO-TEQ2	pg/L		1.00	1.00 | 1.00 | 0.00	[NA]	[NA]
1,2,3,6,7,8-HxCDD WHO-TEQ3	pg/L		2.00	2.00 | 2.00 | 0.00	[NA]	[NA]
1,2,3,6,7,8-HxCDD I-TEQ1	pg/L		0.00	0.00 | 0.00 | [NA]	[NA]	[NA]
1,2,3,6,7,8-HxCDD I-TEQ2	pg/L		1.00	1.00 | 1.00 | 0.00	[NA]	[NA]
1,2,3,6,7,8-HxCDD I-TEQ3	pg/L		2.00	2.00 | 2.00 | 0.00	[NA]	[NA]
1,2,3,7,8,9-HxCDD	pg/L	20	<20	<20 | <20 | [NA]	96.3	72.2
1,2,3,7,8,9-HxCDD WHO-TEQ1	pg/L		0.00	0.00 | 0.00 | [NA]	[NA]	[NA]
1,2,3,7,8,9-HxCDD WHO-TEQ2	pg/L		1.00	1.00 | 1.00 | 0.00	[NA]	[NA]
1,2,3,7,8,9-HxCDD WHO-TEQ3	pg/L		2.00	2.00 | 2.00 | 0.00	[NA]	[NA]
1,2,3,7,8,9-HxCDD I-TEQ1	pg/L		0.00	0.00 | 0.00 | [NA]	[NA]	[NA]
1,2,3,7,8,9-HxCDD I-TEQ2	pg/L		1.00	1.00 | 1.00 | 0.00	[NA]	[NA]
1,2,3,7,8,9-HxCDD I-TEQ3	pg/L		2.00	2.00 | 2.00 | 0.00	[NA]	[NA]
1,2,3,4,6,7,8-HpCDD	pg/L	20	<20	<20 | <20 | [NA]	98.2	71.0
Surrogate 13C-1,2,3,4,6,7,8-HpCDD	*%*		*97.1*	*87.0 | 95.4*	*100*	*78.8*
1,2,3,4,6,7,8-HpCDD WHO-TEQ1	pg/L		0.00	0.00 | 0.00 | [NA]	[NA]	[NA]
1,2,3,4,6,7,8-HpCDD WHO-TEQ2	pg/L		0.100	0.100 | 0.100 | 0.00	[NA]	[NA]
1,2,3,4,6,7,8-HpCDD WHO-TEQ3	pg/L		0.200	0.200 | 0.200 | 0.00	[NA]	[NA]
1,2,3,4,6,7,8-HpCDD I-TEQ1	pg/L		0.00	0.00 | 0.00 | [NA]	[NA]	[NA]
1,2,3,4,6,7,8-HpCDD I-TEQ2	pg/L		0.100	0.100 | 0.100 | 0.00	[NA]	[NA]
1,2,3,4,6,7,8-HpCDD I-TEQ3	pg/L		0.200	0.200 | 0.200 | 0.00	[NA]	[NA]
OCDD	pg/L	50	<50	121 | 168 | 32.4	101	70.3
Surrogate 13C-OCDD	*%*		*94.0*	*86.8 | 90.3*	*94.5*	*78.6*
OCDD WHO-TEQ1	pg/L		0.00	0.0363 | 0.0503 | 32.4	[NA]	[NA]
OCDD WHO-TEQ2	pg/L		0.00750	0.0363 | 0.0503 | 32.4	[NA]	[NA]
OCDD WHO-TEQ3	pg/L		0.0150	0.0363 | 0.0503 | 32.4	[NA]	[NA]
OCDD I-TEQ1	pg/L		0.00	0.121 | 0.168 | 32.4	[NA]	[NA]
OCDD I-TEQ2	pg/L		0.0250	0.121 | 0.168 | 32.4	[NA]	[NA]
OCDD I-TEQ3	pg/L		0.0500	0.121 | 0.168 | 32.4	[NA]	[NA]
2,3,7,8-TCDF	pg/L	5.0	<5.0	<5.0 | <5.0 | [NA]	107	103
Surrogate 13C-2,3,7,8-TCDF	*%*		*99.0*	*79.4 | 82.8*	*96.2*	*64.4*

