Contamination | Remediation | Geotechnical

RMB GROUP PTY LTD

Dewatering Management Plan

10-28 Lawrence Street, Freshwater NSW

E25874.E16_Rev0
25 June 2025

DOCUMENT CONTROL

Report Title: Dewatering Management Plan; 10-28 Lawrence Street, Freshwater NSW

Report No: E25874.E16_Rev0

Copies	Recipient
1 Soft Copy (PDF – Secured, issued by email)	RMB Group Pty Ltd Suite 203, 20 Clarke Street, **Crows Nest NSW 2065**
1 Original (Saved to Digital Archives)	EI Australia Suite 6.01, 55 Miller Street, **Pyrmont NSW 2009**

Author	Technical Reviewer
Fiona Zhang Environmental Engineer	**Pedro Balbachevsky** SC-CEnvP Cert.No: SCC41198 Principal Environmental Engineer

Revision	Details	Date	Amended By
0	Original	25 June 2025	-

TABLE OF CONTENTS

Page Number

SCHEDULE OF TABLES

APPENDICES

1. INTRODUCTION

1.1 Background

EI Australia (EI) was engaged by RMB Group Pty Ltd ('the client') to prepare a Dewatering Management Plan (DMP) for the property located at 10-28 Lawrence Street, Freshwater NSW ('the site').

The site is located 13km north-east of the Sydney central business district (CBD), within the local government area (LGA) of Northern Beaches Council (**Figure 1**, **Appendix A**). It comprises Lot 1 of Deposited Plan (DP) 900061, Lot 1 of DP100563, Lot 1 of DP578401, Lot 45 of DP974653 and Lot 1 of DP595422. The combined property covers an area of approximately 2,527 m^2 (**Figure 2**, **Appendix A**). At the time of this investigation, the land was occupied by multiple mixed commercial and residential buildings, with on-grade car parking areas.

As the proposed basement will intercept the local groundwater system, temporary groundwater dewatering of the site will be required to enable basement construction. The water to be drawn into the dewatering system is proposed to be appropriately treated to comply with relevant water quality criteria (**Section 5.1**), and subsequently to be discharged into the local Council-owned stormwater system.

Baseline groundwater quality was assessed as described in **Section 3.3**, with tabulated analytical results presented in **Appendix B**.

EI understands that a drained basement design will be adopted for the proposed development. This DMP will form the basis for:

- Obtaining the Council approval for the connection and discharge of groundwater into the municipal stormwater system; and
- Obtaining a water supply works (dewatering licence) approval, to be issued by WaterNSW. EI notes that WaterNSW does not typically process dewatering licences until a discharge approval is issued by the Council.

1.2 Proposed Development

Based on the provided documents (**Appendix C**), the proposed site redevelopment will involve demolition of the existing site structures and the construction of a four-storey, mixed-use building, overlying a two-level basement. The lowest basement level is proposed to have a finished floor level (FFL) at 15.37 metres Australian Height Datum (mAHD). A Bulk Excavation Level (BEL) of 15.1 mAHD is assumed, which includes allowance for the construction of the basement slab. To achieve this BEL, excavation depths ranging from 5.5 to 12 meters Below Ground Level (mBGL) have been estimated. Locally deeper excavations may be required for footings, lift overrun pits, crane pads, and service trenches.

1.3 DMP Objectives

The objectives of this DMP are to:

- Describe the dewatering methodology, groundwater treatment requirements, monitoring and reporting procedures to be employed during temporary dewatering activities;
- Provide effective management and contingency procedures, to ensure that the discharge of extracted groundwater does not pose unacceptable risks to receptors;

- Provide relevant information demonstrating that post-construction seepage control measures, which will include implementation of the operational dewatering management procedure provided in **Section 7**, would present minimal harm to the groundwater resource, pose no adverse impacts to human and ecological receptors and provide a sustainable solution for the management of intermittent seepage waters; and
- Assess the analytical results obtained for the groundwater samples collected to characterise baseline conditions within the existing groundwater monitoring wells.

This DMP will also form the basis for Council approval for connection and discharge to the municipal stormwater system and water supply works (dewatering licence) approval by WaterNSW.

It is also noted that WaterNSW may not fully assess the dewatering license application until Council issues a stormwater discharge permit. To facilitate the approval process, however, this DMP will be issued concurrently to WaterNSW and Council.

1.4 Scope of Work

In order to achieve the DMP objectives above, the following works were undertaken:

- A desktop study including:
    - Review of the development proposal and proposed shoring/dewatering designs;
    - Review of geological, landscape and acid sulfate soil (ASS) risk maps for the area;
    - A search of government records for previously installed registered bores located within a 500m radius of the site;
    - Review of previous environmental investigation reports to identify potential onsite and offsite sources of contamination that may impact on dewatering discharge water quality; and
    - Review of relevant existing reports and laboratory analytical data obtained during previous groundwater monitoring events (GMEs) to determine groundwater quality prior to dewatering.
- Preparation of this DMP report.

A Groundwater Take Assessment (GTA) (EI, 2024) involving computer modelling for the assessment of groundwater inflow volumes and drawdown was also conducted by EI's geotechnical team (**Appendix F**), the findings of which are incorporated and discussed in more detail throughout this DMP.

1.5 Regulatory Framework

The following regulatory framework and guidelines were considered during the preparation of this report:

Table 1-1 Regulatory Framework

NSW Legislation and Regulatory Instruments	Requirements
Contaminated Land Management Act 1997 (CLM Act)	Promotes the effective management of contaminated land in NSW by setting out the roles and responsibilities of the NSW EPA and its rules.
Environmental Planning and Assessment Act 1979 (EP&A Act)	The EP&A Act stipulates the regulations and gives rise to state environmental planning policy (SEPP) to assist regulators with the protection of human and environmental health.

NSW Legislation and Regulatory Instruments	Requirements
Protection of the Environment Operations Act 1997 (POEO Act)	The objective of the *POEO Act* is to achieve the protection, restoration and enhancement of the quality of the environment.
Water Management Act 2000 and *Water Act 1912* (WM Act)	Protects the health of rivers, streams and groundwater systems and gives rise to Water Sharing Plans and quality objectives for catchments within the state of NSW. Manages aquifer interference activities which involve: ▪ The penetration of an aquifer; ▪ The interference of water in an aquifer; ▪ The obstruction of water flow or taking of water from an aquifer when carrying out prescribed activities; and ▪ The disposal of water taken from an aquifer.
NSW Office of Water (2012) *NSW Aquifer Interference Policy*	Details the scope of aquifer interference activities and provides specific guidance on the licensing and approval requirements for activities that interfere with aquifers.
Northern Beaches Council Plans and Policies	Provides controls and guidelines for development in the area. ▪ *Warringah Development Control Plan 2011*; and ▪ *Warringah Local Environmental Plan 2011*.
Relevant Guidelines (but not limited to)	▪ ANZG (2018) *Guidelines for Fresh and Marine Water Quality;* ▪ NHMRC (2022) *Australian Drinking Water Guidelines;* ▪ NHMRC (2008) *Guidelines for Managing Risks in Recreational Water;* ▪ NSW DEC (2007) *Guidelines for the Assessment and Management of Groundwater Contamination* (March 2007); and ▪ NSW EPA (2020) *Guidelines for Consultants Reporting on Contaminated Land.*

2. SITE DESCRIPTION

2.1 Identification, Location and Zoning

Site identification details and associated information are summarised in **Table 2-1**. Site locality and layout plans are provided in **Appendix A**.

Table 2-1 Site Identification, Location and Zoning

Attribute	**Description**
Street Address	10-28 Lawrence Street, Freshwater NSW
Lots and DPs	▪ Lot 1 of DP900061 ▪ Lot 1 of DP100563 ▪ Lot 1 of DP578401 ▪ Lot 45 of DP974653 ▪ Lot 1 of DP595422
Site Area	2,527 m^2 (**Figure 2**, **Appendix A**).
Site Coordinates	Northern-eastern corner of site (GDA2020-MGA56): ▪ Easting: 341187.794 ▪ Northing: 6261022.837 (Source: http://maps.six.nsw.gov.au)
Local Government Area	Northern Beaches Council
Current Zoning	E1: Local Centre (*Warringah Local Environmental Plan 2011)*
Surrounding Land Use	Bound by Dowling Street to the west, Lawrence Street to the north, commercial properties to the east, and residential properties to the south.
Current Site Use	The eastern portion of the site was used as on-grade car parking and the rest of the site was occupied by commercial properties.
Typical Soil Profile	During the EI (2023b) Geotechnical Investigation, the soil profile was generalised as a layer of filling (down to the depth of 1.5mBGL), overlying sand / silty clay and weathered sandstone bedrock.

2.2 Regional Setting

The topography, hydrogeology, geology and soil landscape information is outlined in **Table 2-2**.

Table 2-2 Regional Setting Information

Attribute	**Description**
Topography	The site generally slopes from west to east (**Appendix C**). Regional slope generally dips from the south-west to the north-east (refer to https://meconemosaic.au/)
Drainage	Likely to be consistent with the general slope of the site. Stormwater is expected to be collected in stormwater pits and piped to the municipal collection system.
Geology	The Department of Mineral Resources *Sydney 1:100,000 Geological Series Sheet 9130* (DMR, 1983) indicates the site is underlain by Hawkesbury Sandstone (*Rh*), consisting of medium to coarse-grained quartz sandstone, very minor shale and laminate lenses.
Soil Landscape	The Soil Conservation Service of NSW *Soil Landscapes of the Sydney 1:100,000 Sheet* (Chapman and Murphy, 1989) indicates that the site overlies a Gymea (*gy*) erosional soil landscape, characterised as undulating to rolling rises and low hills on Hawkesbury Sandstone. Local relief 20-80m, slopes 10-25%.

Attribute	Description
Acid Sulfate Soil (ASS) Risk	With reference to the *Sydney_Heads Acid Sulfate Soil Risk Map* (1:25,000 scale; Murphy, 1997), the site lies within an area of '*No Known Occurrence*'. In such cases, ASS are not known or expected to occur and "land management activities are not likely to be affected by ASS materials." The site is not classified on the *Warringah Local Environmental Plan 2011- Acid Sulfate Soil Map*, further proof that the potential for ASS to be present on-site was low. Given the site high elevation (21-35 metres Australian Height Datum - mAHD), as well as the above map information, the potential for ASS presence on-site was considered to be low and further assessment was unwarranted.
Nearest Surface Water Features	Manly Lagoon and Freshwater Beach are situated approximately 500m south and 800m east to the site, respectively.
Groundwater Flow Direction	Inferred to be easterly, towards Freshwater Beach.

2.3 Potential Environmental Receptors

EI assumed that all groundwater extracted from the site during the dewatering activities would be discharged initially into a vessel (basin, or equivalent) and then drained to the municipal stormwater system. Stormwater is expected to the ocean at Freshwater Beach, which is located approximately 800m east of the site.

The discharge point in the South Pacific Ocean is considered to be a slightly to moderately disturbed marine ecosystem. This formed the basis for the selection of the discharge water quality criteria detailed in **Section 5.1**.

3. GROUNDWATER CONDITIONS

3.1 Previous Investigations

Previous investigations have been completed for the site by Geotechnique Pty Ltd and EI, which are documented under the following reports:

A previous (preliminary) investigation had been completed for the site by Geotechnique Pty Ltd, documented under the following report:

- Geotechnique (2011) *Preliminary Contamination Assessment; 10-32 Lawrence Street, Freshwater*, Report No 12446/2-AA, dated 15 April 2011;
- EI (2023a) *Preliminary Site Investigation, 10-28 Lawrence Street, Freshwater NSW*, Report E25884.E01_Rev0, 24 January 2023;
- EI (2023b) *Geotechnical Site Assessment, 10-28 Lawrence Street, Freshwater NSW*, Report E25884.G14_Rev0, 7 February 2023; and
- EI (2024) *Groundwater Take Assessment, 10-28 Lawrence Street, Freshwater NSW*, Report E25874.G12_Rev2, 14 November 2024.

Site-specific details, including predicted water level drawdowns, expected groundwater inflow and discharge volumes, ground settlement rates and excavation shoring methods were obtained from the Groundwater Take Assessment (GTA) report (EI, 2024), a copy of which is presented in **Appendix F**.

3.2 Groundwater Depth

Three groundwater monitoring wells (BH101M, BH102M and BH103M) were installed on 16, 17 and 24 February 2023 for the purpose of characterising the local groundwater. Well construction details are presented in the borehole log attached in **Appendix D**. The monitoring well location is shown on **Figure 2**, **Appendix A**. Well development was conducted immediately after installation. The development process involved the removal of water and accumulated sediment within the full length of the water column using a high-density polyethylene (HDPE), disposable bailer. Bailing was continued until the well dry.

EI completed continuous groundwater level monitoring at wells BH101M, BH102M and BH103M, from 13 April 2023 to 24 October 2023 (EI, 2024). The produced data series is summarised in **Table 3-1**.

Table 3-1 Summary of Long-Term Groundwater Levels

Borehole ID	Average Groundwater Elevation (m AHD)	Highest Recorded Groundwater Elevation (mAHD)	Lowest Recorded Groundwater Elevation (mAHD)
BH101M	15.92	16.58	14.8
BH102M	19.83	20.29	19.4
BH103M	25.60	25.94	25.09

3.3 Pre-Dewatering Groundwater Quality Assessment

3.3.1 Test Parameters

The following groundwater quality parameters were laboratory analysed during the most recent GME conducted on 13 and 21 April 2023, which involved groundwater sampling at three monitoring wells (BH101M, BH102M and BH103M). The selected contaminants of potential concern (COPCs) were the following:

- Priority metals (aluminium, arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc);
- Total Recoverable Hydrocarbons (TRHs);
- Benzene, Toluene, Ethylbenzene and Xylenes (BTEX);
- Polycyclic Aromatic Hydrocarbons (PAHs);
- Phenolic compounds (total phenols);
- Total cyanide;
- Chlorinated Volatile Organic Compounds (CVOCs);
- Electrical Conductivity (EC);
- pH;
- Turbidity;
- Total Dissolved Solids (TDS); and
- Hardness.

3.3.2 Field Observations

Samples were evaluated on the basis of odour and visual signs of contamination, with the following observations noted:

- Groundwater in the monitoring well was observed to be clear, with low turbidity;
- No obvious odours or visual evidence of contamination was detected during sampling; and
- No sheen was observed on the sampled groundwater.

3.3.3 Laboratory Analytical Results

Laboratory analytical results for groundwater samples collected from three monitoring wells (BH101M, BH102M and BH103M) were assessed against the water discharge criteria (the ‘adopted criteria’) detailed in **Section5.1**, which were based on the default guideline values (DGVs) for marine water published under the ANZG (2018) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*.

All results complied with the adopted criteria, with the exception of the following:

- Dissolved metals (aluminium, copper and zinc);
- TRHs (F2 and F3);
- pH; and
- Turbidity.

A summary of analytical results assessed against the adopted water quality criteria is presented in **Table B1** and **Table B2**, **Appendix B**. Laboratory documentation is attached in **Appendix E**.

3.3.4 Water Treatment Requirements

The baseline groundwater quality data indicates that water treatment for dissolved metals (aluminium, copper and zinc) and TRHs (F1, F2 and F3) will be necessary. Aluminium (up to 1200 µg/L) was detected at particularly elevated levels and will require careful monitoring. In addition, treatment of water turbidity and pH are likely required to achieve compliance with the water quality criteria for stormwater discharge under Consent Authority approval.

Potential water treatment options include pumping the water through a sediment settlement tank, where the following could be implemented:

- pH increase to promote the precipitation of dissolved metals;
- Addition of flocculent/coagulant to expedite the settling of suspended particles;
- pH correction back to levels between 6.5 and 8.5;
- Adsorption of TRHs using granular activated carbon (GAC) filters; and
- Adjustment of flow rates to allow sufficient residence time for flocculation/coagulation and settlement to take place.

Further details on water quality management are provided in **Section 5.3**.

4. DEWATERING METHODOLOGY

4.1 Excavation and Shoring

As stated in **Section 1.2**, the proposed development will include the construction of a two-level basement car parking. A BEL of 15.1 mAHD was assumed. Locally deeper excavations may be required for footings, service trenches, crane pads and lift overrun pits.

At the time of this assessment, no detailed structural designs were available. Hence, vertical excavation within the sandstone bedrock was assumed. This assessment does not assess the overall stability and embedment depth of the shoring system. Once final designs are made available, the GTA and this DMP should be revised accordingly, if required.

4.2 Estimated Groundwater Volumes

With reference to the GTA (EI, 2024), groundwater seepage analysis for flow through and beneath the shoring wall during construction has been undertaken using the software package SEEP/W®, a finite element groundwater mathematical modelling software[1]. SEEP/W estimates the volume of water which will be required to be dewatered during the construction of the basement and until the dewatering is turned off.

For modelling purposes, the following was assumed:

- The subsurface conditions were horizontal along the site.
- For the drained basement design, the excavation face is assumed to be permeable and free to drain, with seeping waters being collected by sub-soil drains and directed to a sump-and-pump system.
- For the simplicity of this model, temporary dewatering will be undertaken within the basement retaining wall perimeter to BEL, or about 15.1 mAHD.
- An external design groundwater level of 25.4 mAHD was assumed to be constant at 50 m away from the excavation.
- A “No-Flow” boundary is defined along the symmetric line (the centre of the excavation), at 15 m from the perimeter excavation.
- The basement excavation perimeter has a total length of about 220 m.

Based on these assumptions, the groundwater take during construction and operational phase is expected to be approximately **1.50 megalitres (ML) per year**, as documented in the GTA report (EI, 2024).

---

[1] https://www.geoslope.com/products/seep-w

4.3 Dewatering Level

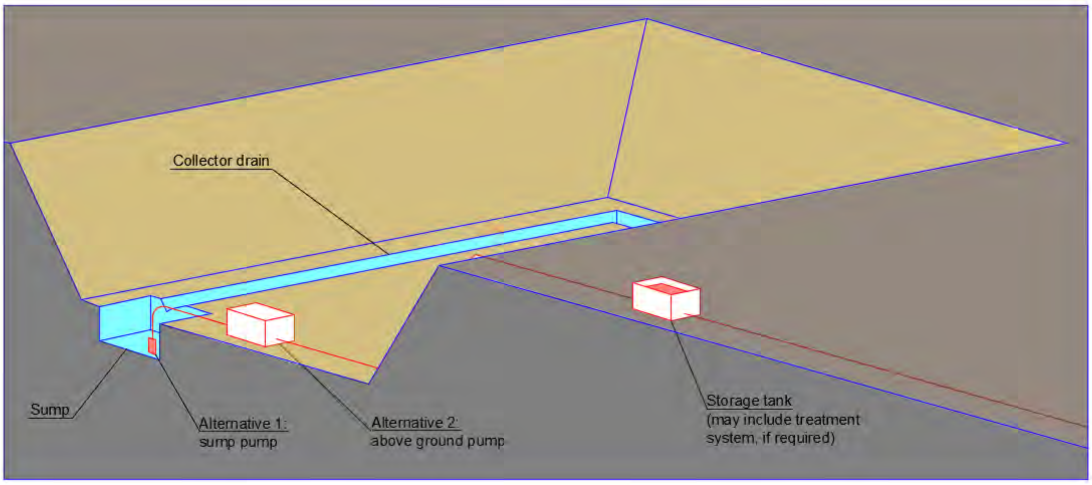
The EI (2024) GTA report stated that permanent dewatering will be undertaken within the basement retaining wall perimeter to BEL, or about 15.1 mAHD.

Groundwater depth will be monitored periodically by measuring groundwater depth in selected monitoring wells. As the estimated seepage rate is low (i.e. 0.0187 m^3/day per metre length of perimeter wall, producing approximately 4.12 m^3/day, for a 220 m basement perimeter, as detailed in **Appendix F**). EI recommends groundwater depth gauging by electric water contact meter, during each sampling site visit, as described in **Section 5.2**.

4.4 Dewatering Method (Construction Phase)

A sump and pump system will be used to control seepage into the excavation during basement construction (**Figure 4-1**).

Figure 4-1 Hypothetical layout of a *Sump and Pump* seepage collection system



During construction, it is recommended that groundwater is pumped-out from the collection sump and discharged initially into a vessel (basin, or equivalent) for sediment settling. The preferred vessel type will require capacity to accommodate the rate of groundwater extraction.

Groundwater treatment will be undertaken either in the vessel, or via a water treatment system installed close to the vessel prior to discharge. The treated water will then be discharged into the storm water pit provided that prior approval for discharge has been obtained from the relevant consent authorities.

The pumping system may operate on a full time or intermittent basis (as required, depending on the selected equipment) for the approved construction dewatering period, to control seepage during basement construction.

The Site Manager, Dewatering Contractor and Water Treatment Specialist must agree on a dewatering strategy to confirm that dewatering treatment systems and water retention tanks can be positioned appropriately within approved areas of the site, prior to the commencement of the excavation works.

4.5 Dewatering Method (Operational Phase)

After construction, the seeping water collection system will be integrated to the basement design, to be later detailed by the client. It is anticipated, though, that all seeping waters will be collected by sub-soil drains and directed to a sump-and-pump system, which will then redirect the water for appropriate treatment before discharge.

4.6 Discharge Flow and Volume Monitoring

The volume of water discharged must be monitored by a calibrated flow meter (or equivalent alternative means) that is integrated as part of the dewatering system for the complete duration of the dewatering period. The flow meter will therefore display cumulative volume discharged at any stage during dewatering, which will be documented as part of the dewatering monitoring records.

Flow monitoring data will be documented by a suitably trained site employee under the supervision of the Site Manager. Tabulated records should be maintained on site and made available to the Environmental Consultant for inclusion in the routine monitoring event reports.

These records will be used to calculate the actual groundwater volume discharged from the site and will be included in the reports (**Section 5.2.3**) to be periodically issued to Council and WaterNSW.

4.7 Drawdown Impacts

In specific cases, dewatering may induce ground subsidence on neighbouring properties due to the associated increase in vertical effective stress in the ground. Ground settlement due to groundwater drawdown is particularly an issue when occurring in soft to firm clays or sands. As the dewatered lithology comprises competent bedrock, settlement impacts due to water level drawdown are unlikely to be significant. While drawdown may occur outside of the excavation, therefore, this should not result in settlement given the subsurface conditions.

It is beyond the scope of this DMP to assess the risk on neighbouring properties associated with ground settlement. EI assumed that the groundwater level drawdown as a result of dewatering is expected to have negligible, if any, impacts on the neighbouring properties due to the characteristically low seepage rates and the stability of the regional bedrock aquifer

5. WATER QUALITY MANAGEMENT

Groundwater quality assessment (monitoring) must be performed prior to and during the dewatering. The on-going monitoring will ensure the treatment system (if required) is functioning as intended, as well as confirm the quality of discharge water is acceptable.

5.1 Discharge Water Quality Guidelines

In accordance with statutory requirements for site dewatering operations, discharged waters must comply with the ANZG (2018) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*, or relevant default criteria where the ANZG (2018) guidelines do not provide values. This requirement is in compliance with the *Protection of the Environment Operations Act 1997*.

The nearest, primary receiving water body is the South Pacific Ocean at Freshwater Beach, which has been determined to be a slightly to moderately disturbed marine ecosystem (**Section 2.3**). Therefore, the ANZG (2018) *95% Marine DGVs* and 99% *DGVs* for bio-accumulative toxicants were adopted as the Discharge Water Criteria (DWC).

For parameters that are not currently addressed by the ANZG marine DGVs, relevant alternative criteria have been adopted as the default DWC.

A summary of the recommended DWC for this site is provided in **Table 5-1**. These parameters and their respective criteria will apply for both the initial (pre-dewatering) and on-going assessment of water quality.

Table 5-1 Discharge Water Criteria (DWC)

Analyte	Discharge Water Criterion (µg/L) [1]
Physico-Chemical Parameters	
pH	6.5 - 8.5 [3]
Turbidity (NTU)	50 [4]
Electrical Conductivity (µS/cm)	125 - 2,200 [4]
Total Dissolved Solids (mg/L)	<1200 [5]
Hardness (mg/L as $CaCO_3$)	<60 – 500 [5]
Metals	
Aluminium (pH>6.5)	55 [7]
Arsenic ^{III}	24 [7]
Arsenic ^{V}	13 [7]
Cadmium	0.7
Chromium ^{III}	27.4
Chromium ^{VI}	4.4
Copper	1.3
Lead	4.4
Mercury (total)	0.1
Nickel	7
Zinc	15

Analyte	**Discharge Water Criterion (µg/L)** [1]
Total Recoverable Hydrocarbons (TRH)	
F1 (C_6-C_{10} minus BTEX)	50 [6]
F2 (>C_{10}-C_{16} minus naphthalene)	60 [6]
F3 (>C_{16}-C_{34})	500 [6]
F4 (>C_{34}-C_{40})	500 [6]
Monocyclic Aromatic Hydrocarbons (BTEX)	
Benzene	700
Toluene	180 [2]
Ethylbenzene	80
o - xylene	350 [2]
p - xylene	200 [7]
m - xylene	75 [2]
Polycyclic Aromatic Hydrocarbons (PAH)	
Benzo(a)pyrene	0.1 [6]
Naphthalene	50
Total PAH	1 [6]
Other Parameters	
Phenol (total)	400
Cyanide (total)	4

Note 1 Discharge water criteria are the ANZG (2018) *95% Trigger Values* for the protection of slightly to moderately disturbed marine ecosystems (with the *99% Trigger Values* applied for the bio-accumulative parameters – cadmium, mercury and nickel), unless otherwise indicated.

Note 2 Low reliability toxicity data, refer to ANZECC / ARMCANZ (2000).

Note 3 In the absence of ANZG (2018) criteria, alternative criteria from ANZECC / ARMCANZ (2000) are applied, which are sourced from Table 3.3.2 in ANZECC/ARMCANZ (2000) *Default trigger values for physical and chemical stressors for south-east Australia for slightly disturbed ecosystems. Adopted pH range is between minimum Lowland River and maximum Marine values*.

Note 4 Turbidity and electrical conductivity values are sourced from Table 3.3.3 *Default trigger values for physical and chemical stressors for south-east Australia for slightly disturbed ecosystems*.

Note 5 Based on NHMRC (2022) *Drinking Water Guidelines (values multiplied by 10 to account for recreational exposure)*.

Note 6 In lack of a published criterion, the laboratory practical quantitation limit (PQL) will be adopted, as per DEC (2007). The PQL of SGS Australia Pty Ltd is given here.

Note 7 The ANZG (2018) 95% Freshwater DGVs for typical slightly to moderately disturbed ecosystems are applied for the indicated parameters, in the absence of marine water criteria.

5.2 Discharge Water Quality Monitoring

5.2.1 Visual Monitoring

Visual inspections of the dewatering measures and equipment should occur regularly (daily, if possible) by the Site Manager and/or Dewatering Contractor, to ensure:

- The effective operation of all dewatering treatment equipment;
- No hydrocarbon sheens are visible and no hydrocarbon odours are generated by the treated groundwater or sediment;

- No green, blue or extremely clear effluent, potentially indicating high levels of dissolved aluminium (if used in the treatment process);

The Site Manager must keep a record of all visual observations, as well as treatment system information and operational readings, such as filter media changeover events, flow rates, pressures, to enable the calculation of the groundwater extraction/discharge volumes following the completion of the dewatering activities.

5.2.2 Sample Collection and Analysis

Dewatering Quality Assessment

On-going sample analysis must continue for the duration of the dewatering activities, to establish that the treatment system (if required) is functioning as intended, and to confirm the quality of discharge water is acceptable for release into the receiving water body (South Pacific Ocean at Freshwater Beach).

Sample collection should be completed by a suitably qualified environmental scientist or equivalent, with the subsequent analyses performed by a reputable environmental laboratory using NATA-registered analytical methods. The analytical program is to include the priority parameters listed in **Table 5-1** in **Section 5.1**. Additional water quality parameters may be added to the priority test suite, should daily monitoring records indicate that this is warranted.

The following activities are to be implemented for the on-going monitoring program:

- **Trial-Run Period:** Prior to the discharge of any extracted groundwater, a trial run will be completed as follows:
    - Initial groundwater pumped or seeping from the site will be diverted into the excavation, to infiltrate site strata and re-enter the underlying groundwater aquifer, thus allowing a reduction in suspended sediments, which are expected in the initial pump-out waters;
    - Samples of the treated groundwater will be collected and laboratory analysed for the water quality parameters of concern; and
    - After confirmation that the water quality complies with criteria, the extracted groundwater will be directed to the receiving water bodies.

  Semi-weekly (twice per week) sampling frequency will occur during the trial-run period. As a minimum, two samples will be collected before and after the treatment of the extracted groundwater. The analytical results will be compared to each other, as well as to the DWC, to assess the performance of the water treatment system. The results of each sampling event will be recorded, to establish trends (if any) on the water quality.

  Semi-weekly sampling should be maintained for a minimum of two weeks following commencement of the dewatering treatment, unless stated otherwise by the Environmental Consultant. Sampling for trial run purposes will cease once the target parameters in treated water stabilise (i.e. consecutive tests are within ± 10% of the observed results) and contaminant concentrations are within the adopted discharge criteria for three consecutive sampling events. The trial-run period may be extended if stabilisation is not observed, or if the treated water does not satisfy the adopted criteria (**Table 5-1**).

  The Dewatering Contractor / Water Treatment Specialist should seek advice from the Environmental Consultant regarding termination of the trial-run period. During the trial-run period, all collected groundwater seepage (including treated water) should be retained on-site and stored in appropriate bulk containers. No collected groundwater should be discharged until it is proven to meet the adopted criteria.

- **Discharge Monitoring Period (Weekly, Fortnightly and Monthly):** After the Trial-Run Period, and subject to statutory authority approval, treated water may be discharged to the receiving water body. A weekly sampling frequency will be adopted for four weeks. The sampling program will involve the collection of one system discharge (i.e. treated) sample (as a minimum), to be analysed for the target parameters of concern, to confirm the system is functioning as intended.

After four weeks, the weekly sampling frequency may be extended to fortnightly monitoring for a month and then monthly for the remaining duration of dewatering, provided the analytical monitoring results indicate the treated water quality consistently meets the adopted criteria. If this is not achieved, contingency measures must be implemented, with monitoring frequency going back to weekly until consistency in the discharged water results is re-established.

Dewatering contingency measures are detailed in **Section 6.5** (**Table 6-1**) and should be implemented where groundwater results exceed or are predicted to exceed the adopted criteria for any one monitoring event. Any changes to the sampling frequency are to be determined by the appointed environmental consultant.

All laboratory analytical results for the water samples must be retained, to be made available upon request by Council and/or WaterNSW. The Site Manager and Dewatering Contractor / Water Treatment Specialist should seek advice from the Environmental Consultant prior to deviating from any of the above monitoring requirements, to ensure the quality of discharged groundwater is not compromised.

5.2.3 Reporting of Water Quality Results

Dewatering management procedures and monitoring results will be reviewed by the appointed Environmental Consultant to ensure that the treatment procedures are effective, and that the discharge waters are in compliance with the adopted criteria (**Table 5-1**). Discharge water quality reporting will be required as follows:

- Interim Monitoring Reports will be prepared upon receipt of laboratory data for each round of water quality monitoring for the discharged waters. The interim reports will detail the sampling method and procedure, groundwater level gauging results and will provide a comparison of historic and current results obtained from the site, against the adopted criteria, with corrective actions and recommendations based on the results, where required.
- Following completion of dewatering activities, a Dewatering Completion Report (DCR) will be prepared by the appointed Environmental Consultant, and must include copies of all analytical results and interim monitoring reports issued during the dewatering period. A clear statement will be made regarding the overall quality of groundwater discharged in comparison to the acceptable quality standards. The final report will be submitted to Council and Water NSW (if required).

5.2.4 Reporting of Other Information

The Site Manager must keep records of cumulative discharge volume and treatment methods and treatment chemicals applied to the water discharge, if any. In addition, any periods of dewatering stoppage should also be recorded.

5.3 Water Treatment

5.3.1 Treatment System Design

EI considers that metals, TRH, pH and turbidity are priority parameters for groundwater quality evaluation at the site, as identified in the pre-dewatering groundwater quality assessment (**Section 3.3**). EI suggests that the selection and design of the preferred treatment system is conducted by the Dewatering Contractor / Water Treatment Specialist, in collaboration with the appointed Environmental Consultant. Alternative and/or additional water treatment options will be implemented, if necessary, depending on which parameters are found to exceed the DWC.

The design and installation of the preferred system should consider:

- A treatment tank with minimum capacity capable of containing the expected inflow for the basement (as described in **Section 4.4**);

- Water filtration to reduce fine particulates;
- Automated in-line chemical dosing systems for the addition of buffering solutions and/or coagulants for the adjustment of pH and other parameters, which may be required as described in **Section 6.5** *Dewatering Contingencies*;
- Decantation and dewatering equipment for separating solids and metals from the extracted groundwater stream. Any dewatered material (‘the cake’) should be disposed offsite as per NSW EPA (2014) guidelines;
- GAC adsorption filters, to remove TRHs from the extracted groundwater stream. Three in-series filters are recommended, to allow for enough time to detect and act when breakthrough conditions are met (changeover events);
- Spare retention tank(s) to provide additional residence time and sedimentation, in the case that non-compliant water quality is identified during routine monitoring, triggering temporary redirection and storage while adjustments to the water treatment system are being implemented; and
- A means of monitoring flow rate to enable the accurate determination of total discharge volume.

The water treatment system should be installed, tested and operational prior to the commencement of dewatering, to ensure that only treated water meeting the adopted quality criteria is discharged to the receiving water bodies.

5.3.2 Treatment System Maintenance

The groundwater treatment system(s) must be regularly maintained by the Dewatering Contractor / Water Treatment Specialist. Maintenance must include (if applicable):

- Regular cleaning and or replacement of the geo-fabric/particle filters within the retention tanks;
- Media changeover (e.g. granular activated carbon – GAC) whenever breakthrough conditions are met; and
- Regular removal of sediment from the retention tanks by an appropriately-licensed waste contractor.

6. SITE MANAGEMENT CONTROLS

6.1 Deviations from this Plan

The Site Manager should seek advice from the Environmental Consultant whenever deviation from the agreed monitoring program is considered. To ensure the monitoring data set and the early warning objectives of the DMP are not compromised, variations will only be considered where technical justification exists, and any deviations that may be accepted will be documented within the corresponding reports, and must include all justifications for the variation accepted.

Should deviations from the DWC be considered technically justifiable, approval from Council and/or WaterNSW must be obtained before alternative discharge criteria are applied.

6.2 Contact Details for Key Personnel

Once the relevant personnel have been appointed, their names and contact information must be clearly displayed on-site, within the site office. An example format is as follows:

Site Manager	Name: Company:	Mobile phone: Email:
Dewatering Contractor	Name: Company:	Mobile phone: Email:
Water Treatment Specialist	Name: Company:	Mobile phone: Email:
Environmental Consultant (Water Quality Expert)	Name: Company:	Mobile phone: Email:

6.3 Summary of Specific Activities

The appointed contractors and/or Site Manager will be responsible for ensuring that the following activities (requirements) are undertaken during the dewatering program:

- Maintain erosion and sediment control measures in a functioning condition, until all earthwork activities are completed.
- Perform daily visual inspection of stormwater diversions and sediment / erosion control devices, ensuring they are operating effectively and at full capacity.
- Implement appropriate remedial measures where any controls or devices are not functioning effectively or are inappropriate.
- Collate records and comments on the condition of existing erosion and run-off controls (drains, silt fences, catch drains etc.), dewatering procedures and test results, and any site instructions issued to sub-contractors to undertake remedial works.
- Maintain rainfall data (records to be retained on site).
- Confirm water quality parameters meet the relevant discharge limits, by disclosing supporting documentation upon request.
- Reporting any incidents of poor drainage or uncontrolled discharge.

- Recording all daily inspection reports, environmental incidents and controlled discharge volumes, which may be reviewed during any environmental audit performed on the site.

6.4 Vibration, Noise and Odour Management

The following vibration, noise and odour risks must not occur during dewatering:

- Excessive vibration and noise levels associated with site plant / dewatering equipment; and
- Odours released from collected groundwater, which may pose a risk to human health and/or the aesthetic condition of the environment.

It is the responsibility of the Site Manager to ensure appropriate management of vibration, noise and odour during dewatering operations. Appropriate management methodologies include:

- Undertaking dilapidation surveys of neighbouring buildings, in accordance with potential for impacts in final design type.
- All sub-contractors to work only within defined hours set by the DA conditions.
- All reasonable steps shall be taken to muffle and acoustically baffle all plant and equipment. Noise and vibration levels generated by site works must be within the limits set by the DA conditions, the site-specific environmental management plan and the *Protection of Environmental Operation Act 1997*.
- Give consideration to the noise emission of plant/equipment prior to its selection/mobilisation to site.
- Schedule the use of noisy equipment at the least-sensitive time of day.
- Situate noisy equipment at the greatest distance from noise-sensitive areas, or orient the equipment so that noise emissions are directed away from sensitive areas, to achieve the maximum attenuation of noise.
- Where there are several noisy pieces of equipment, schedule operations to minimise cumulative impacts.
- Keep equipment well maintained.
- Ensure engine shrouds (acoustic linings) are installed (where feasible).

6.5 Dewatering Contingencies

Contingent actions for scenarios that may arise during dewatering are detailed in **Table 6-1**.