Quality Control PFF0035

ORG-025_DIOXIN | Dioxins/Furans (Water) | Batch BFF0816

Analyte	Units	PQL	Blank	DUP1 PFF0035-01			LCS %	Spike % PFF0035-02
				Samp	QC	RPD %		
2,3,7,8-TCDF WHO-TEQ1	pg/L		0.00	0.00	0.00	[NA]	[NA]	[NA]
2,3,7,8-TCDF WHO-TEQ2	pg/L		0.250	0.250	0.250	0.00	[NA]	[NA]
2,3,7,8-TCDF WHO-TEQ3	pg/L		0.500	0.500	0.500	0.00	[NA]	[NA]
2,3,7,8-TCDF I-TEQ1	pg/L		0.00	0.00	0.00	[NA]	[NA]	[NA]
2,3,7,8-TCDF I-TEQ2	pg/L		0.250	0.250	0.250	0.00	[NA]	[NA]
2,3,7,8-TCDF I-TEQ3	pg/L		0.500	0.500	0.500	0.00	[NA]	[NA]
1,2,3,7,8-PeCDF	pg/L	20	<20	<20	<20	[NA]	101	81.7
Surrogate 13C-1,2,3,7,8-PeCDF	*%*		*95.7*	*84.2*	*89.6*		*94.0*	*74.3*
1,2,3,7,8-PeCDF WHO-TEQ1	pg/L		0.00	0.00	0.00	[NA]	[NA]	[NA]
1,2,3,7,8-PeCDF WHO-TEQ2	pg/L		0.300	0.300	0.300	0.00	[NA]	[NA]
1,2,3,7,8-PeCDF WHO-TEQ3	pg/L		0.600	0.600	0.600	0.00	[NA]	[NA]
1,2,3,7,8-PeCDF I-TEQ1	pg/L		0.00	0.00	0.00	[NA]	[NA]	[NA]
1,2,3,7,8-PeCDF I-TEQ2	pg/L		0.500	0.500	0.500	0.00	[NA]	[NA]
1,2,3,7,8-PeCDF I-TEQ3	pg/L		1.00	1.00	1.00	0.00	[NA]	[NA]
2,3,4,7,8-PeCDF	pg/L	20	<20	<20	<20	[NA]	101	86.7
Surrogate 13C-2,3,4,7,8-PeCDF	*%*		*94.9*	*91.8*	*88.9*		*92.3*	*68.2*
2,3,4,7,8-PeCDF WHO-TEQ1	pg/L		0.00	0.00	0.00	[NA]	[NA]	[NA]
2,3,4,7,8-PeCDF WHO-TEQ2	pg/L		3.00	3.00	3.00	0.00	[NA]	[NA]
2,3,4,7,8-PeCDF WHO-TEQ3	pg/L		6.00	6.00	6.00	0.00	[NA]	[NA]
2,3,4,7,8-PeCDF I-TEQ1	pg/L		0.00	0.00	0.00	[NA]	[NA]	[NA]
2,3,4,7,8-PeCDF I-TEQ2	pg/L		5.00	5.00	5.00	0.00	[NA]	[NA]
2,3,4,7,8-PeCDF I-TEQ3	pg/L		10.0	10.0	10.0	0.00	[NA]	[NA]
1,2,3,4,7,8-HxCDF	pg/L	20	<20	<20	<20	[NA]	99.5	68.9
Surrogate 13C-1,2,3,4,7,8-HxCDF	*%*		*90.4*	*90.0*	*94.8*		*95.4*	*77.8*
1,2,3,4,7,8-HxCDF WHO-TEQ1	pg/L		0.00	0.00	0.00	[NA]	[NA]	[NA]
1,2,3,4,7,8-HxCDF WHO-TEQ2	pg/L		1.00	1.00	1.00	0.00	[NA]	[NA]
1,2,3,4,7,8-HxCDF WHO-TEQ3	pg/L		2.00	2.00	2.00	0.00	[NA]	[NA]
1,2,3,4,7,8-HxCDF I-TEQ1	pg/L		0.00	0.00	0.00	[NA]	[NA]	[NA]
1,2,3,4,7,8-HxCDF I-TEQ2	pg/L		1.00	1.00	1.00	0.00	[NA]	[NA]
1,2,3,4,7,8-HxCDF I-TEQ3	pg/L		2.00	2.00	2.00	0.00	[NA]	[NA]
1,2,3,6,7,8-HxCDF	pg/L	20	<20	<20	<20	[NA]	103	61.8
Surrogate 13C-1,2,3,6,7,8-HxCDF	*%*		*89.8*	*95.4*	*96.1*		*96.4*	*86.0*
1,2,3,6,7,8-HxCDF WHO-TEQ1	pg/L		0.00	0.00	0.00	[NA]	[NA]	[NA]
1,2,3,6,7,8-HxCDF WHO-TEQ2	pg/L		1.00	1.00	1.00	0.00	[NA]	[NA]
1,2,3,6,7,8-HxCDF WHO-TEQ3	pg/L		2.00	2.00	2.00	0.00	[NA]	[NA]
1,2,3,6,7,8-HxCDF I-TEQ1	pg/L		0.00	0.00	0.00	[NA]	[NA]	[NA]
1,2,3,6,7,8-HxCDF I-TEQ2	pg/L		1.00	1.00	1.00	0.00	[NA]	[NA]
1,2,3,6,7,8-HxCDF I-TEQ3	pg/L		2.00	2.00	2.00	0.00	[NA]	[NA]
1,2,3,7,8,9-HxCDF	pg/L	20	<20	<20	<20	[NA]	104	104
Surrogate 13C-1,2,3,7,8,9-HxCDF	*%*		*98.5*	*91.5*	*87.7*		*96.8*	*74.2*
1,2,3,7,8,9-HxCDF WHO-TEQ1	pg/L		0.00	0.00	0.00	[NA]	[NA]	[NA]
1,2,3,7,8,9-HxCDF WHO-TEQ2	pg/L		1.00	1.00	1.00	0.00	[NA]	[NA]
1,2,3,7,8,9-HxCDF WHO-TEQ3	pg/L		2.00	2.00	2.00	0.00	[NA]	[NA]
1,2,3,7,8,9-HxCDF I-TEQ1	pg/L		0.00	0.00	0.00	[NA]	[NA]	[NA]
1,2,3,7,8,9-HxCDF I-TEQ2	pg/L		1.00	1.00	1.00	0.00	[NA]	[NA]
1,2,3,7,8,9-HxCDF I-TEQ3	pg/L		2.00	2.00	2.00	0.00	[NA]	[NA]
2,3,4,6,7,8-HxCDF	pg/L	20	<20	<20	<20	[NA]	102	75.4
Surrogate 13C-2,3,4,6,7,8-HxCDF	*%*		*89.8*	*91.8*	*94.2*		*98.2*	*78.2*
2,3,4,6,7,8-HxCDF WHO-TEQ1	pg/L		0.00	0.00	0.00	[NA]	[NA]	[NA]
2,3,4,6,7,8-HxCDF WHO-TEQ2	pg/L		1.00	1.00	1.00	0.00	[NA]	[NA]
2,3,4,6,7,8-HxCDF WHO-TEQ3	pg/L		2.00	2.00	2.00	0.00	[NA]	[NA]
2,3,4,6,7,8-HxCDF I-TEQ1	pg/L		0.00	0.00	0.00	[NA]	[NA]	[NA]
2,3,4,6,7,8-HxCDF I-TEQ2	pg/L		1.00	1.00	1.00	0.00	[NA]	[NA]
2,3,4,6,7,8-HxCDF I-TEQ3	pg/L		2.00	2.00	2.00	0.00	[NA]	[NA]
1,2,3,4,6,7,8-HpCDF	pg/L	20	<20	<20	<20	[NA]	99.6	66.9
Surrogate 13C-1,2,3,4,6,7,8-HpCDF	*%*		*97.7*	*89.6*	*93.8*		*95.4*	*79.4*
1,2,3,4,6,7,8-HpCDF WHO-TEQ1	pg/L		0.00	0.00	0.00	[NA]	[NA]	[NA]

Quality Control PFF0035

ORG-025_DIOXIN | Dioxins/Furans (Water) | Batch BFF0816

Analyte	Units	PQL	Blank	DUP1 PFF0035-01 Samp | QC | RPD %	LCS %	Spike % PFF0035-02
1,2,3,4,6,7,8-HpCDF WHO-TEQ2	pg/L		0.100	0.100 | 0.100 | 0.00	[NA]	[NA]
1,2,3,4,6,7,8-HpCDF WHO-TEQ3	pg/L		0.200	0.200 | 0.200 | 0.00	[NA]	[NA]
1,2,3,4,6,7,8-HpCDF I-TEQ1	pg/L		0.00	0.00 | 0.00 | [NA]	[NA]	[NA]
1,2,3,4,6,7,8-HpCDF I-TEQ2	pg/L		0.100	0.100 | 0.100 | 0.00	[NA]	[NA]
1,2,3,4,6,7,8-HpCDF I-TEQ3	pg/L		0.200	0.200 | 0.200 | 0.00	[NA]	[NA]
1,2,3,4,7,8,9-HpCDF	pg/L	20	<20	<20 | <20 | [NA]	99.8	69.1
Surrogate 13C-1,2,3,4,7,8,9-HpCDF	*%*		*96.3*	*87.4 | 89.2*	*95.8*	*78.9*
1,2,3,4,7,8,9-HpCDF WHO-TEQ1	pg/L		0.00	0.00 | 0.00 | [NA]	[NA]	[NA]
1,2,3,4,7,8,9-HpCDF WHO-TEQ2	pg/L		0.100	0.100 | 0.100 | 0.00	[NA]	[NA]
1,2,3,4,7,8,9-HpCDF WHO-TEQ3	pg/L		0.200	0.200 | 0.200 | 0.00	[NA]	[NA]
1,2,3,4,7,8,9-HpCDF I-TEQ1	pg/L		0.00	0.00 | 0.00 | [NA]	[NA]	[NA]
1,2,3,4,7,8,9-HpCDF I-TEQ2	pg/L		0.100	0.100 | 0.100 | 0.00	[NA]	[NA]
1,2,3,4,7,8,9-HpCDF I-TEQ3	pg/L		0.200	0.200 | 0.200 | 0.00	[NA]	[NA]
OCDF	pg/L	50	<50	<50 | <50 | [NA]	101	66.2
OCDF WHO-TEQ1	pg/L		0.00	0.00 | 0.00 | [NA]	[NA]	[NA]
OCDF WHO-TEQ2	pg/L		0.00750	0.00750 | 0.00750 | 0.00	[NA]	[NA]
OCDF WHO-TEQ3	pg/L		0.0150	0.0150 | 0.0150 | 0.00	[NA]	[NA]
OCDF I-TEQ1	pg/L		0.00	0.00 | 0.00 | [NA]	[NA]	[NA]
OCDF I-TEQ2	pg/L		0.0250	0.0250 | 0.0250 | 0.00	[NA]	[NA]
OCDF I-TEQ3	pg/L		0.0500	0.0500 | 0.0500 | 0.00	[NA]	[NA]