Table 6-1 Mitigation Measures for Potential Dewatering Issues

Anticipated Problem	Preventive/Corrective Actions
Water Quality Criteria Non-Compliance	
Water Quality Criteria Exceedance Laboratory analytical report for any monitoring event reveals that the quality of treated discharge water does not satisfy the adopted criteria detailed in **Section 5.1**.	Immediate action must be taken to halt the release of water into receiving water bodies, where water quality is found not to meet the adopted criteria detailed in **Table 5-1**. Discharge of water must be suspended to enable the following procedure to be implemented: 1) Treated water will be redirected to the spare retention basin; 2) A treated water sample will be collected and sent to the laboratory for confirmation analysis for the non-compliant parameter(s) on an express (24hr) results turn-around basis; 3) Should the analytical result for the confirmation sample show that the previously non-compliant parameter(s) is/are now meet the adopted criteria, the treated water outlet may be redirected to receiving water bodies; however 4) Should the analytical result for the confirmation sample show

Anticipated Problem	Preventive/Corrective Actions
	that the discharge water quality does not comply with the adopted criteria, the environmental consultant / water treatment specialist will be required to modify the water treatment system, in order to achieve compliant discharge water quality. Collection of further treated water samples will be required to confirm the effectiveness of the modifications; 5) After laboratory confirmation that the revised treated water quality complies with criteria, extracted groundwater may be redirected to receiving water bodies; and 6) Weekly monitoring of treated discharge water quality monitoring will be required, until such time that contaminant concentrations are within the adopted criteria values for three consecutive sampling events. Once this is achieved, fortnightly monitoring may be reinstated. **Note: Wastewater Removal** - It may be necessary to have collected waters removed by a licensed wastewater contractor, should quantities exceed the on-site capacity for temporary storage. In this case, records must be maintained to document quantities of wastewater disposed in this way, with provision of wastewater disposal dockets issued by the contractor to be retained for audit and reporting purposes.
Visible and Olfactory Impacts Visual and/or olfactory anomalies (e.g. change in water colour, turbidity, odour, presence of oil / grease) are observed in extracted groundwater.	Similar to the above procedure (Steps 1 to 6) treated water will be redirected to an alternative retention vessel, while the treatment system is adjusted. It may be necessary to have collected waters removed by a licensed wastewater contractor, should retained quantities exceed the on-site capacity for temporary storage. The contractor is to seek advice from a suitably experienced environmental consultant in regard to the additional assessment and treatment that may be required for any observed changes to water appearance or detectable odours.
Repeated Criteria Exceedances After three non-compliances for discharge water quality	Retain extracted water onsite in appropriate bulk containers for subsequent removal by a licensed wastewater contractor. Determine an alternative discharge method, if necessary, updating the DMP accordingly.
Groundwater Take Non-Compliance	
Excessive Extraction Daily discharge rate is exceeded.	Retain tail water onsite in appropriate bulk containers. Remove water by a licensed wastewater contractor, or seek Council approval for temporary increase in discharge rate to the stormwater system.
System Performance Issues	
Dewatering system failures	Ensure that spare equipment parts (where practical) are on hand. Ensure that the failed equipment can be serviced by site personnel or an appointed contractor who can rapidly report to site when needed.
Power outages	Ensure that a backup generator is readily available. In this event, an assessment across the site and surrounding sites should also be completed in order to identify whether any other lights and electrical equipment are working so to identify if the issue is site specific or if it is across a whole area. In addition to having the back-up generator running, the contractor should also seek advice from an electrician in regard to the additional assessment and repairs that may be required.
Unexpected contaminants found during monitoring	Contact the appointed environmental consultant / water quality expert and collect samples for analysis, to assess the identified concentrations against relevant criteria. If the contaminant is found to exceed the adopted criteria, follow the corrective actions

Anticipated Problem	Preventive/Corrective Actions
	corresponding to *Water Quality Criteria Exceedances* above. Expand the adopted criteria accordingly.
Chemical/ fuel spill and leaks from machinery	Stop earthworks, notify site manager. Use accessible soil or appropriate absorbent material to absorb the spill (if practicable). Stockpile the impacted material in a secure location, on builder's plastic to avoid cross contamination. Inspect groundwater and note any visual and/or changes. The contractor should seek advice from environmental consultant in regard to assessment and treatment requirements.
Excessive rainfall	Ensure sediment and surface water controls are in place and functioning as intended, as per the designs provided in the site-specific Soil and Water Management Plan. Any non-conformance is to be documented and rectified. The capacity of the dewatering system to dispose larger volumes of water should be evaluated and if required, a temporary system should be utilised following correspondence with Council / WaterNSW and the environmental consultant.
Excessive Noise	Identify the source and isolate if possible. Modify the actions of the source or erect temporary noise barriers if required.
Excessive Organic Odours / Vapours	In accordance with Council's Contaminated Land Policy, no nuisance odours are to be detected at any site boundary during the dewatering stage. Should odour emissions be detected at a site boundary, the following measures will be implemented: 1. Stop work, to allow odour to subside. 2. Monitor ambient air across the site and boundaries with a portable photo-ionisation detector (PID). 3. Implement control measures, including respirators for on-site workers, use of odour suppressants and wetting down of excavated material. 4. Notify the occupants of adjoining premises regarding odour issues. Notification should be in writing, providing the contact details of the responsible site personnel. 5. Record logs for odours and volatile emissions using photo-ionisation detectors (PID), if applicable.
Impacts on the stability of adjacent structures	Contractor to seek advice from qualified professional (such as a geotechnical engineer and/or structural consultant) in regards to the additional assessment and monitoring that may be required.
Complaint Management	Notify client, site manager and environmental consultant (if required) logging and following up complaint. Reporting should follow management procedures. Implement control measures to address reason of complaint (if possible) and notify complainant of outcome.

7. MINIMAL HARM ASSESSMENT

7.1 Consideration of NSW Aquifer Interference Policy

In accordance with the NSW Water Management Act 2000 the taking of water from an aquifer and/or the disposal of water taken from an aquifer is defined as an aquifer interference activity. The NSW 2012 Aquifer Interference Policy (the ‘NSW AIP’) provides guidance for the assessment of potential impacts of dewatering on water users and groundwater dependent ecosystems. The NSW AIP assessment process was performed with due regard for all hydrogeological information collected for the site and is presented below.

7.1.1 Hydrogeological Model Summary

Groundwater flow is predominantly moving through the underlying sandstone bedrock (EI, 2024). For a bedrock aquifer with groundwater under pressure conditions, groundwater seepage would enter the excavation flowing through joints, faults and bedding plane fractures within the bedrock. Lower seepage flow volumes may be expected during depressed groundwater levels in dry periods, with higher seepage flow after high rainfall events, which would be expected to cause temporary, elevated groundwater levels.

7.1.2 Groundwater source category

Under the NSW 2012 Aquifer Interference Policy (the ‘NSW AIP’) *highly productive groundwater* is defined as a groundwater source that:

a) *has total dissolved solids (TDS) of less than 1,500 mg/L; and*

b) *involves water supply works that can yield water at a rate greater than 5 L/sec.*

Baseline groundwater salinity was shown to be low with EC values ranging from 240 to 350 µS/cm; and laboratory test TDS ranging from 140 mg/L and 200 mg/L (see **Table B2**). With reference to the GTA report, modelled inflow to the basement will be approximately 0.000216 L/sec (i.e. 0.0187 m^3/day).

The aquifer at the site therefore meets the description of a *“less productive groundwater source”*, as defined under Section 3.2.1 *Aquifer impact assessment* of the NSW AIP.

7.1.3 Minimal impact considerations

In accordance with the NSW AIP Table 1 *“If the predicted impacts are less than the Level 1 minimal impact considerations, then these impacts will be considered as acceptable.”*

Table 1 *Minimal Impact Considerations for Aquifer Interference Activities* of the NSW AIP shows that for *Less Productive Groundwater Sources* in low yielding porous and fractured rock water sources that are under groundwater pressure conditions, the following minimal impact considerations are applicable:

<u>Drawdown</u>

- *Level 1 – A cumulative pressure head decline of not more than 2m, at any water supply work.*
- *Level 2 – If the predicted pressure head decline is greater than the Level 1 requirement (above), then appropriate studies are required to demonstrate to the Minister’s satisfaction that the decline will not prevent the long-term viability of the affected water supply works unless make good provisions apply.*

Water Quality

- *Level 1 - Any change in groundwater quality should not lower the beneficial use category of the groundwater source beyond 40m from the activity.*
- *Level 2 - If the Level 1 condition (above) is not met, then appropriate studies will need to demonstrate to the Minister's satisfaction that the change in groundwater quality will not prevent the long-term viability of the dependent ecosystem, significant site or affected water supply works.*

7.1.4 Impact Assessment Conclusions

The proposed dewatering for the construction and operational phases of the project are considered to be compliant with the NSW AIP minimal impact criteria for the following reasons:

- While the estimated maximum cumulative pressure head decline (approximately 9m) has been modelled to be greater than *Level 1 minimal impact considerations*, there are no active water supply bores within 500m of the site; therefore water supply losses in response to dewatering are unlikely.
- No records regarding the drawdown and ground settlement are reported in GTA (**Appendix F**). Notwithstanding, considering that the deeper, competent bedrock will be dewatered temporarily during basement construction and not for the longer-term, and that seepage inflows are predicted to be less than 1 m^3 per day, drawdown-induced ground settlement is considered unlikely to pose potential adverse impacts on neighbouring properties.
- The petrol service station (located 300m northeast of the site) represents a low risk potential offsite source of contaminants due to the distance of the service station in relation to the site. Furthermore, as groundwater is not significantly utilised, dewatering would be unlikely to adversely impact the beneficial use category of the groundwater source and the *Level 1 Water Quality* conditions would be maintained.
- There is no documented, high priority, groundwater dependant ecosystem within 40 m of the site.

In addition to the above, the routine monitoring of treated water quality, groundwater drawdown and water take, as well as the dewatering contingencies tabulated in **Section 6.5**, are designed to ensure that potential impacts are minimised.

7.2 Assessment Inputs

The inputs for assessing the potential impacts of dewatering on the groundwater system are summarised in **Table 7-1**.

Table 7-1 Assessment inputs summary

Assessment Items	Comments
1. Estimated water take volume	As detailed in **Section 4.2**, the water take volume is estimated to be **1.50 ML** per year during the construction and operational phases of development.
2. Suitability of volume estimation	Use of SEEP/W (a finite element computer model), implemented by experienced Geotechnical Engineer and reviewed by Senior Geotechnical Engineer (see also GTA report in **Appendix F**).
3. Ground elevation across the site	The site generally slopes from west to east (**Appendix C**).
4. Geotechnical ground characterisation	Refer to GTA report in **Appendix F**.
5. Water level measurements	Groundwater levels were measured at depths from 14.8 m AHD (minimum) to 25.94 m AHD (maximum), as detailed in **Section 3.2**. Periodic groundwater level gauging will be conducted on an annual

Assessment Items	Comments
	basis (i.e. 1 monitoring event per year) at monitoring wells during the operational phase, as described in **Section 4.3**.
6. Required water level draw down and potential impacts	It is beyond the scope of this DMP to assess the risk on neighbouring properties associated with ground settlement.
7. Works proposed for dewatering	A drained basement using drainage of sub-soil seepage waters and a sump-and-pump system, as described in **Section 4.4**.
8. The base level of the aquifer	Fractured sandstone bedrock extends below the proposed BEL, see **Appendix F**.
9. Excavation footprint dimensions	Not available at the time of this DMP.
10. Hydraulic conductivity of lithological units	Detailed in Table 2 of the GTA (EI, 2024) in **Appendix F**
11. Anticipated duration of dewatering	Dewatering will be ongoing for the approved construction dewatering period, while operational dewatering will be ongoing for the life time of the project.
12. Depth of piling embedment beneath bulk excavation	Refer to **Section 4.1** – embedment depth will be provided with final design and detailed shoring plans.

7.3 Operational (Occupational) Phase Dewatering Management

7.3.1 Monitoring and Reporting

The following procedure will be adhered to by strata management to ensure that the long-term dewatering system is managed appropriately:

- **Groundwater level monitoring**: Scheduled groundwater level monitoring is required for the first 36 months of the sump and pump operational phase in order to characterise seasonal groundwater level fluctuations for the operational (post-construction) phase of the development. It is noted that the occupational phase of the development commences prior to the sump and pump commences operation.

  A quarterly groundwater level monitoring frequency (i.e. once every 3 months) will be adopted for the first twelve months of occupation. This will be followed by semi-annual water level monitoring (i.e. once every 6 months) for the second year; then annual monitoring (i.e. a monitoring event at the end of the third year). Water level data will be recorded on a data form to document date of monitoring, well identification number, reference point from where all water level measurements are consistently taken (e.g. top of well casing, or ground level), the depth to water and the name of the person conducting the monitoring.
- **Discharge volume monitoring**: The volume of water discharged to stormwater must be monitored by a calibrated flow meter (or equivalent alternative means) that is integrated as part of the long-term pumping system. The flow meter (or flow monitoring device) will display cumulative volume discharged, which will be recorded onto the same data form used to document groundwater level, at the time of each water level monitoring event. Discharge volume monitoring frequency will therefore be the same as for groundwater level monitoring, i.e:
  - Quarterly, during the first year;
  - Every 6 months, during year two;
  - A single monitoring event, at the end of year three; and
  - One monitoring event every 3 years, after that.

- **Water quality monitoring**: A single, post-treatment water sample will be collected on an annual basis during the final monitoring event in each year (i.e. at 12 months and 24 months of operation). Treated water samples will be laboratory analysed for the priority discharge water quality parameters (**Table 5-1**), to confirm that DWC compliance and show that discharge water quality is not deteriorating with time. Given that the groundwater is to be treated prior to offsite discharge, the risks presented to the human health and environment for the construction phase of the development are considered low and acceptable. Groundwater assessment of water quality parameters is required at the end of the construction phase to verify concentrations, and review or amend proposed operational phase water treatment if required.
- **Annual dewatering monitoring report**: A factual, 12-monthly Dewatering Monitoring Report will be prepared in letter format after each 12 months of monitoring by the appointed consultant. Each report will document the groundwater level gauging results, groundwater quality results and the cumulative volume of water discharge from the seepage collection sump to the storm water system. The monitoring report will also include an updated copy of the monitoring data form, showing all monitoring records since the start of the occupational phase. Each annual monitoring report will also include a trend analysis of the monitoring data and provide a discussion to characterise trends in groundwater quality, groundwater levels as measured in the monitoring well and water discharge volumes over time.
- **Cessation of monitoring**: Should the annual dewatering monitoring report after the 36th month of occupation confirm that groundwater quality, groundwater level fluctuations at the monitoring well(s) and annual groundwater discharge volumes are stable (i.e. not statistically trending up or down), then it will be determined that equilibrium has been reached and termination of the monitoring program would be justified. If this is not the case then the dewatering program will be reviewed accordingly. The appointed environmental consultant will provide notification to Council to document the termination or continuation of monitoring at this stage. Should monitoring be continued, a review of monitoring frequency will be undertaken and appropriate notification to Council will be issued by the appointed environmental consultant.

7.3.2 Monitoring Well Replacement Protocol

Should the existing wells be damaged during the construction works, installation of a new groundwater monitoring well will be required, under the management of a qualified and appropriately experienced environmental consultant. Strata management should formally engage the environmental / geotechnical consultant to perform the required monitoring.

8. DEWATERING MANAGEMENT SUMMARY

The requirements of this Dewatering Management Plan are summarised in **Table 8-1**.

Table 8-1 Dewatering Management Summary

Item	Requirement / Procedure
Objective of DMP	Ensure that the proposed dewatering operations do not impact on the quality of the receiving surface waters (i.e. at the point of groundwater discharge). Where necessary, groundwater will be treated to achieve an acceptable water quality prior to discharge: ▪ See **Section 3** for groundwater conditions. ▪ See **Section 5.1** for groundwater quality discharge requirements. ▪ See **Section 5.3** for groundwater treatment options. Provide comment on groundwater level changes that occur during dewatering: ▪ See **Section 4** for summary of groundwater take assessment and dewatering drawdown impacts. ▪ Refer to **Appendix F** for groundwater take assessment model. See **Section 7.3** for operational phase dewatering management.
Person Responsible for Implementation of DMP	The Site Manager will be responsible for ensuring the implementation of appropriate treatment of extracted groundwater, as outlined in this document. Occupation phase responsibility will rest with the Site Manager (yet to be determined).
Operation Policy	To ensure that all extracted groundwater is effectively treated prior to discharge, as per operational dewatering management procedures detailed in **Section 7.3**.
Pre-Dewatering Groundwater Assessment	As set out in **Section 3.3**, representative samples were collected prior to dewatering and tested for the identified potential contaminants, to provide baseline groundwater quality data and review the proposed discharge water quality requirements.
Discharge Performance Criteria	All groundwater designated for discharge is to meet (at the very least) the criteria outlined within **Table 5-1, Section 5.1**.
Implementation Strategy	All extracted groundwater will be monitored and treated (where necessary). On-going testing to be performed, to confirm water quality meets the adopted criteria prior to release into receiving water bodies. Additional treatment / waste disposal to be undertaken if the criteria values are not met.
Monitoring Requirements	As specified in **Section 5.2**: 1. Initial Assessment = Prior to dewatering 2. Trial-Run Period = Twice per week* 3. Discharge Monitoring Period = Weekly for a month to fortnightly for a month then monthly* **provided the analytical results indicate treated water quality meets the adopted criteria, or risks are considered to be significantly low. Should analytical results exceed the adopted discharge criteria, contingencies listed in **Section 6.5** must be followed.*
Monitoring Requirements for Operational Phase Dewatering	As specified in **Section 7.3**: - Quarterly, during the first year;

Item	Requirement / Procedure
	- Every 6 months, during year two; - A single monitoring event, at the end of year three; and - Once every 3 years after that.
Auditing	The appointed environmental consultant (water quality expert) will undertake weekly audits during the Trial-Run Period (if required), and monthly audits during the Monitoring Period, to ensure that all discharges comply with the criteria specified in **Section 5.1**.
Reporting	The contractor responsible for dewatering will keep records of all monitoring and laboratory test results, as well as quantities of treatment agents applied during the dewatering process. All records should be made available for inspection onsite during the construction phase.
Corrective Actions	As specified in the contingency measures, outlined in **Section 6.5**.

9. STATEMENT OF LIMITATIONS

This plan has been prepared for the exclusive use of RMB Group Pty Ltd, whom is the only intended beneficiary of EI’s work. The scope of work completed for the purpose of this plan is limited to that agreed with RMB Group Pty Ltd.

No other party should rely on the document without the prior written consent of EI, and EI undertakes no duty, or accepts any responsibility or liability, to any third party who purports to rely upon this document without EI's approval.

EI has used a degree of care and skill ordinarily exercised in drafting similar plans by reputable members of the environmental industry in Australia, as at the date of this document. No other warranty, expressed or implied, is made or intended. Each section must be read in conjunction with the whole of this plan, including its appendices.

EI's professional opinions are reasonable and based on its judgment, experience, training and results from analytical data. EI may also have relied upon information provided by the client and other third parties to prepare this document, some of which may not have been verified by EI.

EI's professional opinions contained in this document are subject to modification if additional information is obtained through further investigation or observations. In some cases, further testing and analysis may be required, which may result in a further report with different conclusions.

Should you have any queries regarding this plan, please do not hesitate to contact EI.

REFERENCES

ANZECC/ARMCANZ (2000) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*, Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand, October 2000.

ANZG (2018) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*, Australian and New Zealand Governments and Australian State and Territory Governments, Canberra ACT, Australia, August 2018.

Cashman and Preene (2001) *Groundwater Lowering in Construction. A Practical Guide*, Spon Press, New York, 2001.

Chapman GA and Murphy CL (1989) *Soil Landscapes of the Sydney 1:100 000 Sheet*, Soil Conservation Service of NSW, Sydney, September 1989.

DEC (2007) *Guidelines for the Assessment and Management of Groundwater Contamination*, New South Wales Department of Environment and Conservation, DEC 2007/144, June 2007.

DMR (1983) *Sydney 1:100,000 Geological Series Sheet 9130*, Geological Survey of New South Wales, Department of Mineral Resources.

DPIE (2020) *eSPADE v2.0 Portal*, NSW Department of Planning, Industry and Environment (retrieved from www.espade.environment.nsw.gov.au).

Geotechnique (2011) *Preliminary Contamination Assessment; 10-32 Lawrence Street, Freshwater*, Report No 12446/2-AA, dated 15 April 2011;

EI (2023a) *Preliminary Site Investigation, 10-28 Lawrence Street, Freshwater NSW*, Report E25884.E01_Rev0, 24 January 2023;

EI (2023b) *Geotechnical Site Assessment, 10-28 Lawrence Street, Freshwater NSW*, Report E25884.G14_Rev0, 7 February 2023.

EI (2024) *Groundwater Take Assessment, 10-28 Lawrence Street, Freshwater NSW*, Report E25884.G12_Rev2, 14 November 2024.

Murphy CL (1997) *Acid Sulfate Soil Risk of the Sydney_Heads Sheet (Second Edition)*, Department of Land and Water Conservation, Sydney, supplied by the Sydney South Coast, Geographical Information Systems Unit.