Updated: 1/7/24 0732

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CHAIN OF CUSTODY FORM - Client

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Client Project Name/Number/Site etc (ie report title): 22148
PO No.: 22148
Envirolab Quote No. :
Date results required: standard
Or choose: standard / same day / 1 day / 2 day / 3 day
Note: Inform lab in advance if urgent turnaround is required - surcharges apply
Additional report format: esdat
Lab Comments:

Sample information					Tests Required															Comments
Envirolab Sample ID	Client Sample ID or information	Depth	Date sampled	Type of sample	Combo 3	PFAS Short Suite (Trace)	Cations	Anions	Ionic Balance	Nutrients	Dioxins & Furans									Provide as much information about the sample as you can
1	RMW01	-	30/05/2024	Water	x	x	x	x	x	x	x									
2	RMW02	-	30/05/2024	Water	x		x	x	x	x										
3	RMW03	-	30/05/2024	Water	x		x	x	x	x										
4	RMW04	-	30/05/2024	Water	x	x	x	x	x	x	x									
	RMW05	-	31/05/2024	Water	x		x	x	x	x										
	MW1-B	-	31/05/2024	Water	x	x														
	MW2-B	-	31/05/2024	Water	x	x														
5	MW3-B		30/05/2024	Water	x	x					x									
	MW4-B	-	31/05/2024	Water	x	x														
	EW1	-	31/05/2024	Water	x	x														
	DUP1	-	31/05/2024	Water	x	x														
	TRIP1	-	31/05/2024	Water	x	x														Please forward to ALS
	DUP2	-	31/05/2024	Water		x														
	TRIP2	-	31/05/2024	Water		x														Please forward to ALS
	BLANK	-	31/05/2024	Water	x	x														
				Sample Count	13	12	5	5	5	5	3	0	0	0	0	0	0	0	0	

☐ *Please tick the box if observed settled sediment present in water samples is to be included in the extraction and/or analysis*

Relinquished by (Company): Reditus	Received by (Company): ELS SMD	*Lab Use Only*	
Print Name: Kyle Sier	Print Name: OW	Job number: 352732-A	Cooling: [✓ Ice] / Ice pack / None
Date & Time: 31/05/2024	Date & Time: 30/5/24 1810	Temperature: 8	Security seal: [✓ Intact] / Broken / None
Signature: K.Sier	Signature: OW	TAT Req - SAME day / 1 / 2 / 3 / 4 / STD	

From: tobyscrivener@redituscconsulting.com
Sent: Monday, 3 June 2024 10:41 AM
To: 'Kyle Sier'; Samplereceipt
Subject: RE: COC - 22148

1 2

Hi all – further to Kyle's email (below), could I please also add the following to samples RMW01, RMW02, RMW03, RMW04 and RMW05:

3 4

- Dissolved –
    - Aluminium (Al),
    - antimony (Sb),
    - arsenic (As),
    - barium (Ba),
    - beryllium (Be),
    - boron (B),
    - cadmium (Cd),
    - chromium (Cr),
    - cobalt (Co),
    - copper (Cu),
    - iron (Fe),
    - lead (Pb),
    - lithium (Li),
    - manganese (Mn),
    - mercury (Hg),
    - molybdenum (Mo),
    - nickel (Ni),
    - selenium (Se),
    - silica (dissolved SiO_2),
    - silver (Ag),
    - strontium (Sr),
    - uranium (U),
    - vanadium (V),
    - zinc (Zn)
- Alkalinity (bicarbonate, carbonate, hydroxide and total)
- Total dissolved solids (TDS), total hardness

Thanks,

Regards,

352732 -A

Toby Scrivener
Principal Environmental Engineer
EIANZ Certified Environmental Practitioner - Site Contamination Specialist

REDITUS

Unit 1A, 29-33 Waratah Street
Kirrawee NSW 2232

Envirolab Services Pty Ltd
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12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

CERTIFICATE OF ANALYSIS 352854

Client Details

Client	Reditus Consulting
Attention	Toby Scrivener, Kyle Sier
Address	Shop 1, 29-33 Waratah St, KIRRAWEE, NSW, 2232

Sample Details

Your Reference	**22148**
Number of Samples	10 Water
Date samples received	31/05/2024
Date completed instructions received	31/05/2024

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	07/06/2024
Date of Issue	04/06/2024

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

Results Approved By
Stuart Chen, Asbestos Approved Identifier/Report coordinator

Authorised By
Nancy Zhang, Laboratory Manager

Microbiologocal Testing		
Our Reference		352854-5
Your Reference	UNITS	RMW05
Date Sampled		31/05/2024
Type of sample		Water
Date of testing	-	01/06/2024
Faecal Coliforms	cfu/100mL	80
E. coli	cfu/100mL	80
Enterococci	cfu/100mL	<1

Method ID	Methodology Summary
Ext-008	Subcontracted to Sonic Food & Water Testing. NATA Accreditation No. 4034.

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

Microbiology analysed by Sonic Food & Water Testing. Report no. W2413062

The time between collection and the commencement of testing should not exceed 24 hours. Samples tested outside this time may have their results compromised.

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

CERTIFICATE OF ANALYSIS 352854-A

Client Details

Client	Reditus Consulting
Attention	Toby Scrivener
Address	Shop 1, 29-33 Waratah St, KIRRAWEE, NSW, 2232

Sample Details

Your Reference	**22148**
Number of Samples	Additional analysis
Date samples received	31/05/2024
Date completed instructions received	03/06/2024

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	11/06/2024
Date of Issue	11/06/2024

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Results Approved By
Diego Bigolin, Inorganics Supervisor
Dragana Tomas, Senior Chemist
Giovanni Agosti, Group Technical Manager
Jack Wallis, Chemist (FAS)
Loren Bardwell, Development Chemist
Sean McAlary, Chemist (FAS)

Authorised By
Nancy Zhang, Laboratory Manager

vTRH(C6-C10)/BTEXN in Water						
Our Reference		352854-A-1	352854-A-2	352854-A-3	352854-A-4	352854-A-5
Your Reference	UNITS	MW4-B	MW1-B	MW2-B	EW1	RMW05
Date Sampled		31/05/2024	31/05/2024	31/05/2024	31/05/2024	31/05/2024
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	11/06/2024	11/06/2024	11/06/2024	11/06/2024	11/06/2024
Date analysed	-	11/06/2024	11/06/2024	11/06/2024	11/06/2024	11/06/2024
TRH C_6 - C_9	μg/L	47	<10	<10	<10	<10
TRH C_6 - C_{10}	μg/L	50	<10	<10	<10	<10
TRH C_6 - C_{10} less BTEX (F1)	μg/L	50	<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	%	106	112	112	111	112
Surrogate Toluene-d8	%	90	94	94	94	94
Surrogate 4-Bromofluorobenzene	%	105	107	107	106	106

vTRH(C6-C10)/BTEXN in Water			
Our Reference		352854-A-6	352854-A-10
Your Reference	UNITS	DUP1	BLANK
Date Sampled		31/05/2024	31/05/2024
Type of sample		Water	Water
Date extracted	-	11/06/2024	11/06/2024
Date analysed	-	11/06/2024	11/06/2024
TRH C_6 - C_9	μg/L	<10	<10
TRH C_6 - C_{10}	μg/L	<10	<10
TRH C_6 - C_{10} less BTEX (F1)	μg/L	<10	<10
Benzene	μg/L	<1	<1
Toluene	μg/L	<1	<1
Ethylbenzene	μg/L	<1	<1
m+p-xylene	μg/L	<2	<2
o-xylene	μg/L	<1	<1
Naphthalene	μg/L	<1	<1
Surrogate Dibromofluoromethane	%	112	112
Surrogate Toluene-d8	%	93	94
Surrogate 4-Bromofluorobenzene	%	107	107

svTRH (C10-C40) in Water

Our Reference	UNITS	352854-A-1	352854-A-2	352854-A-3	352854-A-4	352854-A-5
Your Reference		MW4-B	MW1-B	MW2-B	EW1	RMW05
Date Sampled		31/05/2024	31/05/2024	31/05/2024	31/05/2024	31/05/2024
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	04/06/2024	04/06/2024	04/06/2024	04/06/2024	04/06/2024
Date analysed	-	04/06/2024	04/06/2024	04/06/2024	04/06/2024	04/06/2024
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	%	61	93	77	80	75

svTRH (C10-C40) in Water

Our Reference	UNITS	352854-A-6	352854-A-10
Your Reference		DUP1	BLANK
Date Sampled		31/05/2024	31/05/2024
Type of sample		Water	Water
Date extracted	-	11/06/2024	04/06/2024
Date analysed	-	11/06/2024	04/06/2024
TRH C_{10} - C_{14}	µg/L	<50	<50
TRH C_{15} - C_{28}	µg/L	<100	<100
TRH C_{29} - C_{36}	µg/L	<100	<100
Total +ve TRH (C10-C36)	µg/L	<50	<50
TRH >C_{10} - C_{16}	µg/L	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	µg/L	<50	<50
TRH >C_{16} - C_{34}	µg/L	<100	<100
TRH >C_{34} - C_{40}	µg/L	<100	<100
Total +ve TRH (>C10-C40)	µg/L	<50	<50
Surrogate o-Terphenyl	%	76	71

PAHs in Water						
Our Reference		352854-A-1	352854-A-2	352854-A-3	352854-A-4	352854-A-5
Your Reference	UNITS	MW4-B	MW1-B	MW2-B	EW1	RMW05
Date Sampled		31/05/2024	31/05/2024	31/05/2024	31/05/2024	31/05/2024
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	04/06/2024	04/06/2024	04/06/2024	04/06/2024	04/06/2024
Date analysed	-	04/06/2024	04/06/2024	04/06/2024	04/06/2024	04/06/2024
Naphthalene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Anthracene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Pyrene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)anthracene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Chrysene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(b,j+k)fluoranthene	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Benzo(a)pyrene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Indeno(1,2,3-c,d)pyrene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)pyrene TEQ	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Total +ve PAH's	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate p-Terphenyl-d14	%	65	83	74	83	82

PAHs in Water			
Our Reference		352854-A-6	352854-A-10
Your Reference	UNITS	DUP1	BLANK
Date Sampled		31/05/2024	31/05/2024
Type of sample		Water	Water
Date extracted	-	04/06/2024	04/06/2024
Date analysed	-	04/06/2024	04/06/2024
Naphthalene	µg/L	<0.1	<0.1
Acenaphthylene	µg/L	<0.1	<0.1
Acenaphthene	µg/L	<0.1	<0.1
Fluorene	µg/L	<0.1	<0.1
Phenanthrene	µg/L	<0.1	<0.1
Anthracene	µg/L	<0.1	<0.1
Fluoranthene	µg/L	<0.1	<0.1
Pyrene	µg/L	<0.1	<0.1
Benzo(a)anthracene	µg/L	<0.1	<0.1
Chrysene	µg/L	<0.1	<0.1
Benzo(b,j+k)fluoranthene	µg/L	<0.2	<0.2
Benzo(a)pyrene	µg/L	<0.1	<0.1
Indeno(1,2,3-c,d)pyrene	µg/L	<0.1	<0.1
Dibenzo(a,h)anthracene	µg/L	<0.1	<0.1
Benzo(g,h,i)perylene	µg/L	<0.1	<0.1
Benzo(a)pyrene TEQ	µg/L	<0.5	<0.5
Total +ve PAH's	µg/L	<0.1	<0.1
Surrogate p-Terphenyl-d14	%	76	70

All metals in water-dissolved						
Our Reference	UNITS	352854-A-1	352854-A-2	352854-A-3	352854-A-4	352854-A-5
Your Reference		MW4-B	MW1-B	MW2-B	EW1	RMW05
Date Sampled		31/05/2024	31/05/2024	31/05/2024	31/05/2024	31/05/2024
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	05/06/2024	05/06/2024	05/06/2024	05/06/2024	05/06/2024
Date analysed	-	05/06/2024	05/06/2024	05/06/2024	05/06/2024	05/06/2024
Aluminium-Dissolved	µg/L	[NA]	[NA]	[NA]	[NA]	60
Antimony-Dissolved	µg/L	[NA]	[NA]	[NA]	[NA]	<1
Arsenic-Dissolved	µg/L	<1	2	2	<1	<1
Barium-Dissolved	µg/L	[NA]	[NA]	[NA]	[NA]	50
Beryllium-Dissolved	µg/L	[NA]	[NA]	[NA]	[NA]	3
Boron-Dissolved	µg/L	[NA]	[NA]	[NA]	[NA]	60
Cadmium-Dissolved	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Chromium-Dissolved	µg/L	<1	<1	<1	<1	<1
Cobalt-Dissolved	µg/L	[NA]	[NA]	[NA]	[NA]	91
Copper-Dissolved	µg/L	2	<1	<1	<1	<1
Iron-Dissolved	µg/L	[NA]	[NA]	[NA]	[NA]	48,000
Lead-Dissolved	µg/L	<1	<1	<1	<1	<1
Lithium-Dissolved	µg/L	[NA]	[NA]	[NA]	[NA]	36
Manganese-Dissolved	µg/L	[NA]	[NA]	[NA]	[NA]	4,300
Mercury-Dissolved	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Molybdenum-Dissolved	µg/L	[NA]	[NA]	[NA]	[NA]	<1
Nickel-Dissolved	µg/L	<1	2	25	120	94
Selenium-Dissolved	µg/L	[NA]	[NA]	[NA]	[NA]	<1
Silver-Dissolved	µg/L	[NA]	[NA]	[NA]	[NA]	<1
Strontium-Dissolved	µg/L	[NA]	[NA]	[NA]	[NA]	88
Uranium-Dissolved	µg/L	[NA]	[NA]	[NA]	[NA]	<0.5
Vanadium-Dissolved	µg/L	[NA]	[NA]	[NA]	[NA]	<1
Zinc-Dissolved	µg/L	7	9	4	68	400