NEPC (2013) *National Environment Protection (Assessment of Site Contamination) Amendment Measure*, National Environment Protection Council, April 2013.

NHMRC (2008) *Guidelines for Managing Risks in Recreational Water*, National Health and Medical Research Council, Australian Government, 2008.

NHMRC (2022) *Australian Drinking Water Guidelines, Paper 6 National Water Quality Management Strategy*, National Health and Medical Research Council, Commonwealth of Australia, Canberra, Version 3.7, January 2022.

NSW EPA (2013) *Licencing Fact Sheet – Using Environment Protection Licensing to Control Water* Pollution, New South Wales Environment Protection Authority, EPA 2013/0119, May 2013.

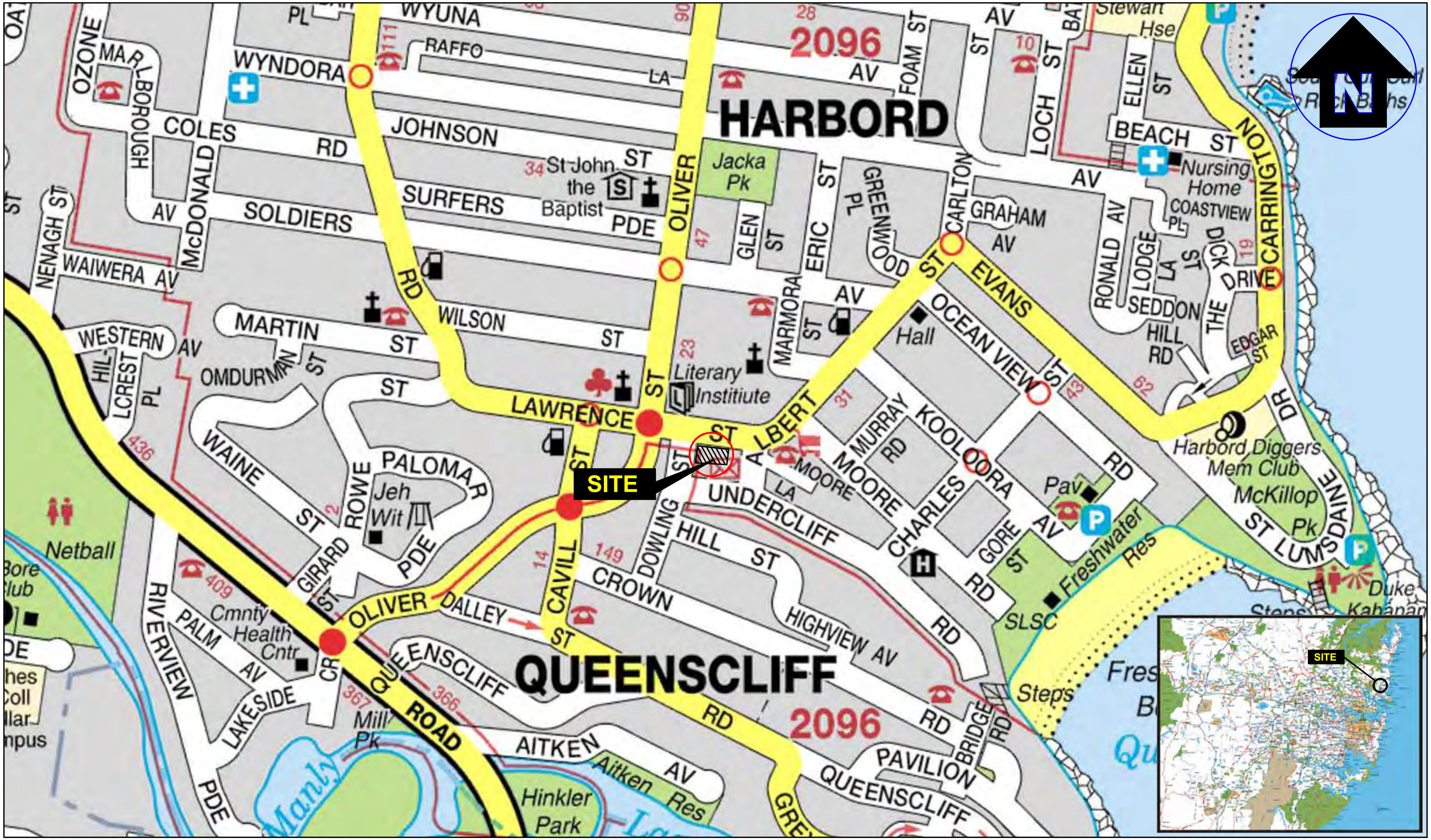
NSW EPA (2014) *Waste Classification Guidelines - Part 1: Classifying Waste*, Environment Protection Authority of New South Wales, EPA 2014/0796, November 2014.

NUDLC (2020) *Minimum Construction Requirements for Water Bores in Australia* (4th Edition), National Uniform Drillers Licensing Committee, 2020.

ABBREVIATIONS

ANZECC	Australian and New Zealand Environment Conservation Council
ANZG	Australian and New Zealand Governments
ASS	Acid Sulfate Soils
BEL	Bulk Excavation Level
BTEX	Benzene, Toluene, Ethyl benzene, Xylene
DA	Development Application
DCR	Dewatering Completion Report
DMP	Dewatering Management Plan
DP	Deposited Plan
DWC	Discharge Water Criteria
EC	Electrical Conductivity
EI	EI Australia
FFL	Finished Floor Level
GAC	Granular Activated Carbon
GME	Groundwater Monitoring Event
GTA	Groundwater Take Assessment
km	Kilometres
LGA	Local Government Area
LOR	Limit of Reporting (limit of reporting for respective analytical method)
m	metres
mAHD	metres Australian Height Datum
mBGL	meters Below Ground Level
ML	Megalitres
mg/L	Milligrams per litre
µg/L	Micrograms per litre
µS/cm	Microsiemens per Centimetre
NA	Not Applicable
NATA	National Association of Testing Authorities
NR	No Recommended Criterion
NSW EPA	Environmental Protection Authority (of New South Wales)
NTU	Nepholemetric Turbidity Units
PAH	Polycyclic Aromatic Hydrocarbons
pH	Potential Hydrogen (a measure of the acidity or basicity of an aqueous solution)
PID	Photo-Ionisation Detector
PQL	Practical Quantitation Limit (quantitative limit for respective analytical method)
TDS	Total Dissolved Solids
TRH	Total Recoverable Hydrocarbons (non-specific analysis of organic compounds)
TSS	Total Suspended Solids
VOC	Volatile Organic Compounds

Appendix A - Figures



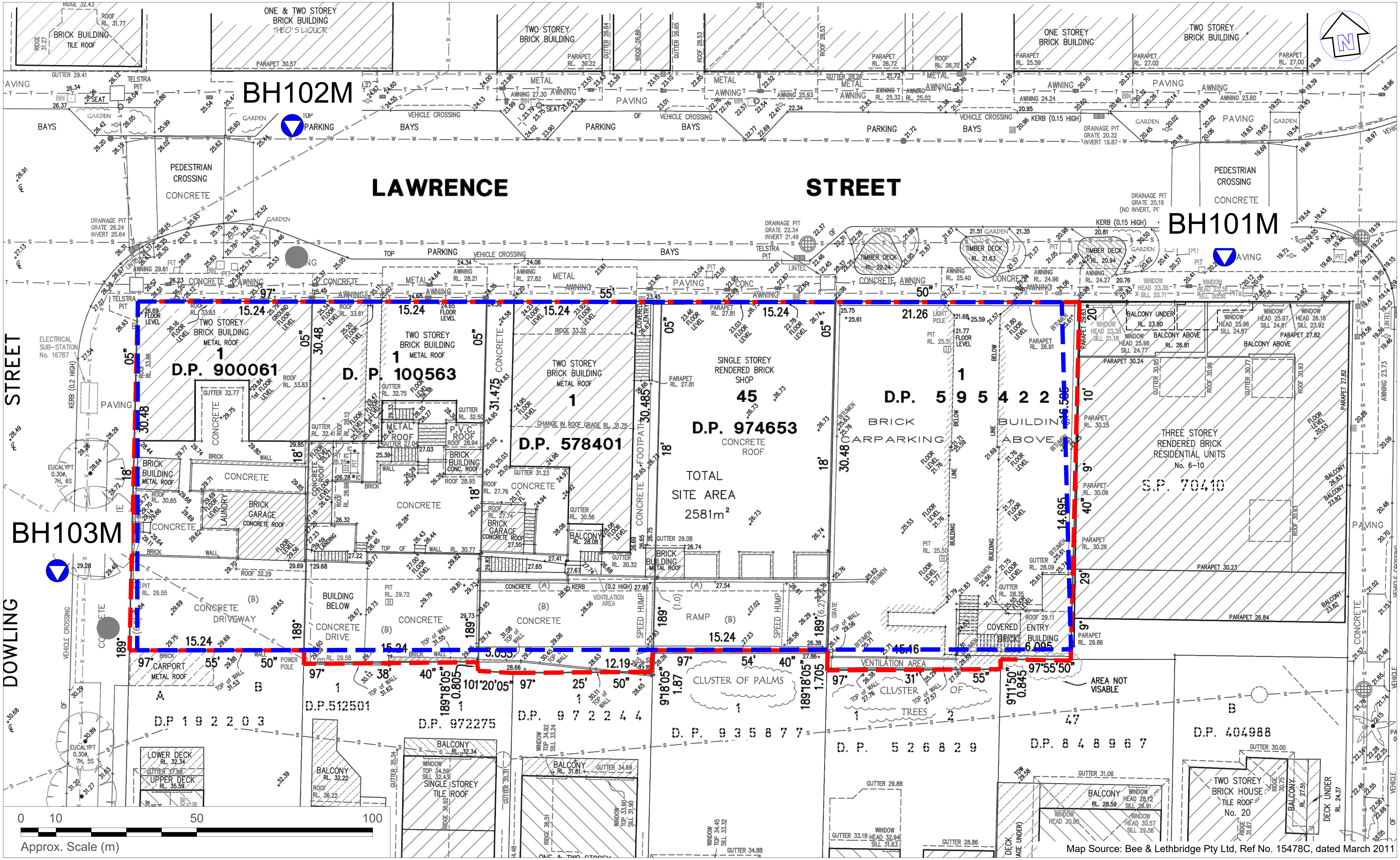
ei australia Practical Solutions for Built Environments Suite 6.01, 55 Miller Street, PYRMONT 2009 Ph (02) 9516 0722 Fax (02) 9518 5088		
	Drawn:	A.N.
	Approved:	-
	Date:	12-12-22
	Scale:	Not To Scale

RMB Group Pty Ltd
Dewatering Management Plan
10-28 Lawrence Street, Freshwater NSW

Site Locality Plan

Figure:
1

Project: E25874.E16



Map Source: Bee & Lethbridge Pty Ltd, Ref No. 15478C, dated March 2011

LEGEND (All Locations are Approximate)

🟥	Site boundary
🟦	Basement boundary
●	Borehole/monitoring well location

eiaustralia
Practical Solutions for Built Environments
Suite 6.01, 55 Miller Street, PYRMONT 2009
Ph (02) 9516 0722 Fax (02) 9518 5088

Drawn:	L.T.
Approved:	K.X.
Date:	12-04-23

MD Living Pty Ltd
Additional Geotechnical Investigation
10-28 Lawrence Street, Freshwater, NSW
Borehole/Monitoring Well Location Plan

Figure: 2

Project: E25874.G04.01

Appendix B - Tables

Table B1 - Groundwater Analytical Results for Groundwater Monitoring Events

		Metals									BTEX					PAHs [9]										TRHs				VOCs [8]			
Sample Identification	**Date**	**Al**	**As**	**Cd**	**Cr [3]**	**Cu**	**Pb**	**Ni**	**Zn**	**Hg**	**Benzene**	**Toluene**	**Ethylbenzene**	**m + p-xylene**	**o-xylene**	**Benzo(α)pyrene**	**Naphthalene**	**2-methylnaphthalene**	**1-methylnaphthalene**	**Acenaphthylene**	**Acenaphthene**	**Fluorene**	**Phenanthrene**	**Anthracene**	**Total PAH**	**F1**	**F2**	**F3**	**F4**	**Tetrachloroethene (Perchloroethylene,PCE)**	**Total VOCs**	**Total Cyanide**	**Total Phenols**
BH101M	13/04/2023	1200	<1	<0.1	1	4	1	2	9	<0.1	<0.5	<0.5	<0.5	<1	<0.5	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<1	<50	4400 / 1100[#]	2700 / 570[#]	<500	<0.5	<10	<4	<50
BH102M		610	2	<0.1	5	<1	<1	1	6	<0.1	<0.5	<0.5	<0.5	<1	<0.5	<0.1	5	8.8	6	6	0.3	2.7	1	0.1	30	<50	2300 / 710[#]	1600 / <500	<500	6.5	12	<4	<50
BH103M	21/04/2023	260	<1	<0.1	5	3	<1	1	22	<0.1	<0.5	<0.5	<0.5	<1	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<1	<50	37000 / 5200[#]	21000 / 2500[#]	1200 / < 500[#]	<0.5	<10	<4	<50
GW-QD1		NA	<1	<0.1	5	2	<1	2	19	<0.1	<0.5	<0.5	<0.5	<1	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	96	22000 / 30000[#]	13000 / 16000[#]	770 / <500[#]	NA	NA	NA	NA
Statistical Analysis																																	
Maximum Concentration		1200	2	<0.1	5	4	1	2	22	<0.1	<0.5	<0.5	<0.5	<1	<0.5	<0.1	5	8.8	6	6	0.3	2.7	1	0.1	30	96	5200*	2500*	<500	6.5	12	<4	<50
Guidelines																																	
ANZG (2018)[1]	**Marine Water**			0.7 [5]	27.4 (CrIII) 4.4 (CrVI)	1.3	4.4	7 [5]	15	0.1 [5]	700	180	80	275	350	0.1	50						2	0.4		50 [4]	60 [4]	500 [4]	500 [4]			4	400
	Fresh Water	55 [7]	24 (As III) 13 (As V)	0.2	3.3 (CrIII) [6] 1.0 (CrVI)	1.4	3.4	11	8	0.06 [5]	950	180	80	275	350	0.1	16						2	0.4		50 [4]	60 [4]	500 [4]	500 [4]			7	320

Notes:

All values are µg/L unless stated otherwise

F1	C6-C10 minus BTEX
F2	>C10-C16 minus naphthalene
F3	(>C16-C34)
F4	(>C34-C40)

[1] Groundwater Investigation Levels for fresh and marine water, based on ANZG (2018) Australian and New Zealand Guidelines for 95% protection level.

[2] Based on NHMRC (2022 - update January 2022 v.3.7) Drinking Water Guidelines.

[2a] The lowest of the Health Guideline x10 or the Aesthetic Guideline has been chosen as the assessment criteria. Aesthetic based criteria have been indicated by *

[3] Value is for total Chromium

[4] In lack of a criteria the laboratory PQL has been used (DEC, 2007).

[5] To account for the bioaccumulating nature of this toxicant, 99% species protection level DGV is used for slightly to moderately disturbed systems. Refer to Warne et al. (2017) for details.

[6] Figure may not protect key species from chronic toxicity, refer to ANZECC & ARMCANZ (2000) for further guidance.

[7] Guideline value provided for when the water pH >6.5

[8] Listed all tested PAH with detections, all the other PAH were below PQL.

[9] Listed all tested VOC with detections, all the other tested VOCs were below PQL.

[#] Results after silica gel clean-up.

The sources of the various guideline criteria values applied to this assessment are explained in the footnotes to **Table 5-1**, in **Section 5** of the DMP.

🟨	Highlighted indicates values exceeded criteria
🟦	Highlighted indicates criteria not met

Table B2 – Physicochemical Results

Sample Identification	Date Sampled	Physicochemical Properties				
		Electrical Conductivity (µS/cm)	Total Dissolved Solids (mg/L)	pH	Turbidity NTU	Hardness (mg/CaCO3/L)
GME Results						
BH101M	13/04/2023	350	200	4.3	4.9	41
BH102M		240	140	4.4	17	17
BH103M	21/04/2023	300	200	5.4	380	37
Statistical Analysis						
Maximum Concentration		350	200	5.4	380	41
Guidelines						
Default Value as Presented in the DMP [1]		125 - 2,200 [3]	<1,200 [4]	6.5-8.5 [2]	50 [3]	<60 - 500 [4]

Notes:
All values are mg/L unless stated otherwise

[1] Discharge water quality will be assessed against the ANZG (2018) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality,* or the default ANZECC & ARMCANZ (2000) *Guidelines for Fresh and Marine Water Quality* , for parameters not addressed by ANZG.
[2] In the absence of ANZG (2018) criteria, alternative criteria from ANZECC / ARMCANZ (2000) are applied, which are sourced from Table 3.3.2 in ANZECC/ARMCANZ (2000) Default trigger values for physical and chemical stressors for south-east Australia for slightly disturbed ecosystems.
[3] Turbidity and electrical conductivity values are sourced from Table 3.3.3 Default trigger values for physical and chemical stressors for south-east Australia for slightly disturbed ecosystems.
[4] Based on NHMRC (2011 - update August 2018 v.3.5) Drinking Water Guidelines.

🟨 Highlighted cell indicates value exceeded guideline value - Note: data was based on samples from monitoring wells, turbidity indicated sedimetation in the well.