All metals in water-dissolved			
Our Reference		352854-A-6	352854-A-10
Your Reference	UNITS	DUP1	BLANK
Date Sampled		31/05/2024	31/05/2024
Type of sample		Water	Water
Date prepared	-	05/06/2024	05/06/2024
Date analysed	-	05/06/2024	05/06/2024
Arsenic-Dissolved	µg/L	2	<1
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	2	<1
Zinc-Dissolved	µg/L	6	<1

Ion Balance		
Our Reference		352854-A-5
Your Reference	UNITS	RMW05
Date Sampled		31/05/2024
Type of sample		Water
Date prepared	-	07/06/2024
Date analysed	-	07/06/2024
Calcium - Dissolved	mg/L	10
Potassium - Dissolved	mg/L	7.8
Sodium - Dissolved	mg/L	850
Magnesium - Dissolved	mg/L	120
Hardness (calc) equivalent $CaCO_3$	mg/L	520
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	<5
Bicarbonate Alkalinity as $CaCO_3$	mg/L	75
Carbonate Alkalinity as $CaCO_3$	mg/L	<5
Total Alkalinity as $CaCO_3$	mg/L	75
Sulphate, SO4	mg/L	310
Chloride, Cl	mg/L	1,500
Ionic Balance	%	-3.0

Miscellaneous Inorganics		
Our Reference		352854-A-5
Your Reference	UNITS	RMW05
Date Sampled		31/05/2024
Type of sample		Water
Date prepared	-	03/06/2024
Date analysed	-	03/06/2024
Total Dissolved Solids (grav)	mg/L	3,100
Ammonia as N in water	mg/L	0.016
Nitrate as N in water	mg/L	0.31
Nitrite as N in water	mg/L	0.021
NOx as N in water	mg/L	0.3
Total Nitrogen in water	mg/L	0.5
TKN in water	mg/L	0.2
Phosphate as P in water	mg/L	<0.005
Organic Nitrogen as N	mg/L	<0.2

Metals in Waters - Acid extractable		
Our Reference	UNITS	352854-A-5
Your Reference		RMW05
Date Sampled		31/05/2024
Type of sample		Water
Date prepared	-	04/06/2024
Date analysed	-	04/06/2024
Phosphorus - Total	mg/L	<0.05

Metals in Water - Dissolved		
Our Reference	UNITS	352854-A-5
Your Reference		RMW05
Date Sampled		31/05/2024
Type of sample		Water
Date digested	-	04/06/2024
Date analysed	-	04/06/2024
Silicon*- Dissolved	mg/L	11

PFAS in Water TRACE Short

Our Reference		352854-A-1	352854-A-2	352854-A-3	352854-A-4	352854-A-6
Your Reference	UNITS	MW4-B	MW1-B	MW2-B	EW1	DUP1
Date Sampled		31/05/2024	31/05/2024	31/05/2024	31/05/2024	31/05/2024
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	05/06/2024	05/06/2024	05/06/2024	05/06/2024	05/06/2024
Date analysed	-	05/06/2024	05/06/2024	05/06/2024	05/06/2024	05/06/2024
Perfluorohexanesulfonic acid - PFHxS	µg/L	0.0039	0.0081	0.001	<0.0002	0.0074
Perfluorooctanesulfonic acid PFOS	µg/L	0.013	0.001	0.002	<0.0002	0.001
Perfluorooctanoic acid PFOA	µg/L	0.018	0.0023	0.0020	<0.0002	0.0021
6:2 FTS	µg/L	<0.0004	0.0007	0.0007	<0.0004	0.0005
8:2 FTS	µg/L	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
Surrogate $^{13}C_8$ *PFOS*	%	92	114	97	107	95
Surrogate $^{13}C_2$ *PFOA*	%	89	91	95	92	93
Extracted ISTD $^{18}O_2$ *PFHxS*	%	84	70	83	81	79
Extracted ISTD $^{13}C_4$ *PFOS*	%	89	71	84	69	82
Extracted ISTD $^{13}C_4$ *PFOA*	%	96	91	98	105	98
Extracted ISTD$^{13}C_2$ *6:2FTS*	%	125	102	157	94	156
Extracted ISTD $^{13}C_2$ *8:2FTS*	%	164	92	164	120	186
Total Positive PFHxS & PFOS	µg/L	0.017	0.0094	0.0032	<0.0002	0.0085
Total Positive PFOS & PFOA	µg/L	0.031	0.0035	0.0038	<0.0002	0.0031
Total Positive PFAS	µg/L	0.035	0.012	0.0060	<0.0002	0.011

PFAS in Water TRACE Short			
Our Reference		352854-A-8	352854-A-10
Your Reference	UNITS	DUP2	BLANK
Date Sampled		31/05/2024	31/05/2024
Type of sample		Water	Water
Date prepared	-	05/06/2024	05/06/2024
Date analysed	-	05/06/2024	05/06/2024
Perfluorohexanesulfonic acid - PFHxS	µg/L	<0.0002	<0.0002
Perfluorooctanesulfonic acid PFOS	µg/L	0.0002	<0.0002
Perfluorooctanoic acid PFOA	µg/L	<0.0002	<0.0002
6:2 FTS	µg/L	<0.0004	<0.0004
8:2 FTS	µg/L	<0.0004	<0.0004
Surrogate $^{13}C_8$ *PFOS*	%	112	97
Surrogate $^{13}C_2$ *PFOA*	%	90	96
Extracted ISTD $^{18}O_2$ *PFHxS*	%	80	91
Extracted ISTD $^{13}C_4$ *PFOS*	%	76	84
Extracted ISTD $^{13}C_4$ *PFOA*	%	105	130
Extracted ISTD$^{13}C_2$ *6:2FTS*	%	103	#
Extracted ISTD $^{13}C_2$ *8:2FTS*	%	117	#
Total Positive PFHxS & PFOS	µg/L	0.0002	<0.0002
Total Positive PFOS & PFOA	µg/L	0.0002	<0.0002
Total Positive PFAS	µg/L	0.0002	<0.0002