Table B3 Summary of Results for the Field QA/QC samples

Sample identification	**Sampled Date**	**Description**	**TRH**				**BTEX**				**Heavy Metals**							
			F1*	F2**	F3 ($>C_{16}$ - C_{34})	F4 ($>C_{34}$ - C_{40})	Benzene	Toluene	Ethylbenzene	Xylene (total)	Arsenic	Cadmium	Chromium (Total)	Copper	Lead	Mercury	Nickel	Zinc
Intra-laboratory Duplicate																		
BH103M	21/4/2023	Groundwater	<50	5200	2500	< 500	<0.5	<0.5	<0.5	<1.5	<1	<0.1	5	3	<1	<0.1	1	22
GW-QD1		Duplicate of BH103M	96	30000	16000	<500	<0.5	<0.5	<0.5	<1.5	<1	<0.1	5	2	<1	<0.1	2	19
RPD (%)			**76.0**	**140.9**	**145.9**	***NA***	***0.0***	***0.0***	***0.0***	***0.0***	***0.0***	***0.0***	***0.0***	***40.0***	***0.0***	***0.0***	**66.7**	***14.6***

▒	Indicates values where a single result is found to be less than detection, with the duplicate sample found to be over the detection limit.
■	RPD exceeds 30-50% range referenced from AS4482.1 (2005)

NOTE:
All soil results are reported in mg/kg . All water results are reported in µg/L.
* - to obtain F1 subtract the sum of BTEX concentrations from the C_6-C_{10} fraction
** - to obtain F2 subtract naphthalene from the > C_{10}-C_{16} fraction

Appendix C - Proposed Development Plans

NOTES:

1) BEARINGS AND DIMENSIONS SHOWN COMPILED FROM PLANS AVAILABLE ON PUBLIC RECORD. BOUNDARIES DETERMINED BY SURVEY.
2) THIS SURVEY HAS BEEN MADE PURSUANT TO SECTION 9 OF THE SURVEYING & SPATIAL INFORMATION REGULATION 2017.
3) ORIGIN OF LEVELS: PM2226 RL18.674 (A.H.D.) SCIMS
4) 0.3Ø10S,8H DENOTES INDICATIVE TREE SIZE 0.3 TRUNK DIAMETER, 10 SPREAD, 8HIGH
5) TREE NAMES SHOWN CONSTITUTE OUR OPINION ONLY. IF TREE IDENTIFICATION IS IMPORTANT THEY SHOULD BE DETERMINED BY A QUALIFIED ARBORIST.
6) UNDERGROUND SERVICES HAVE NOT BEEN INVESTIGATED.
7) SITE COMPRISES LOT 1 DP900061, LOT 1 DP100563, LOT 1 DP578401, LOT 45 DP974653
LOT 1 DP595422
COMPILED SITE AREA: 2581m

ISSUE	DATE	AMENDMENT

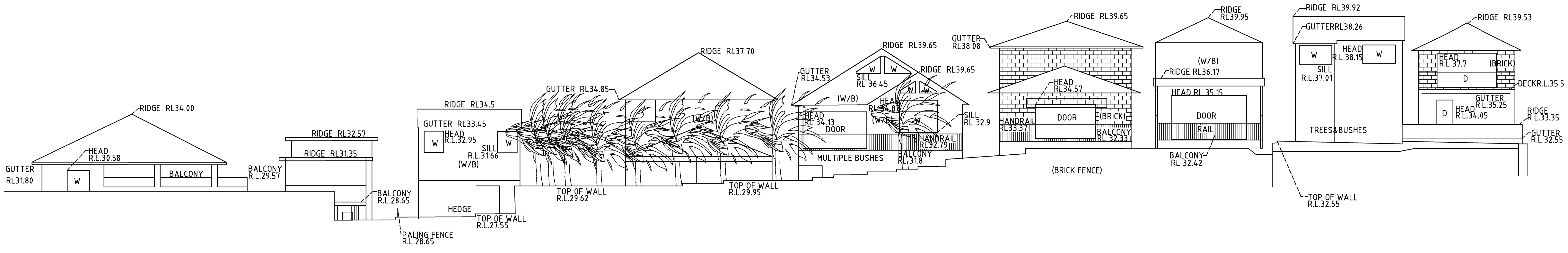
TITLE: PLAN SHOWING SELECTED DETAIL & LEVELS OVER
NO 10-28 LAWRENCE STREET, FRESH WATER

LGA: NORTHERN BEACHES		REFERENCE: 53094	
CLIENT : MD LIVING PTY LTD		DATE: 25.11.22	SHEET
SCALE (AT A1) 1:200	DATUM : AHD	SURVEYOR: AW	1

Norton Survey Partners
SURVEYORS & LAND TITLE CONSULTANTS

A.C.N. 618 980 475
SUITE 1
505 BALMAIN ROAD
LILYFIELD N.S.W. 2040

PH +61 2 9555 2744
office@nspartners.com.au



SOUTHERN ELEVATION
NO. 18

SOUTHERN ELEVATION
NO. 16

SOUTHERN ELEVATION
NO. 14

SOUTHERN ELEVATION
NO. 12

SOUTHERN ELEVATION
NO. 10

SOUTHERN ELEVATION
NO. 8

SOUTHERN ELEVATION
NO. 6

SOUTHERN ELEVATION
NO. 4

SOUTHERN ELEVATION
NO. 2

PRELIMINARY

NOTES:

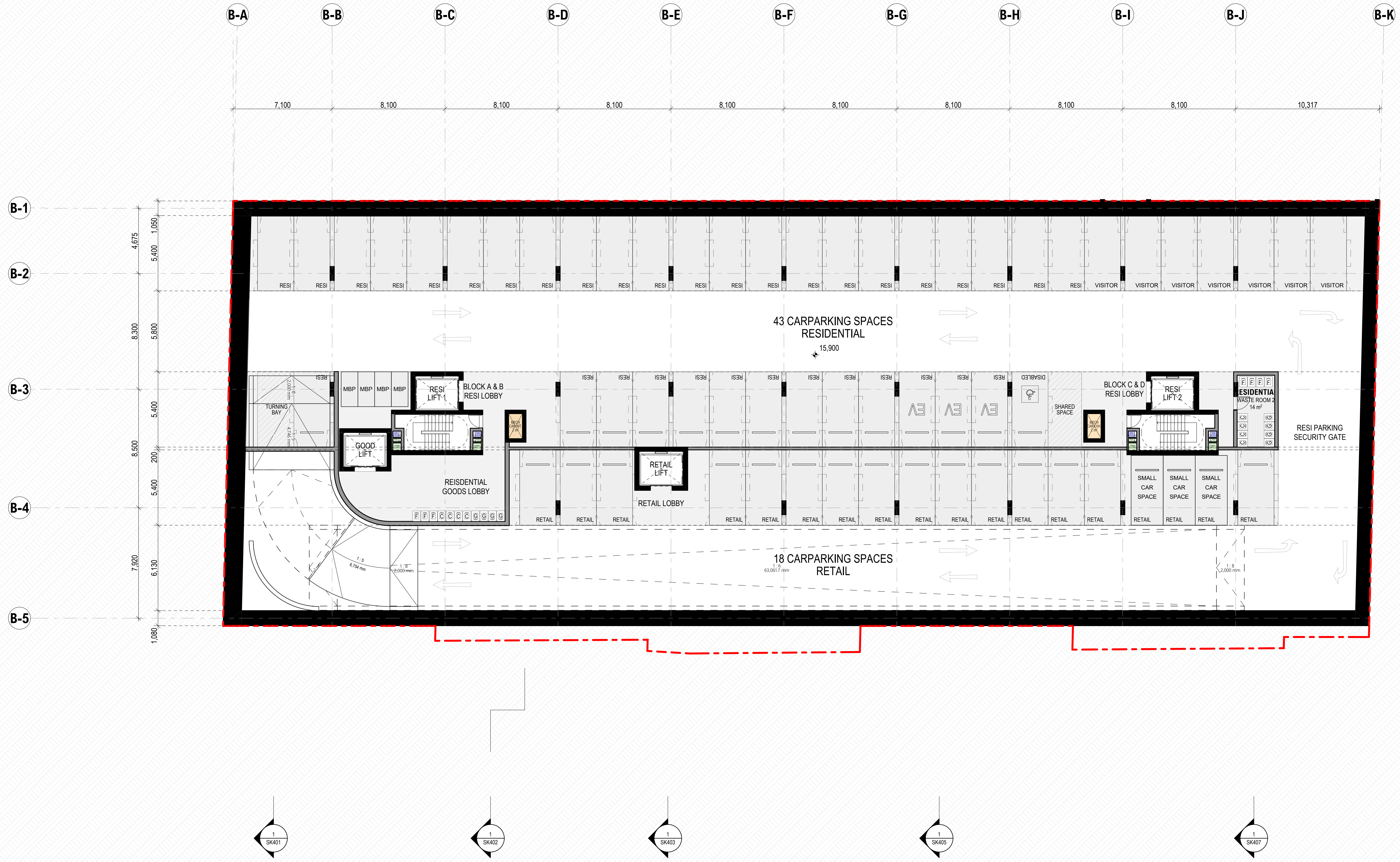
1) BEARINGS AND DIMENSIONS SHOWN COMPILED FROM PLANS AVAILABLE ON PUBLIC RECORD. BOUNDARIES DETERMINED BY SURVEY.
2) THIS SURVEY HAS BEEN MADE PURSUANT TO SECTION 9 OF THE SURVEYING & SPATIAL INFORMATION REGULATION 2017.
3) ORIGIN OF LEVELS: PM2226 RL18.674 (A.H.D.) SCIMS
4) 0.3Ø10S,8H DENOTES INDICATIVE TREE SIZE 0.3 TRUNK DIAMETER, 10 SPREAD, 8HIGH
5) TREE NAMES SHOWN CONSTITUTE OUR OPINION ONLY. IF TREE IDENTIFICATION IS IMPORTANT THEY SHOULD BE DETERMINED BY A QUALIFIED ARBORIST.
6) UNDERGROUND SERVICES HAVE NOT BEEN INVESTIGATED.
7) SITE COMPRISES LOT 1 DP900061, LOT 1 DP100563, LOT 1 DP578401, LOT 45 DP974653
LOT 1 DP595422
COMPILED SITE AREA: 2581m

ISSUE	DATE	AMENDMENT

TITLE: PLAN SHOWING SELECTED DETAIL & LEVELS OVER
NO 10-28 LAWRENCE STREET, FRESH WATER

LGA: NORTHERN BEACHES		**REFERENCE: 53094**	
CLIENT : MD LIVING		**DATE: 25.11.22**	**SHEET**
SCALE (AT A1) 1:150	**DATUM : AHD**	**SURVEYOR:**	2

Norton Survey Partners
SURVEYORS & LAND TITLE CONSULTANTS
A.C.N. 618 980 475
SUITE 1
505 BALMAIN ROAD
LILYFIELD N.S.W. 2040
PH +61 2 9555 2744
office@nspartners.com.au



ARCHITECT

CHROFI

3/1 THE CORSO MANLY NSW 2095 AUSTRALIA
T +61 2 8096 8500 E info@chrofi.com

CHOI ROPIHA FIGHERA P/L ACN 144 714 885 ATF CHOI ROPIHA FIGHERA UNIT TRUST T/A CHROFI ABN
22 365 257 187 NOMINATED ARCHITECT JOHN CHOI 8706 TAI ROPIHA 6568 STEVEN FIGHERA 6609

REV	DATE	ISSUE
01	01/10/24	ISSUE FOR COORDINATION
02 - WIP	Work in Progress	ISSUE FOR COORDINATION

REV	DATE	ISSUE

PROJECT
FRESHIE MIXED-USE DEVELOPMENT

DRAWING TITLE
BASEMENT 2

PROJECT NUMBER	PLOT DATE	DRAWN	CHECKED	SHEET SCALE	SHEET SIZE	NORTH	DRAWING NUMBER	REVISION
21053	09/10/24	VL	SF	1:200	A1	N	A-DA-097	02 - WIP

ARCHITECT

CHROFI

3/1 THE CORSO MANLY NSW 2095 AUSTRALIA
T +61 2 8096 8500 E info@chrofi.com

CHOI ROPIHA FIGHERA P/L ACN 144 714 885 ATF CHOI ROPIHA FIGHERA UNIT TRUST T/A CHROFI ABN 22 365 257 187 NOMINATED ARCHITECT JOHN CHOI 8706 TAI ROPIHA 6568 STEVEN FIGHERA 6609

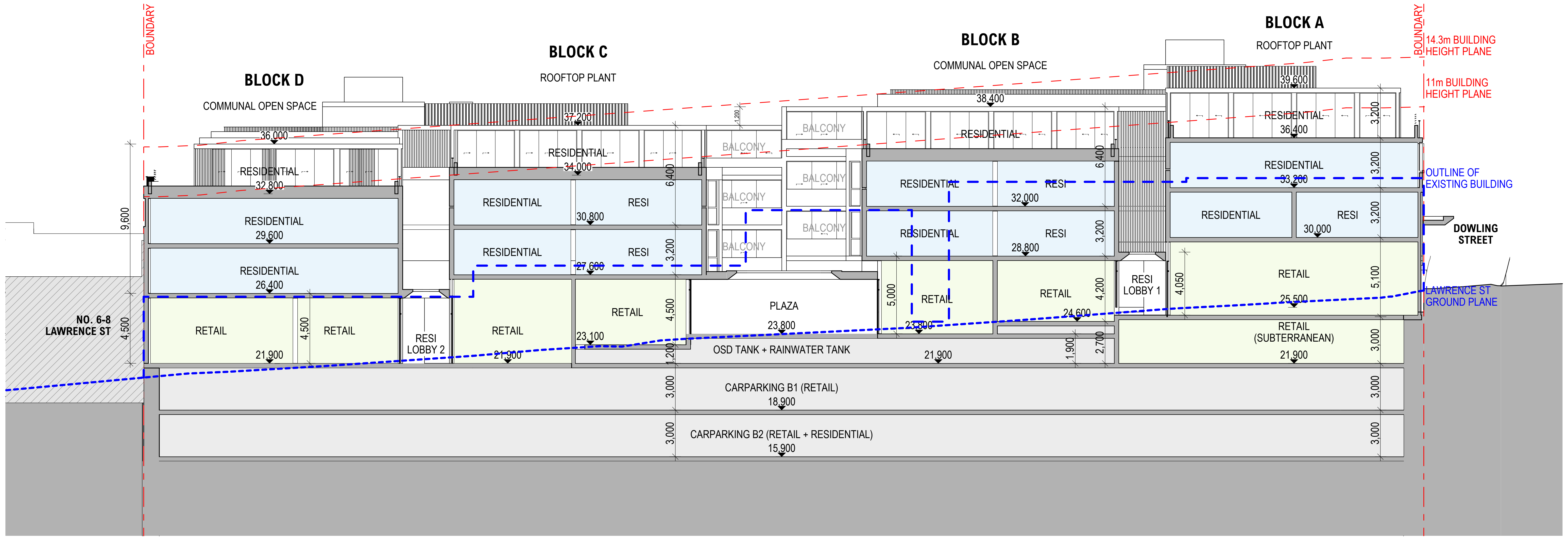
REV	DATE	ISSUE
01	01/10/24	ISSUE FOR COORDINATION
02 - WIP	Work in Progress	ISSUE FOR COORDINATION

REV	DATE	ISSUE

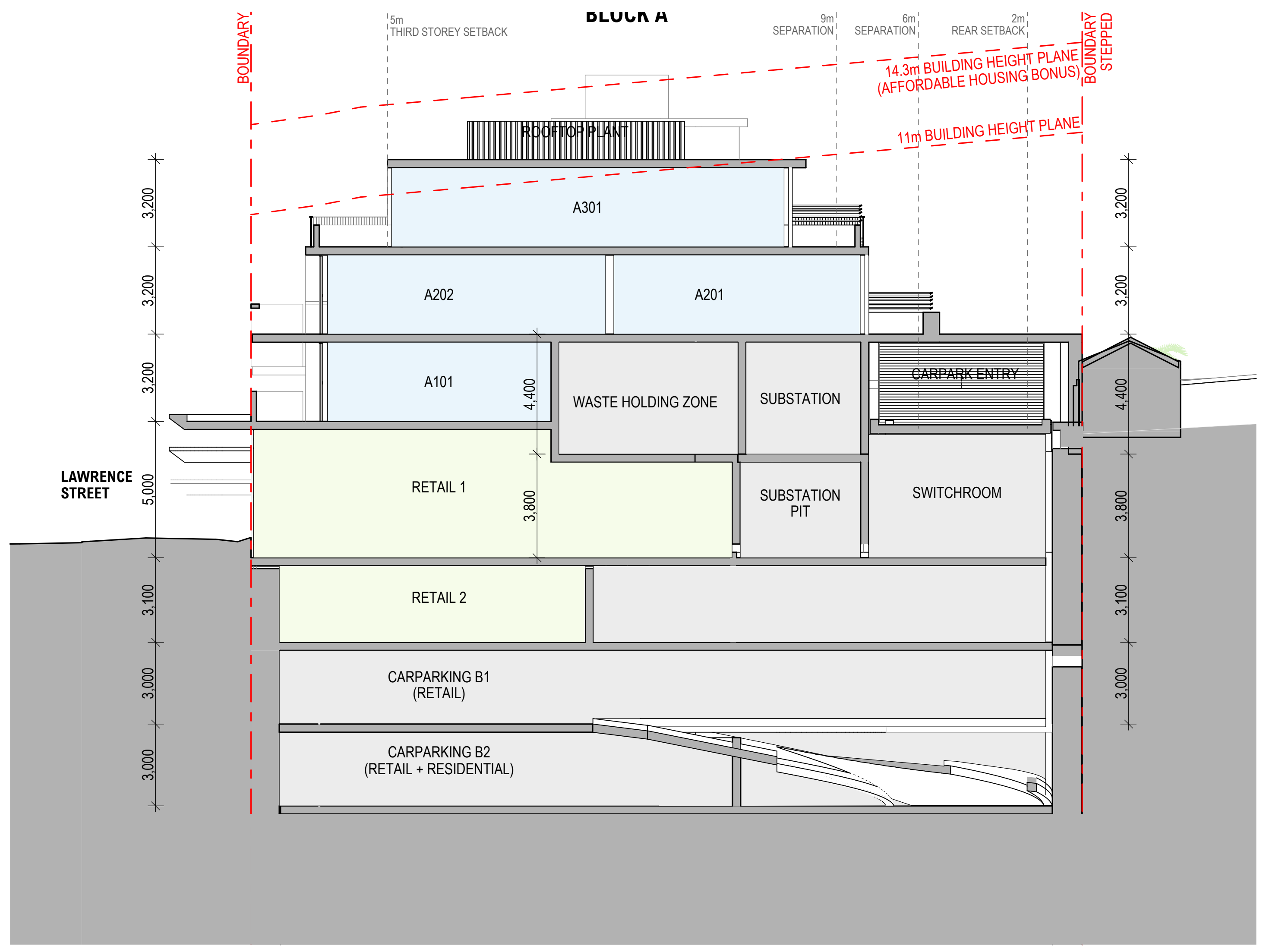
PROJECT
FRESHIE MIXED-USE DEVELOPMENT

DRAWING TITLE
BASEMENT 1

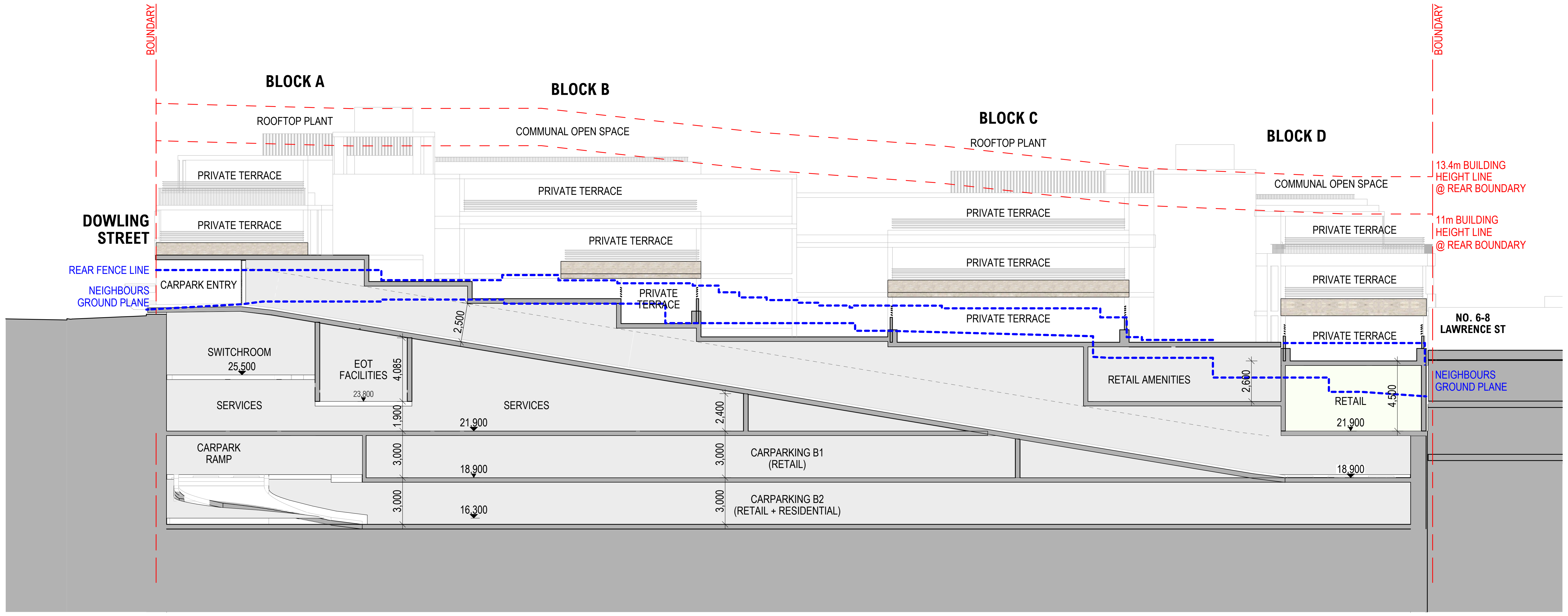
PROJECT NUMBER	PLOT DATE	DRAWN	CHECKED	SHEET SCALE	SHEET SIZE	NORTH	DRAWING NUMBER	REVISION
21053	09/10/24	VL	SF	1:200	A1	N	A-DA-098	02 - WIP



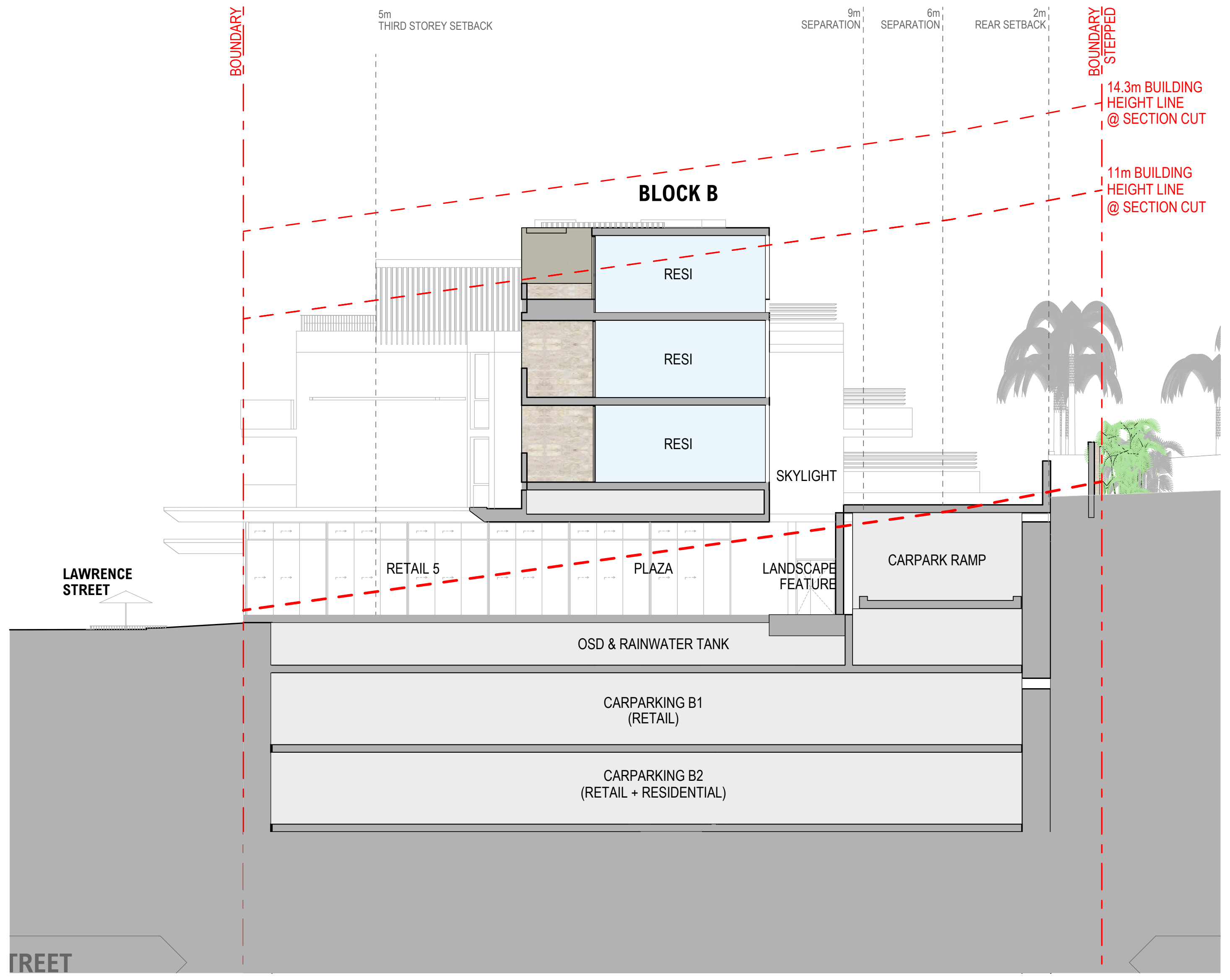
1 LONG SECTION - LAWRENCE STREET
1:200



3 SHORT SECTION - BLOCK A & CARPARK ENTRY
1:200



2 LONG SECTION - BASEMENT CARPARK RAMP
1:200



4 SHORT SECTION - CENTRAL PUBLIC PLAZA
1:200

ARCHITECT

CHROFI

3/1 THE CORSO MANLY NSW 2095 AUSTRALIA
T +61 2 8096 8500 E info@chrofi.com

CHOI ROPIHA FIGHERA P/L ACN 144 714 885 ATF CHOI ROPIHA FIGHERA UNIT TRUST T/A CHROFI ABN 22 365 257 187 NOMINATED ARCHITECT JOHN CHOI 8706 TAI ROPIHA 6568 STEVEN FIGHERA 6609

REV	DATE	ISSUE	REV	DATE	ISSUE
01	01/10/24	ISSUE FOR COORDINATION			
02 - WIP	Work in Progress	ISSUE FOR COORDINATION			

PROJECT
FRESHIE MIXED-USE DEVELOPMENT

DRAWING TITLE
SECTIONS

PROJECT NUMBER	PLOT DATE	DRAWN	CHECKED	SHEET SCALE	SHEET SIZE	NORTH	DRAWING NUMBER	REVISION
21053	09/10/24	VL	SF	1:200	A1	N	A-DA-301	02 - WIP

Appendix D - Borehole Logs

MONITORING WELL LOG

MW NO. BH101M

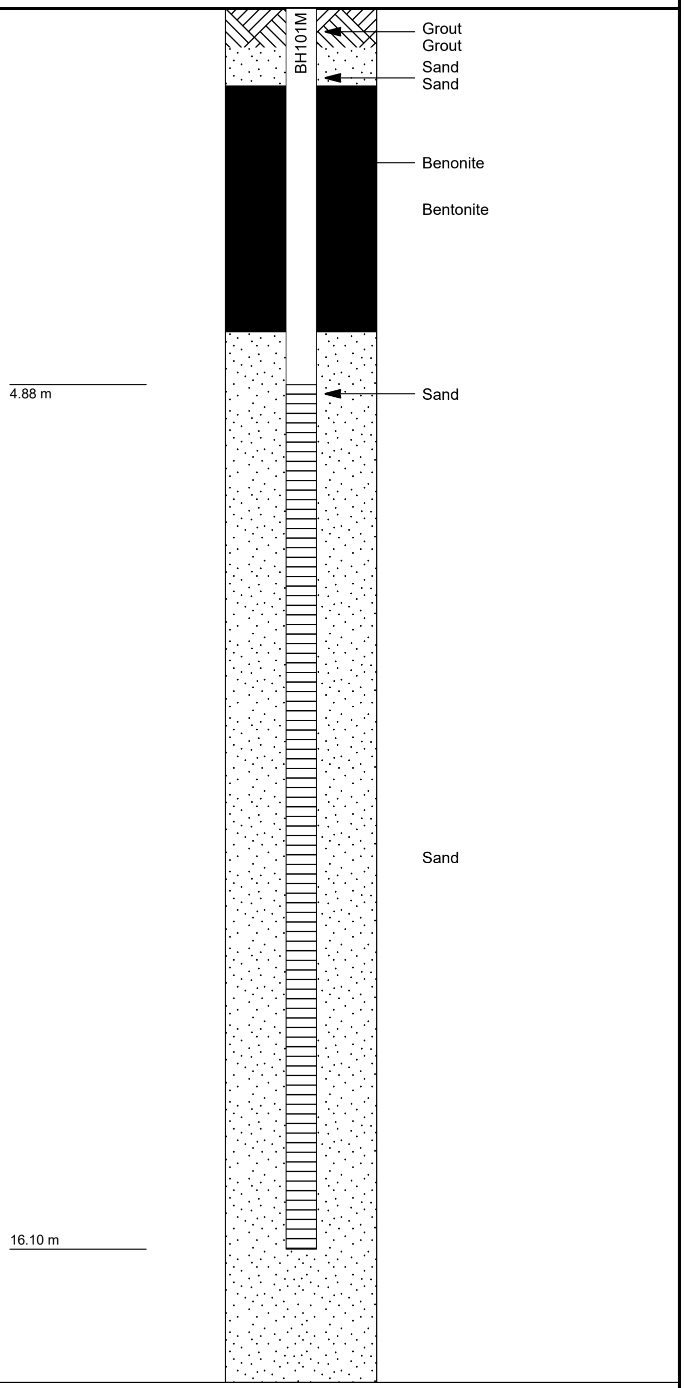
Project	Proposed Development	**Sheet**	1 of 2
Location	16 Lawrence Street Freshwater	**Date Started**	24/02/2023
Position	See Figure 2	**Date Completed**	24/02/2023
Job No.	E25874	**Logged By** DD	**Date** 24/02/2023
Client	MD Living	**Reviewed By** DD	**Date** 24/02/2023

Drilling Contractor	Geosense Drilling Services	**Surface RL**	≈20.00 m
Drill Rig	Geo205	**Inclination**	-90°

PIEZOMETER CONSTRUCTION DETAILS

ID	Type	Stick Up & RL	Tip Depth & RL	Installation Date	Static Water Level
BH101M	Standpipe	-0.07 m 20.07 m	16.10 m 3.90 m	24/02/2023	

METHOD	WATER	DEPTH (m)	RL (m)	SOIL/ROCK MATERIAL DESCRIPTION
AD/T		0	20	40mm Pavers/Tiles, 20mm SP fine grained bedding sand, 200mm Concrete,
				sandy GRAVEL; orange-grey and orange-brown, fine to coarse angular to sub-angular sandstone gravel, sand is fine to coarse grained, with silt, trace sandstone cobbles
		2	18	Sand; fine to medium grained, orange-brown and grey-orange, with silt
				silty CLAY; high plasticity, grey and red-grey, trace fine grained sub-angular gravel
NMLC		4	16	SANDSTONE; fine to medium grained, orange-brown and grey, thinly bedded
		6	14	SANDSTONE; fine to medium grained, grey and pale grey, medium bedded
		8	12	
		10	10	
		12	8	
		14	6	320mm Core Loss
				SANDSTONE; fine to medium grained, grey and pale grey, medium bedded
		16	4	
		18	2	Hole Terminated at 17.83 m Target depth



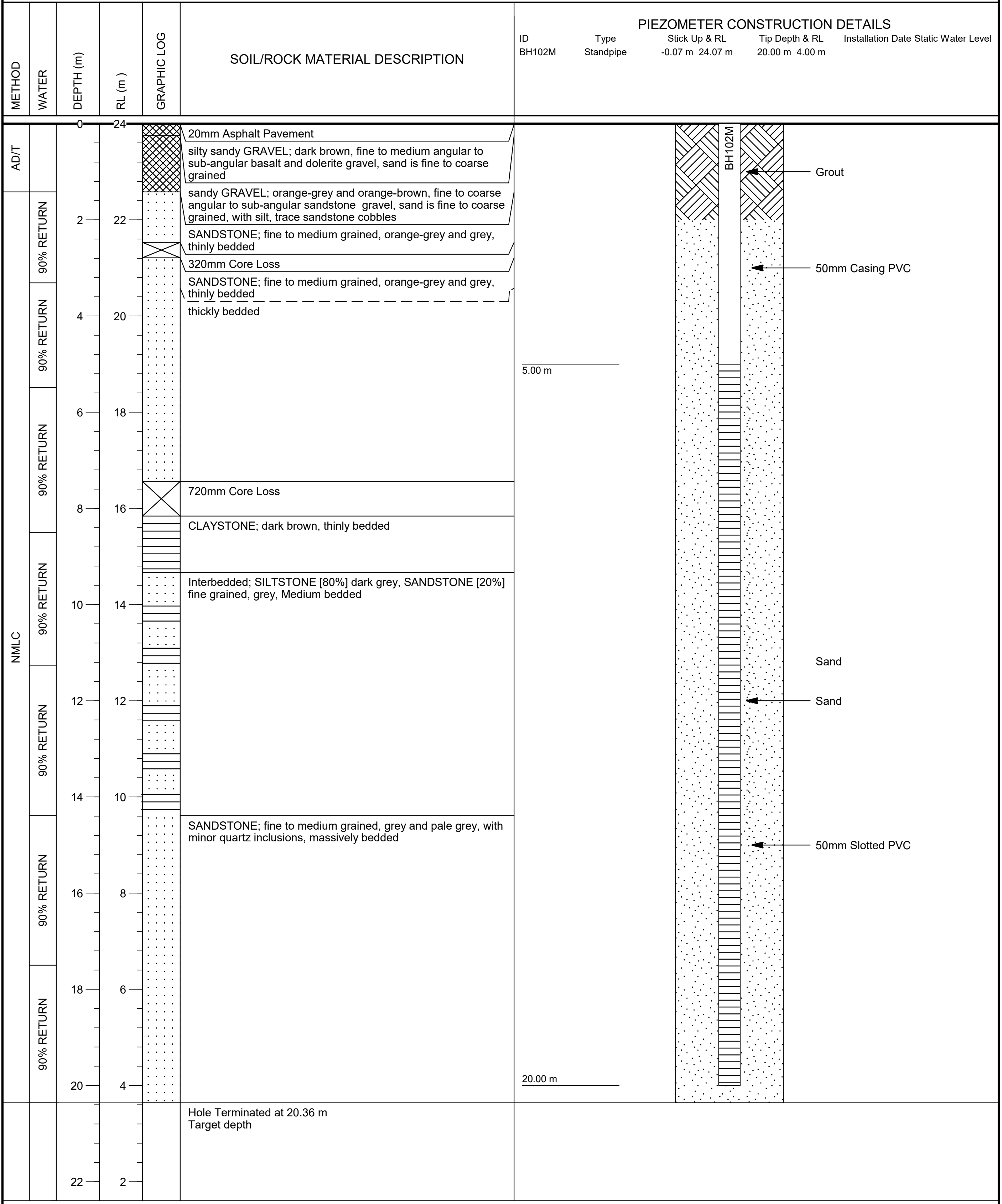
This well log should be read in conjunction with EI Australia's accompanying standard notes.

MONITORING WELL LOG

MW NO. BH102M

Project	Proposed Development	**Sheet**	1 of 2
Location	16 Lawrence Street Freshwater	**Date Started**	16/02/2023
Position	See Figure 2	**Date Completed**	16/02/2023
Job No.	E25874	**Logged By** DD	**Date** 16/02/2023
Client	MD Living	**Reviewed By** DD	**Date** 22/02/2023

Drilling Contractor	Geosense Drilling Services	**Surface RL**	≈24.00 m
Drill Rig	Geo205	**Inclination**	-90°



PIEZOMETER CONSTRUCTION DETAILS

ID	Type	Stick Up & RL	Tip Depth & RL	Installation Date	Static Water Level
BH102M	Standpipe	-0.07 m 24.07 m	20.00 m 4.00 m		

20mm Asphalt Pavement

silty sandy GRAVEL; dark brown, fine to medium angular to sub-angular basalt and dolerite gravel, sand is fine to coarse grained

sandy GRAVEL; orange-grey and orange-brown, fine to coarse angular to sub-angular sandstone gravel, sand is fine to coarse grained, with silt, trace sandstone cobbles

SANDSTONE; fine to medium grained, orange-grey and grey, thinly bedded

320mm Core Loss

SANDSTONE; fine to medium grained, orange-grey and grey, thinly bedded

thickly bedded

720mm Core Loss

CLAYSTONE; dark brown, thinly bedded

Interbedded; SILTSTONE [80%] dark grey, SANDSTONE [20%] fine grained, grey, Medium bedded

SANDSTONE; fine to medium grained, grey and pale grey, with minor quartz inclusions, massively bedded

Hole Terminated at 20.36 m
Target depth

This well log should be read in conjunction with EI Australia's accompanying standard notes.

MONITORING WELL LOG

MW NO. BH103M

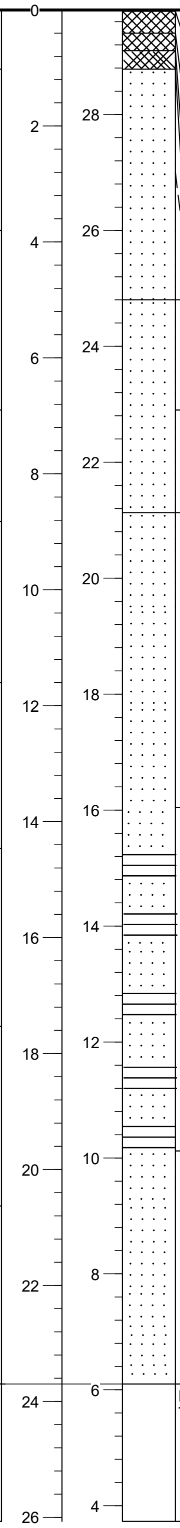
Project	Proposed Development	**Sheet**	1 of 2
Location	16 Lawrence Street Freshwater	**Date Started**	17/02/2023
Position	See Figure 2	**Date Completed**	17/02/2023
Job No.	E25874	**Logged By** DD	**Date** 17/02/2023
Client	MD Living	**Reviewed By** DD	**Date** 22/02/2023

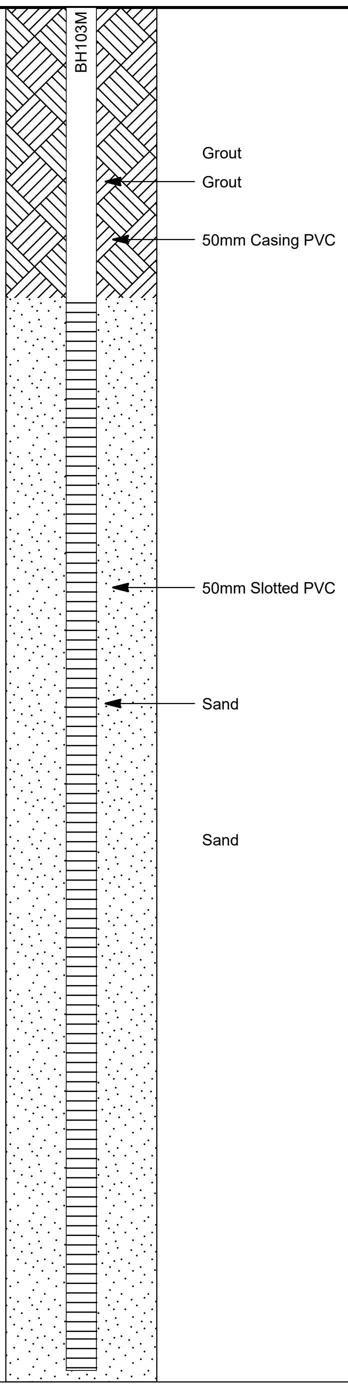
Drilling Contractor	Geosense Drilling Services	**Surface RL**	≈29.80 m
Drill Rig	Geo205	**Inclination**	-90°

PIEZOMETER CONSTRUCTION DETAILS

ID	Type	Stick Up & RL	Tip Depth & RL	Installation Date	Static Water Level
BH103M	Standpipe		23.50 m 6.30 m	24/02/2023	

METHOD	WATER	SOIL/ROCK MATERIAL DESCRIPTION
AD/T		20mm Asphalt Pavement
AD/T		silty sandy GRAVEL; dark brown, fine to medium angular to sub-angular basalt and dolerite gravel, sand is fine to coarse grained
NMLC	90% RETURN	sandy GRAVEL; orange-grey and orange-brown, fine to coarse angular to sub-angular sandstone gravel, sand is fine to coarse grained, with silt, trace sandstone cobbles
NMLC	90% RETURN	Extremely Weathered Sandstone Material; recovered as sandy Gravel
NMLC	90% RETURN	SANDSTONE; fine to medium grained, orange-grey and grey, thinly bedded
NMLC	90% RETURN	massively bedded
NMLC	90% RETURN	SANDSTONE; fine to medium grained, orange-grey and grey, thinly bedded
NMLC	90% RETURN	thickly bedded
NMLC	90% RETURN	SANDSTONE with Siltstone clasts; fine to medium grained sandstone [grey], siltstone [dark grey], very thinly bedded
NMLC	90% RETURN	Interbedded; SILTSTONE [20%] dark grey, SANDSTONE [80%] fine grained, grey, thinly bedded
NMLC	90% RETURN	SANDSTONE; fine to medium grained, grey and pale grey, with minor quartz inclusions, thickly bedded
		Hole Terminated at 23.70 m Target depth





This well log should be read in conjunction with EI Australia's accompanying standard notes.

eiaustralia
Contamination | Remediation | Geotechnical

EXPLANATION OF NOTES, ABBREVIATIONS & TERMS USED ON BOREHOLE AND TEST PIT LOGS

DRILLING/EXCAVATION METHOD

		RR	Rock Roller	RH	Rock Hammer
HA	Hand Auger	RD	Rotary blade or drag bit	NQ	Diamond Core - 47 mm
DTC	Diatube Coring	RT	Rotary Tricone bit	NMLC	Diamond Core - 52 mm
NDD	Non-destructive digging	RAB	Rotary Air Blast	HQ	Diamond Core - 63 mm
AS*	Auger Screwing	RC	Reverse Circulation	HMLC	Diamond Core - 63mm
AD*	Auger Drilling	PT	Push Tube	BH	Tractor Mounted Backhoe
*V	V-Bit	CT	Cable Tool Rig	EX	Tracked Hydraulic Excavator
*T	TC-Bit, e.g. ADT	JET	Jetting	EE	Existing Excavation
ADH	Hollow Auger	WB	Washbore or Bailer	HAND	Excavated by Hand Methods

PENETRATION/EXCAVATION RESISTANCE

L	**Low resistance.** Rapid penetration/ excavation possible with little effort from equipment used.
M	**Medium resistance.** Penetration/ excavation possible at an acceptable rate with moderate effort from equipment used.
H	**High resistance.** Penetration/ excavation is possible but at a slow rate and requires significant effort from equipment used.
R	**Refusal/ Practical Refusal.** No further progress possible without risk of damage or unacceptable wear to equipment used.