Method ID	Methodology Summary
Inorg-006	Alkalinity - determined titrimetrically in accordance with APHA latest edition, 2320-B.
Inorg-018	Total Dissolved Solids - determined gravimetrically. The solids are dried at 180+/-10°C. NOTE: Where the EC of the sample is <100µS/cm, the TDS will typically be below 70mg/L (as the sample is very likely to be at least drinking water quality). Therefore to ensure data quality for TDS, the TDS is typically calculated as per the equation below:- TDS = EC * 0.6
Inorg-040	The concentrations of the major ions (mg/L) are converted to milliequivalents and summed. The ionic balance should be within +/- 15% ie total anions = total cations +/-15%.
Inorg-055	Nitrate - determined colourimetrically. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a water extraction.
Inorg-055	Nitrite - determined colourimetrically based on APHA latest edition NO2- B. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a water extraction.
Inorg-055/062/127	Total Nitrogen - Calculation sum of TKN and oxidised Nitrogen. Alternatively analysed by combustion and chemiluminescence.
Inorg-057	Ammonia - determined colourimetrically, based on APHA latest edition 4500-NH3 F. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a KCl extraction.
Inorg-060	Phosphate determined colourimetrically based on EPA365.1 and APHA latest edition 4500 P E. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a water extraction.
Inorg-062	TKN - determined colourimetrically based on APHA latest edition 4500 Norg. Alternatively, TKN can be derived from calculation (Total N - NOx).
Inorg-081	Anions - a range of Anions are determined by Ion Chromatography, in accordance with APHA latest edition, 4110-B. Waters samples are filtered on receipt prior to analysis. Alternatively determined by colourimetry/turbidity using Discrete Analyser.
Metals-020	Determination of various metals by ICP-AES.
Metals-021	Determination of Mercury by Cold Vapour AAS.
Metals-022	Determination of various metals by ICP-MS. Please note for Bromine and Iodine, any forms of these elements that are present are included together in the one result reported for each of these two elements. Salt forms (e.g. FeO, PbO, ZnO) are determined stoichiometrically from the base metal concentration.
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.

Method ID	Methodology Summary
Org-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS/GC-MSMS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013.
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.
Org-029	Soil samples are extracted with basified Methanol. Waters and soil extracts are directly injected and/or concentrated/extracted using SPE. TCLPs/ASLP leachates are centrifuged, the supernatant is then analysed (including amendment with solvent) - as per the option in AS4439.3. Analysis is undertaken with LC-MS/MS. PFAS results include the sum of branched and linear isomers where applicable. Please note that PFAS results are corrected for Extracted Internal Standards (QSM 5.4 Table B-15 terminology), which are mass labelled analytes added prior to sample preparation to assess matrix effects and verify processing of the sample. PFAS analytes without a commercially available mass labelled analogue are corrected vs a closely eluting mass labelled PFAS compound. Surrogates are also reported, in this context they are mass labelled PFAS compounds added prior to extraction but are used as monitoring compounds only (not used for result correction). Envicarb (or similar) is used discretionally to remove interfering matrix components. Please contact the laboratory if estimates of Measurement Uncertainty are required as per WA DER.

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Water					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			11/06/2024	[NT]	[NT]	[NT]	[NT]	11/06/2024	[NT]
Date analysed	-			11/06/2024	[NT]	[NT]	[NT]	[NT]	11/06/2024	[NT]
TRH C_6 - C_9	µg/L	10	Org-023	<10	[NT]	[NT]	[NT]	[NT]	94	[NT]
TRH C_6 - C_{10}	µg/L	10	Org-023	<10	[NT]	[NT]	[NT]	[NT]	94	[NT]
Benzene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	103	[NT]
Toluene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	89	[NT]
Ethylbenzene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	86	[NT]
m+p-xylene	µg/L	2	Org-023	<2	[NT]	[NT]	[NT]	[NT]	97	[NT]
o-xylene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	93	[NT]
Naphthalene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate Dibromofluoromethane	%		Org-023	107	[NT]	[NT]	[NT]	[NT]	123	[NT]
Surrogate Toluene-d8	%		Org-023	95	[NT]	[NT]	[NT]	[NT]	94	[NT]
Surrogate 4-Bromofluorobenzene	%		Org-023	107	[NT]	[NT]	[NT]	[NT]	98	[NT]

QUALITY CONTROL: svTRH (C10-C40) in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	352854-A-2
Date extracted	-			04/06/2024	1	04/06/2024	04/06/2024		04/06/2024	04/06/2024
Date analysed	-			04/06/2024	1	04/06/2024	04/06/2024		04/06/2024	04/06/2024
TRH C_{10} - C_{14}	µg/L	50	Org-020	<50	1	<50	<50	0	114	97
TRH C_{15} - C_{28}	µg/L	100	Org-020	<100	1	<100	<100	0	104	98
TRH C_{29} - C_{36}	µg/L	100	Org-020	<100	1	<100	<100	0	100	82
TRH $>C_{10}$ - C_{16}	µg/L	50	Org-020	<50	1	<50	<50	0	114	97
TRH $>C_{16}$ - C_{34}	µg/L	100	Org-020	<100	1	<100	<100	0	104	98
TRH $>C_{34}$ - C_{40}	µg/L	100	Org-020	<100	1	<100	<100	0	100	82
Surrogate o-Terphenyl	%		Org-020	89	1	61	70	14	88	99

QUALITY CONTROL: PAHs in Water					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	352854-A-2
Date extracted	-			04/06/2024	1	04/06/2024	04/06/2024		04/06/2024	04/06/2024
Date analysed	-			04/06/2024	1	04/06/2024	04/06/2024		04/06/2024	04/06/2024
Naphthalene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	109	118
Acenaphthylene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Acenaphthene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	115	118
Fluorene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	108	118
Phenanthrene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	110	102
Anthracene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Fluoranthene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	105	100
Pyrene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	103	100
Benzo(a)anthracene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Chrysene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	103	103
Benzo(b,j+k)fluoranthene	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Benzo(a)pyrene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	91	94
Indeno(1,2,3-c,d)pyrene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Dibenzo(a,h)anthracene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Benzo(g,h,i)perylene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Surrogate *p*-Terphenyl-d14	%		Org-022/025	85	1	65	75	14	81	75