These assessments are subjective and are dependent on many factors, including equipment power and weight, condition of excavation or drilling tools and experience of the operator.

WATER

▽	Water level at date shown	◁	Partial water loss
▷	Water inflow	◀	Complete water loss

GROUNDWATER NOT OBSERVED	Observation of groundwater, whether present or not, was not possible due to drilling water, surface seepage or cave-in of the borehole/ test pit.
GROUNDWATER NOT ENCOUNTERED	Borehole/ test pit was dry soon after excavation. However, groundwater could be present in less permeable strata. Inflow may have been observed had the borehole/ test pit been left open for a longer period.

SAMPLING AND TESTING

SPT	Standard Penetration Test to AS1289.6.3.1-2004
4,7,11 N=18	4,7,11 = Blows per 150mm. N = Blows per 300mm penetration following 150mm
seating 30/80mm	Where practical refusal occurs, the blows and penetration for that interval are reported
RW	Penetration occurred under the rod weight only
HW	Penetration occurred under the hammer and rod weight only
HB	Hammer double bouncing on anvil
Sampling	
DS	Disturbed Sample
BDS	Bulk disturbed Sample
GS	Gas Sample
WS	Water Sample
U63	Thin walled tube sample - number indicates nominal sample diameter in millimetres
Testing	
FP	Field Permeability test over section noted
FVS	Field Vane Shear test expressed as uncorrected shear strength (sv = peak value, sr = residual value)
PID	Photoionisation Detector reading in ppm
PM	Pressuremeter test over section noted
PP	Pocket Penetrometer test expressed as instrument reading in kPa
WPT	Water Pressure tests
DCP	Dynamic Cone Penetrometer test
CPT	Static Cone Penetration test
CPTu	Static Cone Penetration test with pore pressure (u) measurement

RANKING OF VISUALLY OBSERVABLE CONTAMINATION AND ODOUR (for specific soil contamination assessment

R = 0	No visible evidence of contamination	R = A	No non-natural odours identified
R = 1	Slight evidence of visible contamination	R = B	Slight non-natural odours identified
R = 2	Visible contamination	R = C	Moderate non-natural odours identified
R = 3	Significant visible contamination	R = D	Strong non-natural odours identified

ROCK CORE RECOVERY

TCR = Total Core Recovery (%)

$$= \frac{\textbf{Length of core recevered}}{\textbf{Lengh of core run}} \textbf{ x 100}$$

SCR = Solid Core Recovery (%)

$$= \frac{\boldsymbol{\Sigma}\textbf{ Length ofcylindrical core recevered}}{\textbf{Lengh of core run}} \textbf{ x 100}$$

RQD = Rock Quality Designation (%)

$$= \frac{\boldsymbol{\Sigma}\textbf{Axial Lenghts of core}>\textbf{100mm}}{\textbf{Lengh of core run}} \textbf{ x 100}$$

MATERIAL BOUNDARIES

———— = inferred boundary

- - - - - - - - = probable boundary

— ?— ?— ?— ?— ? = possible boundary

METHOD OF SOIL DESCRIPTION USED ON BOREHOLE AND TEST PIT LOGS

▩	FILL	⁂	ORGANIC SOILS (OL, OH or Pt)	☰	CLAY (CL, CI or CH)
⁘	COUBLES or BOULDERS	⁙	SILT (ML or MH)	⁚	SAND (SP or SW)
⁘	GRAVEL (GP or GW)		Combinations of these basic symbols may be used to indicate mixed materials such as sandy clay		

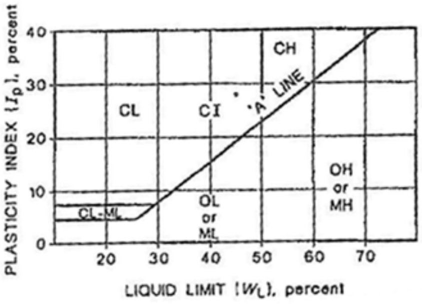
CLASSIFICATION AND INFERRED STRATIGRAPHY

Soil is broadly classified and described in Borehole and Test Pit Logs using the preferred method given in AS1726 – 1993, (Amdt1 – 1994 and Amdt2 – 1994), Appendix A. Material properties are assessed in the field by visual/tactile methods.

PARTICLE SIZE CHARACTERISTICS

Major Division	Sub Division	Particle Size
BOULDERS		>200 mm
COBBLES		63 to 200 mm
GRAVEL	Coarse	20 to 63 mm
	Medium	6 to 20 mm
	Fine	2 to 6 mm
SAND	Coarse	0.6 to 2 mm
	Medium	0.2 to 0.6 mm
	Fine	0.075 to 0.2mm
SILT		0.002 to 0.075 mm
CLAY		<0.002 mm

PLASTICITY PROPERTIES



USCS SYMBOLS

Major Divisions		Symbol	Description
COARSE GRAINED SOILS More than 50% by dry mass less than 63mm is greater than 0.075mm	More than 50% of coarse grains are >2.mm	GW	Well graded gravel and gravel-sand mixtures, little or no fines.
		GP	Poorly graded gravel and gravel-sand mixtures, little or no fines.
		GM	Silty gravel, gravel-sand-silt mixtures.
		GC	Clayey gravel, gravel-sand-clay mixtures.
	More than 50% of coarse grains are <2 mm	SW	Well graded sand and gravelly sand, little or no fines.
		SP	Poorly graded sand and gravelly sand, little or no fines.
		SM	Silty sand, sand-silt mixtures.
		SC	Clayey sand, sandy-clay mixtures.
FINE GRAINED SOILS More than 50% by dry mass less than 63mm is less than 0.075mm	Liquid Limit less < 50%	ML	Inorganic silts of low plasticity, very fine sands, rock flour, silty or clayey fine sands.
		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays.
		OL	Organic silts and organic silty clays of low plasticity.
	Liquid Limit > than 50%	MH	Inorganic silts of high plasticity.
		CH	Inorganic clays of high plasticity.
		OH	Organic clays of medium to high plasticity.
		PT	Peat muck and other highly organic soils.

MOISTURE CONDITION

Symbol	Term	Description
D	Dry	Sands and gravels are free flowing. Clays & Silts may be brittle or friable and powdery.
M	Moist	Soils are darker than in the dry condition & may feel cool. Sands and gravels tend to cohere.
W	Wet	Soils exude free water. Sands and gravels tend to cohere.

Moisture content of cohesive soils may also be described in relation to plastic limit (WP) or liquid limit (WL) [» much greater than, > greater than, < less than, « much less than].

CONSISTENCY

Symbol	Term	Undrained Shear Strength
VS	Very Soft	0. to 12 kPa
S	Soft	12 to 25 kPa
F	Firm	25 to 50 kPa
St	Stiff	50 to 100 kPa
VSt	Very Stiff	100 to 200 kPa
H	Hard	Above 200 kPa

DENSITY

Symbol	Term	Density Index %	SPT "N" #
VL	Very Loose	< 15	0 to 4
L	Loose	15 to 35	4 to 10
MD	Medium Density	35 to 65	10 to 30
D	Dense	65 to 85	30 to 50
VD	Very Dense	Above 85	Above 50

In the absence of test results, consistency and density may be assessed from correlations with the observed behaviour of the material.
SPT correlations are not stated in AS1726 – 1993, and may be subject to corrections for overburden pressure and equipment type.

MINOR COMPONENTS

Term	Assessment Guide	Proportion by Mass
Trace	Presence just detectable by feel or eye but soil properties little or no different to general properties of primary component	Coarse grained soils: ≤ 5% Fine grained soil: ≤15%
Some	Presence easily detectable by feel or eye but soil properties little or no different to general properties of primary component	Coarse grained soils: 5 - 12% Fine grained soil: 15 - 30%

eiaustralia
Contamination | Remediation | Geotechnical

TERMS FOR ROCK MATERIAL STRENGTH AND WEATHERING

CLASSIFICATION AND INFERRED STRATIGRAPHY

Soil is broadly classified and described in Borehole and Test Pit Logs using the preferred method given in AS1726 – 1993, (Amdt1 – 1994 and Amdt2 – 1994), Appendix A. Material properties are assessed in the field by visual/ tactile methods.

STRENGTH

Symbol	**Term**	**Point Load Index, $Is_{(50)}$ (MPa) #**	**Field Guide**
EL	Extremely Low	< 0.03	Easily remoulded by hand to a material with soil properties.
VL	Very Low	0.03 to 0.1	Material crumbles under firm blows with sharp end of pick; can be peeled with knife; too hard to cut a triaxial sample by hand. Pieces up to 30 mm can be broken by finger pressure.
L	Low	0.1 to 0.3	Easily scored with a knife; indentations 1 mm to 3 mm show in the specimen with firm blows of pick point; has dull sound under hammer. A piece of core 150 mm long by 50 mm diameter may be broken by hand. Sharp edges of core may be friable and break during handling.
M	Medium	0.3 to 1	Readily scored with a knife; a piece of core 150 mm long by 50 mm diameter can be broken by hand with difficulty.
H	High	1 to 3	A piece of core 150 mm long by 50 mm diameter cannot be broken by hand but can be broken with pick with a single firm blow; rock rings under hammer.
VH	Very High	3 to 10	Hand specimen breaks with pick after more than one blow; rock rings under hammer.
EH	Extremely High	>10	Specimen requires many blows with geological pick to break through intact material; rock rings under hammer.

 # Rock Strength Test Results

▼	Point Load Strength Index, $Is_{(50)}$, Axial test (MPa)
◀	Point Load Strength Index, $Is_{(50)}$, Diametral test (MPa)

Relationship between rock strength test result ($Is_{(50)}$) and unconfined compressive strength (UCS) will vary with rock type and strength, and should be determined on a site-specific basis. UCS is typically 10 to 30 x $Is_{(50)}$, but can be as low as 5 MPa.

ROCK MATERIAL WEATHERING

Symbol		**Term**	**Field Guide**
RS		Residual Soil	Soil developed on extremely weathered rock; the mass structure and substance fabric are no longer evident; there is a large change in volume but the soil has not been significantly transported.
EW		Extremely Weathered	Rock is weathered to such an extent that it has soil properties - i.e. it either disintegrates or can be remoulded, in water.
DW	HW	Distinctly Weathered	Rock strength usually changed by weathering. The rock may be highly discoloured, usually by iron staining. Porosity may be increased by leaching, or may be decreased due to deposition of weathering products in pores. In some environments it is convenient to subdivide into Highly Weathered and Moderately Weathered, with the degree of alteration typically less for MW.
	MW		
SW		Slightly Weathered	Rock slightly discoloured but shows little or no change of strength relative to fresh rock.
FR		Fresh	Rock shows no sign of decomposition or staining.

ABBREVIATIONS AND DESCRIPTIONS FOR ROCK MATERIAL AND DEFECTS

CLASSIFICATION AND INFERRED STRATIGRAPHY

Rock is broadly classified and described in Borehole Logs using the preferred method given in AS1726 – 1993, (Amdt1 – 1994 and Amdt2 – 1994), Appendix A. Material properties are assessed in the field by visual/ tactile methods.

ROCK MATERIAL DESCRIPTION

Layering

Term	Description
Massive	No layering apparent
Poorly Developed	Layering just visible; little effect on properties
Well Developed	Layering (bedding, foliation, cleavage) distinct; rock breaks more easily parallel to layering

Structure

Term	Spacing (mm)
Thinly laminated	<6
Laminated	6 – 20
Very thinly bedded	20 – 60
Thinly bedded	60 – 200
Medium bedded	200 – 600
Thickly bedded	600 – 2,000
Very thickly bedded	> 2,000

ABBREVIATIONS AND DESCRIPTIONS FOR DEFECT TYPES

Defect Type	Abbr.	Description
Joint	JT	Surface of a fracture or parting, formed without displacement, across which the rock has little or no tensile strength. May be closed or filled by air, water or soil or rock substance, which acts as cement.
Bedding Parting	BP	Surface of fracture or parting, across which the rock has little or no tensile strength, parallel or sub-parallel to layering/ bedding. Bedding refers to the layering or stratification of a rock, indicating orientation during deposition, resulting in planar anisotropy in the rock material.
Foliation	FL	Repetitive planar structure parallel to the shear direction or perpendicular to the direction of higher pressure, especially in metamorphic rock, e.g. Schistosity (SH) and Gneissosity.
Contact	CO	The surface between two types or ages of rock.
Cleavage	CL	Cleavage planes appear as parallel, closely spaced and planar surfaces resulting from mechanical fracturing of rock through deformation or metamorphism, independent of bedding.
Sheared Seam/ Zone (Fault)	SS/SZ	Seam or zone with roughly parallel almost planar boundaries of rock substance cut by closely spaced (often <50 mm) parallel and usually smooth or slickensided joints or cleavage planes.
Crushed Seam/ Zone (Fault)	CS/CZ	Seam or zone composed of disoriented usually angular fragments of the host rock substance, with roughly parallel near-planar boundaries. The brecciated fragments may be of clay, silt, sand or gravel sizes or mixtures of these.
Decomposed Seam/ Zone	DS/DZ	Seam of soil substance, often with gradational boundaries, formed by weathering of the rock material in places.
Infilled Seam	IS	Seam of soil substance, usually clay or clayey, with very distinct roughly parallel boundaries, formed by soil migrating into joint or open cavity.
Schistocity	SH	The foliation in schist or other coarse grained crystalline rock due to the parallel arrangement of platy or prismatic mineral grains, such as mica.
Vein	VN	Distinct sheet-like body of minerals crystallised within rock through typically open-space filling or crack-seal growth.

ABBREVIATIONS AND DESCRIPTIONS FOR DEFECT SHAPE AND ROUGHNESS

Shape	Abbr.	Description	Roughness	Abbr.	Description
Planar	Pl	Consistent orientation	Polished	Pol	Shiny smooth surface
Curved	Cu	Gradual change in orientation	Slickensided	SL	Grooved or striated surface, usually polished
Undulating	Un	Wavy surface	Smooth	S	Smooth to touch. Few or no surface irregularities
Stepped	St	One or more well defined steps	Rough	RF	Many small surface irregularities (amplitude generally <1mm). Feels like fine to coarse sandpaper
Irregular	Ir	Many sharp changes in orientation	Very Rough	VR	Many large surface irregularities, amplitude generally >1mm. Feels like very coarse sandpaper

Orientation: **Vertical Boreholes –** The dip (inclination from horizontal) of the defect.
Inclined Boreholes – The inclination is measured as the acute angle to the core axis.

ABBREVIATIONS AND DESCRIPTIONS FOR DEFECT COATING

Coating	Abbr.	Description
Clean	CN	No visible coating or infilling
Stain	SN	No visible coating but surfaces are discoloured by staining, often limonite (orange-brown)
Veneer	VNR	A visible coating of soil or mineral substance, usually too thin to measure (< 1 mm); may be patchy

DEFECT APERTURE

Aperture	Abbr.	Description
Closed	CL	Closed.
Open	O	Without any infill material.
Infilled	-	Soil or rock i.e. clay, talc, pyrite, quartz, etc.

Appendix E - Laboratory Documentation

ANALYTICAL REPORT

Accreditation No. 2562

CLIENT DETAILS

Contact	Daniel Duffy
Client	EI AUSTRALIA
Address	SUITE 6.01 55 MILLER STREET PYRMONT NSW 2009
Telephone	61 2 95160722
Facsimile	(Not specified)
Email	daniel.duffy@eiaustralia.com.au
Project	**E25874 10-28 Lawrence St, Freshwater**
Order Number	**E25874**
Samples	2

LABORATORY DETAILS

Manager	Huong Crawford
Laboratory	SGS Alexandria Environmental
Address	Unit 16, 33 Maddox St Alexandria NSW 2015
Telephone	+61 2 8594 0400
Facsimile	+61 2 8594 0499
Email	au.environmental.sydney@sgs.com
SGS Reference	**SE245981 R0**
Date Received	14/4/2023
Date Reported	21/4/2023

COMMENTS

Accredited for compliance with ISO/IEC 17025 - Testing. NATA accredited laboratory 2562(4354).