Client Reference: 22148

QUALITY CONTROL: All metals in water-dissolved					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W4	[NT]
Date prepared	-			05/06/2024	1	05/06/2024	05/06/2024		05/06/2024	[NT]
Date analysed	-			05/06/2024	1	05/06/2024	05/06/2024		05/06/2024	[NT]
Aluminium-Dissolved	µg/L	10	Metals-022	<10	[NT]	[NT]	[NT]	[NT]	96	[NT]
Antimony-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	94	[NT]
Arsenic-Dissolved	µg/L	1	Metals-022	<1	1	<1	[NT]		101	[NT]
Barium-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	107	[NT]
Beryllium-Dissolved	µg/L	0.5	Metals-022	<0.5	[NT]	[NT]	[NT]	[NT]	83	[NT]
Boron-Dissolved	µg/L	20	Metals-022	<20	[NT]	[NT]	[NT]	[NT]	112	[NT]
Cadmium-Dissolved	µg/L	0.1	Metals-022	<0.1	1	<0.1	[NT]		98	[NT]
Chromium-Dissolved	µg/L	1	Metals-022	<1	1	<1	[NT]		98	[NT]
Cobalt-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	103	[NT]
Copper-Dissolved	µg/L	1	Metals-022	<1	1	2	[NT]		98	[NT]
Iron-Dissolved	µg/L	10	Metals-022	<10	[NT]	[NT]	[NT]	[NT]	99	[NT]
Lead-Dissolved	µg/L	1	Metals-022	<1	1	<1	[NT]		98	[NT]
Lithium-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	92	[NT]
Manganese-Dissolved	µg/L	5	Metals-022	<5	[NT]	[NT]	[NT]	[NT]	97	[NT]
Mercury-Dissolved	µg/L	0.05	Metals-021	<0.05	1	<0.05	<0.05	0	101	[NT]
Molybdenum-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	99	[NT]
Nickel-Dissolved	µg/L	1	Metals-022	<1	1	<1	[NT]		101	[NT]
Selenium-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	98	[NT]
Silver-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	104	[NT]
Strontium-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	99	[NT]
Uranium-Dissolved	µg/L	0.5	Metals-022	<0.5	[NT]	[NT]	[NT]	[NT]	91	[NT]
Vanadium-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	99	[NT]
Zinc-Dissolved	µg/L	1	Metals-022	<1	1	7	[NT]		98	[NT]

QUALITY CONTROL: Ion Balance					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date prepared	-			07/06/2024	[NT]	[NT]	[NT]	[NT]	07/06/2024	[NT]
Date analysed	-			07/06/2024	[NT]	[NT]	[NT]	[NT]	07/06/2024	[NT]
Calcium - Dissolved	mg/L	0.5	Metals-020	<0.5	[NT]	[NT]	[NT]	[NT]	105	[NT]
Potassium - Dissolved	mg/L	0.5	Metals-020	<0.5	[NT]	[NT]	[NT]	[NT]	98	[NT]
Sodium - Dissolved	mg/L	0.5	Metals-020	<0.5	[NT]	[NT]	[NT]	[NT]	101	[NT]
Magnesium - Dissolved	mg/L	0.5	Metals-020	<0.5	[NT]	[NT]	[NT]	[NT]	102	[NT]
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	5	Inorg-006	<5	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Bicarbonate Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Carbonate Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Total Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	[NT]	[NT]	[NT]	[NT]	109	[NT]
Sulphate, SO4	mg/L	1	Inorg-081	<1	[NT]	[NT]	[NT]	[NT]	105	[NT]
Chloride, Cl	mg/L	1	Inorg-081	<1	[NT]	[NT]	[NT]	[NT]	100	[NT]

QUALITY CONTROL: Miscellaneous Inorganics					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date prepared	-			03/06/2024	[NT]	[NT]	[NT]	[NT]	03/06/2024	[NT]
Date analysed	-			03/06/2024	[NT]	[NT]	[NT]	[NT]	03/06/2024	[NT]
Total Dissolved Solids (grav)	mg/L	5	Inorg-018	<5	[NT]	[NT]	[NT]	[NT]	96	[NT]
Ammonia as N in water	mg/L	0.005	Inorg-057	<0.005	[NT]	[NT]	[NT]	[NT]	92	[NT]
Nitrate as N in water	mg/L	0.005	Inorg-055	<0.005	[NT]	[NT]	[NT]	[NT]	97	[NT]
Nitrite as N in water	mg/L	0.005	Inorg-055	<0.005	[NT]	[NT]	[NT]	[NT]	99	[NT]
NOx as N in water	mg/L	0.005	Inorg-055	<0.005	[NT]	[NT]	[NT]	[NT]	97	[NT]
Total Nitrogen in water	mg/L	0.1	Inorg-055/062/127	<0.1	[NT]	[NT]	[NT]	[NT]	91	[NT]
TKN in water	mg/L	0.1	Inorg-062	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Phosphate as P in water	mg/L	0.005	Inorg-060	<0.005	[NT]	[NT]	[NT]	[NT]	99	[NT]
Organic Nitrogen as N	mg/L	0.2	Inorg-055/062/127	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]

QUALITY CONTROL: Metals in Waters - Acid extractable						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date prepared	-			04/06/2024	[NT]	[NT]	[NT]	[NT]	04/06/2024	[NT]
Date analysed	-			04/06/2024	[NT]	[NT]	[NT]	[NT]	04/06/2024	[NT]
Phosphorus - Total	mg/L	0.05	Metals-020	<0.05	[NT]	[NT]	[NT]	[NT]	96	[NT]

QUALITY CONTROL: Metals in Water - Dissolved					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date digested	-			04/06/2024	[NT]	[NT]	[NT]	[NT]	04/06/2024	[NT]
Date analysed	-			04/06/2024	[NT]	[NT]	[NT]	[NT]	04/06/2024	[NT]
Silicon*- Dissolved	mg/L	0.2	Metals-020	<0.2	[NT]	[NT]	[NT]	[NT]	96	[NT]

QUALITY CONTROL: PFAS in Water TRACE Short						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date prepared	-			05/06/2024	[NT]	[NT]	[NT]	[NT]	05/06/2024	[NT]
Date analysed	-			05/06/2024	[NT]	[NT]	[NT]	[NT]	05/06/2024	[NT]
Perfluorohexanesulfonic acid - PFHxS	µg/L	0.0002	Org-029	<0.0002	[NT]	[NT]	[NT]	[NT]	94	[NT]
Perfluorooctanesulfonic acid PFOS	µg/L	0.0002	Org-029	<0.0002	[NT]	[NT]	[NT]	[NT]	102	[NT]
Perfluorooctanoic acid PFOA	µg/L	0.0002	Org-029	<0.0002	[NT]	[NT]	[NT]	[NT]	100	[NT]
6:2 FTS	µg/L	0.0004	Org-029	<0.0004	[NT]	[NT]	[NT]	[NT]	91	[NT]
8:2 FTS	µg/L	0.0004	Org-029	<0.0004	[NT]	[NT]	[NT]	[NT]	100	[NT]
Surrogate $^{13}C_8$ *PFOS*	%		Org-029	98	[NT]	[NT]	[NT]	[NT]	102	[NT]
Surrogate $^{13}C_2$ *PFOA*	%		Org-029	99	[NT]	[NT]	[NT]	[NT]	98	[NT]
Extracted ISTD $^{18}O_2$ *PFHxS*	%		Org-029	83	[NT]	[NT]	[NT]	[NT]	88	[NT]
Extracted ISTD $^{13}C_4$ *PFOS*	%		Org-029	69	[NT]	[NT]	[NT]	[NT]	74	[NT]
Extracted ISTD $^{13}C_4$ *PFOA*	%		Org-029	110	[NT]	[NT]	[NT]	[NT]	98	[NT]
Extracted ISTD$^{13}C_2$ *6:2FTS*	%		Org-029	99	[NT]	[NT]	[NT]	[NT]	127	[NT]
Extracted ISTD $^{13}C_2$ *8:2FTS*	%		Org-029	113	[NT]	[NT]	[NT]	[NT]	149	[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.

Updated: 1/7/24 0732

ENVIROLAB GROUP

ENVIROLAB SERVICES

mpl

CHAIN OF CUSTODY FORM - Client

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National phone number 1300 424 344

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A

Client: Reditus Consulting
Contact Person: Toby Scrivener
Project Mgr: Toby Scrivener
Sampler: Kyle Sier
Address: Unit 1A, Level 1, 29-33 Waratah Street Kirrawee NSW
Phone: 02 9521 6567 **Mob:** 0478117515
Email Invoice To: accounts@reditusconsulting.com
tobyscrivener@reditus.com.au
Email Results To: tobyscrivener@reditus.com.au, kylesier@reditusconsulting.com
reditusconsulting@esdat.com.au

Client Project Name/Number/Site etc (ie report title): 22148
PO No.: 22148
Envirolab Quote No. :
Date results required: standard
Or choose: standard / same day / 1 day / 2 day / 3 day
Note: Inform lab in advance if urgent turnaround is required - surcharges apply
Additional report format: esdat
Lab Comments:

Sample information					Tests Required															Comments
Envirolab Sample ID	**Client Sample ID or information**	**Depth**	**Date sampled**	**Type of sample**	**Combo 3**	**PFAS Short Suite (Trace)**	**Cations**	**Anions**	**Ionic Balance**	**Nutrients**	**Dioxins & Furans**									**Provide as much information about the sample as you can**
	RMW01	-	30/05/2024	Water	x	x	x	x	x	x	x									
	RMW02	-	30/05/2024	Water	x		x	x	x	x										
	RMW03	-	30/05/2024	Water	x		x	x	x	x										
	RMW04	-	30/05/2024	Water	x	x	x	x	x	x	x									
5	RMW05	-	31/05/2024	Water	x		x	x	x	x										
2	MW1-B	-	31/05/2024	Water	x	x														
3	MW2-B	-	31/05/2024	Water	x	x														
	MW3-B		30/05/2024	Water	x	x					x									
1	MW4-B	-	31/05/2024	Water	x	x														
4	EW1	-	31/05/2024	Water	x	x														
6	DUP1	-	31/05/2024	Water	x	x														
7	TRIP1	-	31/05/2024	Water	x	x														Please forward to ALS
8	DUP2	-	31/05/2024	Water		x														
9	TRIP2	-	31/05/2024	Water		x														Please forward to ALS
10	BLANK	-	31/05/2024	Water	x	x														
				Sample Count	13	12	5	5	5	5	3									

☐ *Please tick the box if observed settled sediment present in water samples is to be included in the extraction and/or analysis*

Relinquished by (Company): Reditus	**Received by (Company):** ELS SYD	***Lab Use Only***
Print Name: Kyle Sier	**Print Name:** O.W	**Job number:** 352854-A **Cooling:** [✓ Ice] / Ice pack / None
Date & Time: 31/05/2024	**Date & Time:** 31/5/24 1800	**Temperature:** 10 **Security seal:** [✓ Intact] / Broken / None
Signature: K.Sier	**Signature:** OW	**TAT Req - SAME day / 1 / 2 / 3 / 4 / STD**

Anna Bui

From: tobyscrivener@reditusconsulting.com
Sent: Monday, 3 June 2024 10:41 AM
To: 'Kyle Sier'; Samplereceipt
Subject: RE: COC - 22148

Hi all – further to Kyle's email (below), could I please also add the following to samples RMW01, RMW02, RMW03, RMW04 and RMW05:

5

- Dissolved –
    - Aluminium (Al),
    - antimony (Sb),
    - arsenic (As),
    - barium (Ba),
    - beryllium (Be),
    - boron (B),
    - cadmium (Cd),
    - chromium (Cr),
    - cobalt (Co),
    - copper (Cu),
    - iron (Fe),
    - lead (Pb),
    - lithium (Li),
    - manganese (Mn),
    - mercury (Hg),
    - molybdenum (Mo),
    - nickel (Ni),
    - selenium (Se),
    - silica (dissolved SiO_2),
    - silver (Ag),
    - strontium (Sr),
    - uranium (U),
    - vanadium (V),
    - zinc (Zn)
- Alkalinity (bicarbonate, carbonate, hydroxide and total)
- Total dissolved solids (TDS), total hardness

Thanks,

Regards,

352854 - A

Toby Scrivener
Principal Environmental Engineer
EIANZ Certified Environmental Practitioner - Site Contamination Specialist

REDITUS

Unit 1A, 29-33 Waratah Street
Kirrawee NSW 2232

Report Comments

NO2/NO3/PO4 - out of recommended holding time

Total metals: no unfiltered, preserved sample was received, therefore analysis was conducted from the unpreserved sample bottle. Note: there is a possibility some elements may be underestimated.

For PFAS Extracted Internal Standards denoted with # or outside the 50-150% acceptance range, the respective target analyte results may be unaffected, in other circumstances the PQL has been raised to accommodate the outlier(s).

CHAIN OF CUSTODY FORM - Client

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ENVIROLAB GROUP
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Unit 20/119 Reichardt Road, Winnellie, NT 0820
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Company:	Reditus	Client Project Name/Number/Site etc (ie report title):	22148
Contact Person:	Kyle Sier		
Project Mgr:	Toby Scrivener	PO No. (if applicable):	22148
Sampler:	Kyle Sier	Envirolab Quote No. :	
Address:	29-33 Waratah St, Kirrawee NSW	Date results required:	Microbiological TAT
		Or choose:	☐ Standard ☐ Same Day ☐ 1 day ☐ 2 day ☐ 3 day
Phone:	– Mob: 0478 117 515	*Note: Inform lab in advance if urgent turnaround is required - surcharges apply*	
Email Results to:	kylesier@reditus.com.au tobyscrivener@reditus.com.au	Additional report format:	☐ Esdat ☐ Equis
Email Invoice to:	accounts@reditusconsulting.com	Lab Comments:	

Envirolab Sample ID (Lab use only)	Client Sample ID or Information	Depth	Date Sampled	Type of Sample	Faecal Coliforms	Faecal Streptococci	E. Coli	HOLD	Comments: Provide as much information about the sample as you can
1	MW4-B	–	31/5/24	Water				X	
2	MW1-B	–						X	
3	MW2-B	–						X	
4	EW1	–						X	
5	RMW05	–			X	X	X		
6	DUP1	–						X	
7	TRIP1	–						X	
8	DUP2	–						X	
9	TRIP2	–						X	
10	BLANK	–						X	

☐ *Please tick the box if observed settled sediment present in water samples is to be included in the extraction and/or analysis*

Relinquished by (Company): Reditus Consulting	Received by (Company): ELS SYD	*Lab Use Only*	
Print Name: Kyle Sier	Print Name: O.WILCIAK.	Job number: 352854	Cooling: [✓ Ice] / Ice pack / None
Date & Time: 31/5/24 -> 5:59pm	Date & Time: 3/5/24 1800	Temperature: 10°C	Security seal: [✓ Intact] / Broken / None
Signature:	Signature:	TAT Req - SAME day / 1 / 2 / 3 / 4 / [✓ STD]	

REDITUS

02 9521 6567
admin@rdeitusconsulting.com

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