SIGNATORIES

Bennet LO	**Dong LIANG**	**Kamrul AHSAN**	**Ly Kim HA**
Senior Chemist	Metals/Inorganics Team Leader	Senior Chemist	Organic Section Head

VOCs in Water [AN433] Tested: 19/4/2023

PARAMETER	UOM	LOR	BH101M WATER - 13/4/2023 SE245981.001	BH102M WATER - 13/4/2023 SE245981.002
Benzene	µg/L	0.5	<0.5	<0.5
Toluene	µg/L	0.5	<0.5	<0.5
Ethylbenzene	µg/L	0.5	<0.5	<0.5
m/p-xylene	µg/L	1	<1	<1
o-xylene	µg/L	0.5	<0.5	<0.5
Total Xylenes	µg/L	1.5	<1.5	<1.5
Total BTEX	µg/L	3	<3	<3
Naphthalene (VOC)*	µg/L	0.5	<0.5	**5.6**
Dichlorodifluoromethane (CFC-12)	µg/L	5	<5	<5
Chloromethane	µg/L	5	<5	<5
Vinyl chloride (Chloroethene)	µg/L	0.3	<0.3	<0.3
Bromomethane	µg/L	10	<10	<10
Chloroethane	µg/L	5	<5	<5
Trichlorofluoromethane	µg/L	1	<1	<1
Acetone (2-propanone)	µg/L	10	<10	<10
Iodomethane	µg/L	5	<5	<5
1,1-dichloroethene	µg/L	0.5	<0.5	<0.5
Acrylonitrile	µg/L	0.5	<0.5	<0.5
Dichloromethane (Methylene chloride)	µg/L	5	<5	<5
Allyl chloride	µg/L	2	<2	<2
Carbon disulfide	µg/L	2	<2	<2
trans-1,2-dichloroethene	µg/L	0.5	<0.5	<0.5
MtBE (Methyl-tert-butyl ether)	µg/L	2	<2	<2
1,1-dichloroethane	µg/L	0.5	<0.5	<0.5
Vinyl acetate*	µg/L	10	<10	<10
MEK (2-butanone)	µg/L	10	<10	<10
cis-1,2-dichloroethene	µg/L	0.5	<0.5	<0.5
Bromochloromethane	µg/L	0.5	<0.5	<0.5
Chloroform (THM)	µg/L	0.5	<0.5	<0.5
2,2-dichloropropane	µg/L	0.5	<0.5	<0.5
1,2-dichloroethane	µg/L	0.5	<0.5	<0.5
1,1,1-trichloroethane	µg/L	0.5	<0.5	<0.5
1,1-dichloropropene	µg/L	0.5	<0.5	<0.5
Carbon tetrachloride	µg/L	0.5	<0.5	<0.5
Dibromomethane	µg/L	0.5	<0.5	<0.5
1,2-dichloropropane	µg/L	0.5	<0.5	<0.5
Trichloroethene (Trichloroethylene,TCE)	µg/L	0.5	<0.5	<0.5
2-nitropropane	µg/L	100	<100	<100
Bromodichloromethane (THM)	µg/L	0.5	<0.5	<0.5
MIBK (4-methyl-2-pentanone)	µg/L	5	<5	<5
cis-1,3-dichloropropene	µg/L	0.5	<0.5	<0.5
trans-1,3-dichloropropene	µg/L	0.5	<0.5	<0.5
1,1,2-trichloroethane	µg/L	0.5	<0.5	<0.5
1,3-dichloropropane	µg/L	0.5	<0.5	<0.5
Dibromochloromethane (THM)	µg/L	0.5	<0.5	<0.5
2-hexanone (MBK)	µg/L	5	<5	<5
1,2-dibromoethane (EDB)	µg/L	0.5	<0.5	<0.5
Tetrachloroethene (Perchloroethylene,PCE)	µg/L	0.5	<0.5	**6.5**
1,1,1,2-tetrachloroethane	µg/L	0.5	<0.5	<0.5
Chlorobenzene	µg/L	0.5	<0.5	<0.5
Bromoform (THM)	µg/L	0.5	<0.5	<0.5
Styrene (Vinyl benzene)	µg/L	0.5	<0.5	<0.5
1,1,2,2-tetrachloroethane	µg/L	0.5	<0.5	<0.5
1,2,3-trichloropropane	µg/L	0.5	<0.5	<0.5
trans-1,4-dichloro-2-butene	µg/L	1	<1	<1
Isopropylbenzene (Cumene)	µg/L	0.5	<0.5	<0.5

VOCs in Water [AN433] Tested: 19/4/2023 (continued)

PARAMETER	UOM	LOR	BH101M WATER - 13/4/2023 SE245981.001	BH102M WATER - 13/4/2023 SE245981.002
Bromobenzene	µg/L	0.5	<0.5	<0.5
n-propylbenzene	µg/L	0.5	<0.5	<0.5
2-chlorotoluene	µg/L	0.5	<0.5	<0.5
4-chlorotoluene	µg/L	0.5	<0.5	<0.5
1,3,5-trimethylbenzene	µg/L	0.5	<0.5	<0.5
tert-butylbenzene	µg/L	0.5	<0.5	<0.5
1,2,4-trimethylbenzene	µg/L	0.5	<0.5	<0.5
sec-butylbenzene	µg/L	0.5	<0.5	<0.5
1,3-dichlorobenzene	µg/L	0.5	<0.5	<0.5
1,4-dichlorobenzene	µg/L	0.3	<0.3	<0.3
p-isopropyltoluene	µg/L	0.5	<0.5	<0.5
1,2-dichlorobenzene	µg/L	0.5	<0.5	<0.5
n-butylbenzene	µg/L	0.5	<0.5	<0.5
1,2-dibromo-3-chloropropane	µg/L	0.5	<0.5	<0.5
1,2,4-trichlorobenzene	µg/L	0.5	<0.5	<0.5
Hexachlorobutadiene	µg/L	0.5	<0.5	<0.5
1,2,3-trichlorobenzene	µg/L	0.5	<0.5	<0.5
Total VOC	µg/L	10	<10	12

Volatile Petroleum Hydrocarbons in Water [AN433] Tested: 19/4/2023

PARAMETER	UOM	LOR	BH101M WATER - 13/4/2023 SE245981.001	BH102M WATER - 13/4/2023 SE245981.002
TRH C6-C9	µg/L	40	<40	<40
Benzene (F0)	µg/L	0.5	<0.5	<0.5
TRH C6-C10	µg/L	50	<50	<50
TRH C6-C10 minus BTEX (F1)	µg/L	50	<50	<50

TRH (Total Recoverable Hydrocarbons) in Water [AN403] Tested: 17/4/2023

PARAMETER	UOM	LOR	BH101M WATER - 13/4/2023 SE245981.001	BH102M WATER - 13/4/2023 SE245981.002
TRH C10-C14	µg/L	50	4400	2300
TRH C15-C28	µg/L	200	1800	1100
TRH C29-C36	µg/L	200	1100	680
TRH C37-C40	µg/L	200	<200	<200
TRH >C10-C16	µg/L	60	4400	2300
TRH >C10-C16 - Naphthalene (F2)	µg/L	60	4400	2300
TRH >C16-C34 (F3)	µg/L	500	2700	1600
TRH >C34-C40 (F4)	µg/L	500	<500	<500
TRH C10-C40	µg/L	320	7300	4000

PAH (Polynuclear Aromatic Hydrocarbons) in Water [AN420] Tested: 17/4/2023

PARAMETER	UOM	LOR	BH101M WATER - 13/4/2023 SE245981.001	BH102M WATER - 13/4/2023 SE245981.002
Naphthalene	μg/L	0.1	**0.1**	**5.0**
2-methylnaphthalene	μg/L	0.1	<0.1	**8.8**
1-methylnaphthalene	μg/L	0.1	<0.1	**6.0**
Acenaphthylene	μg/L	0.1	<0.1	**6.0**
Acenaphthene	μg/L	0.1	<0.1	**0.3**
Fluorene	μg/L	0.1	<0.1	**2.7**
Phenanthrene	μg/L	0.1	<0.1	**1.0**
Anthracene	μg/L	0.1	<0.1	**0.1**
Fluoranthene	μg/L	0.1	<0.1	<0.1
Pyrene	μg/L	0.1	<0.1	<0.1
Benzo(a)anthracene	μg/L	0.1	<0.1	<0.1
Chrysene	μg/L	0.1	<0.1	<0.1
Benzo(b&j)fluoranthene	μg/L	0.1	<0.1	<0.1
Benzo(k)fluoranthene	μg/L	0.1	<0.1	<0.1
Benzo(b&j&k)fluoranthene	μg/L	0.2	<0.2	<0.2
Benzo(a)pyrene	μg/L	0.1	<0.1	<0.1
Indeno(1,2,3-cd)pyrene	μg/L	0.1	<0.1	<0.1
Dibenzo(ah)anthracene	μg/L	0.1	<0.1	<0.1
Benzo(ghi)perylene	μg/L	0.1	<0.1	<0.1
Total PAH (18)	μg/L	1	<1	**30**

Total Phenolics in Water [AN295]   Tested: 18/4/2023

PARAMETER	UOM	LOR	BH101M WATER - 13/4/2023 SE245981.001	BH102M WATER - 13/4/2023 SE245981.002
Total Phenols	mg/L	0.05	<0.05	<0.05

pH in water [AN101] Tested: 17/4/2023

PARAMETER	UOM	LOR	BH101M WATER - 13/4/2023 SE245981.001	BH102M WATER - 13/4/2023 SE245981.002
pH**	pH Units	0.1	4.3	4.4

Conductivity and TDS by Calculation - Water [AN106] Tested: 17/4/2023

			BH101M	BH102M
			WATER	WATER
			-	-
			13/4/2023	13/4/2023
PARAMETER	**UOM**	**LOR**	**SE245981.001**	**SE245981.002**
Conductivity @ 25 C	μS/cm	2	350	240

Total Dissolved Solids (TDS) in water [AN113] Tested: 20/4/2023

			BH101M WATER - 13/4/2023	BH102M WATER - 13/4/2023
PARAMETER	**UOM**	**LOR**	**SE245981.001**	**SE245981.002**
Total Dissolved Solids Dried at 175-185°C	mg/L	10	200	140

Turbidity [AN119] Tested: 17/4/2023

PARAMETER	UOM	LOR	BH101M WATER - 13/4/2023 SE245981.001	BH102M WATER - 13/4/2023 SE245981.002
Turbidity	NTU	0.5	4.9	17

Total Cyanide in water by Discrete Analyser [AN077/AN287] Tested: 20/4/2023

			BH101M	**BH102M**
			WATER	WATER
			-	-
			13/4/2023	13/4/2023
PARAMETER	**UOM**	**LOR**	**SE245981.001**	**SE245981.002**
Total Cyanide	mg/L	0.004	<0.004	<0.004

Metals in Water (Dissolved) by ICPOES [AN320] Tested: 19/4/2023

			BH101M WATER - 13/4/2023	BH102M WATER - 13/4/2023
PARAMETER	UOM	LOR	SE245981.001	SE245981.002
Calcium, Ca	mg/L	0.2	8.0	1.2
Magnesium, Mg	mg/L	0.1	5.0	3.3
Total Hardness by Calculation	mg CaCO3/L	1	41	17

Trace Metals (Dissolved) in Water by ICPMS [AN318] Tested: 17/4/2023

			BH101M	BH102M
			WATER	WATER
			-	-
			13/4/2023	13/4/2023
PARAMETER	UOM	LOR	SE245981.001	SE245981.002
Aluminium	µg/L	5	1200	610
Arsenic	µg/L	1	<1	2
Cadmium	µg/L	0.1	<0.1	<0.1
Chromium	µg/L	1	1	5
Copper	µg/L	1	4	<1
Lead	µg/L	1	1	<1
Nickel	µg/L	1	2	1
Zinc	µg/L	5	9	6

Mercury (dissolved) in Water [AN311(Perth)/AN312] Tested: 17/4/2023

			BH101M WATER - 13/4/2023	BH102M WATER - 13/4/2023
PARAMETER	UOM	LOR	SE245981.001	SE245981.002
Mercury	mg/L	0.0001	<0.0001	<0.0001

METHOD	METHODOLOGY SUMMARY
AN020	Unpreserved water sample is filtered through a 0.45µm membrane filter and acidified with nitric acid similar to APHA3030B.
AN077	Hydrogen cyanide is liberated from an acidified sample by distillation and purging with air. The hydrogen cyanide gas is then collected by passing it through a sodium hydroxide scrubbing solution. The scrubbing solution will then be analysed for cyanide by the appropriate method.
AN101	pH in Soil Sludge Sediment and Water: pH is measured electrometrically using a combination electrode (glass plus reference electrode) and is calibrated against 3 buffers purchased commercially. For soils, an extract with water is made at a ratio of 1:5 and the pH determined and reported on the extract. Reference APHA 4500-H+.
AN106	Conductivity and TDS by Calculation: Conductivity is measured by meter with temperature compensation and is calibrated against a standard solution of potassium chloride. Conductivity is generally reported as µmhos/cm or µS/cm @ 25°C. For soils, an extract with water is made at a ratio of 1:5 and the EC determined and reported on the extract, or calculated back to the as-received sample. Total Dissolved Salts can be estimated from conductivity using a conversion factor, which for natural waters, is in the range 0.55 to 0.75. SGS use 0.6. Reference APHA 2510 B.
AN106	Salinity may be calculated in terms of NaCl from the sample conductivity. This assumes all soluble salts present, measured by the conductivity, are present as NaCl.
AN113	Total Dissolved Solids: A well-mixed filtered sample of known volume is evaporated to dryness at 180°C and the residue weighed. Approximate methods for correlating chemical analysis with dissolved solids are available. Reference APHA 2540 C.
AN113	The Total Dissolved Solids residue may also be ignited at 550 C and volatile TDS (Organic TDS) and non-volatile TDS (Inorganic) can be determined.
AN119	Turbidity by Nephelometry: Small particles in a light beam scatter light at a range of angles. A turbidimeter measures this scatter and reports results compared to turbidity standards, in NTU. This procedure is not suitable for very dark coloured liquids or samples with high solids because light absorption causes artificially low light scatter and low turbidity. Reference APHA 2130B.
AN287	A buffered distillate or water sample is treated with chloramine/barbituric acid reagents and the intensity of the colour developed is proportional to the cyanide concentration by DA.
AN295	The water sample or extract of sample is distilled in a phosphoric acid stream. Phenolic compounds in the distillate react with a reagent stream of potassium hexacyanoferrate(III) and 4-Amino-2,3-dimethyl-3-pryazolin-5-one in an alkaline medium to form a coloured complex which is analysed spectrophotometrically onboard a continuous flow analyser.
AN311(Perth)/AN312	Mercury by Cold Vapour AAS in Waters: Mercury ions are reduced by stannous chloride reagent in acidic solution to elemental mercury. This mercury vapour is purged by nitrogen into a cold cell in an atomic absorption spectrometer or mercury analyser. Quantification is made by comparing absorbances to those of the calibration standards. Reference APHA 3112/3500.
AN318	Determination of elements at trace level in waters by ICP-MS technique,, referenced to USEPA 6020B and USEPA 200.8 (5.4).
AN320	Metals by ICP-OES: Samples are preserved with 10% nitric acid for a wide range of metals and some non-metals. This solution is measured by Inductively Coupled Plasma. Solutions are aspirated into an argon plasma at 8000-10000K and emit characteristic energy or light as a result of electron transitions through unique energy levels. The emitted light is focused onto a diffraction grating where it is separated into components.
AN320	Photomultipliers or CCDs are used to measure the light intensity at specific wavelengths. This intensity is directly proportional to concentration. Corrections are required to compensate for spectral overlap between elements. Reference APHA 3120 B.
AN403	Total Recoverable Hydrocarbons: Determination of Hydrocarbons by gas chromatography after a solvent extraction. Detection is by flame ionisation detector (FID) that produces an electronic signal in proportion to the combustible matter passing through it. Total Recoverable Hydrocarbons (TRH) are routinely reported as four alkane groupings based on the carbon chain length of the compounds: C6-C9, C10-C14, C15-C28 and C29-C36 and in recognition of the NEPM 1999 (2013), >C10-C16 (F2), >C16-C34 (F3) and >C34-C40 (F4). Where F2 is corrected for Naphthalene, the VOC data for Naphthalene is used.
AN403	Additionally, the volatile C6-C9/C6-C10 fractions may be determined by a purge and trap technique and GC/MS because of the potential for volatiles loss. Total Recoveerable Hydrocarbons - Silica (TRH-Silica) follows the same method of analysis after silica gel cleanup of the solvent extract. Aliphatic/Aromatic Speciation follows the same method of analysis after fractionation of the solvent extract over silica with differential polarity of the eluent solvents.
AN403	The GC/FID method is not well suited to the analysis of refined high boiling point materials (ie lubricating oils or greases) but is particularly suited for measuring diesel, kerosene and petrol if care to control volatility is taken. This method will detect naturally occurring hydrocarbons, lipids, animal fats, phenols and PAHs if they are present at sufficient levels, dependent on the use of specific cleanup/fractionation techniques. Reference USEPA 3510B, 8015B.

AN420	(SVOCs) including OC, OP, PCB, Herbicides, PAH, Phthalates and Speciated Phenols (etc) in soils, sediments and waters are determined by GCMS/ECD technique following appropriate solvent extraction process (Based on USEPA 3500C and 8270D). Total PAH calculated from individual analyte detections at or above the limit of reporting .
AN433	VOCs and C6-C9 Hydrocarbons by GC-MS P&T: VOC`s are volatile organic compounds. The sample is presented to a gas chromatograph via a purge and trap (P&T) concentrator and autosampler and is detected with a Mass Spectrometer (MSD). Solid samples are initially extracted with methanol whilst liquid samples are processed directly. References: USEPA 5030B, 8020A, 8260.

FOOTNOTES

*	NATA accreditation does not cover the performance of this service.	-	Not analysed.	UOM	Unit of Measure.
**	Indicative data, theoretical holding time exceeded.	NVL	Not validated.	LOR	Limit of Reporting.
***	Indicates that both * and ** apply.	IS	Insufficient sample for analysis.	↑↓	Raised/lowered Limit of Reporting.
		LNR	Sample listed, but not received.		

Unless it is reported that sampling has been performed by SGS, the samples have been analysed as received.
Solid samples expressed on a dry weight basis.

Where "Total" analyte groups are reported (for example, Total PAHs, Total OC Pesticides) the total will be calculated as the sum of the individual analytes, with those analytes that are reported as <LOR being assumed to be zero. The summed (Total) limit of reporting is calculated by summing the individual analyte LORs and dividing by two. For example, where 16 individual analytes are being summed and each has an LOR of 0.1 mg/kg, the "Totals" LOR will be 1.6 / 2 (0.8 mg/kg). Where only 2 analytes are being summed, the " Total" LOR will be the sum of those two LORs.

Some totals may not appear to add up because the total is rounded after adding up the raw values.

If reported, measurement uncertainty follow the ± sign after the analytical result and is expressed as the expanded uncertainty calculated using a coverage factor of 2, providing a level of confidence of approximately 95%, unless stated otherwise in the comments section of this report.

Results reported for samples tested under test methods with codes starting with ARS-SOP, radionuclide or gross radioactivity concentrations are expressed in becquerel (Bq) per unit of mass or volume or per wipe as stated on the report. Becquerel is the SI unit for activity and equals one nuclear transformation per second.
Note that in terms of units of radioactivity:

a. 1 Bq is equivalent to 27 pCi
b. 37 MBq is equivalent to 1 mCi

For results reported for samples tested under test methods with codes starting with ARS-SOP, less than (<) values indicate the detection limit for each radionuclide or parameter for the measurement system used. The respective detection limits have been calculated in accordance with ISO 11929.

The QC and MU criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here: www.sgs.com.au/en-gb/environment-health-and-safety.

STATEMENT OF QA/QC PERFORMANCE

SE245981 R0

CLIENT DETAILS

Contact	Daniel Duffy
Client	EI AUSTRALIA
Address	SUITE 6.01 55 MILLER STREET PYRMONT NSW 2009
Telephone	61 2 95160722
Facsimile	(Not specified)
Email	daniel.duffy@eiaustralia.com.au
Project	**E25874 10-28 Lawrence St, Freshwater**
Order Number	**E25874**
Samples	2

LABORATORY DETAILS

Manager	Huong Crawford
Laboratory	SGS Alexandria Environmental
Address	Unit 16, 33 Maddox St Alexandria NSW 2015
Telephone	+61 2 8594 0400
Facsimile	+61 2 8594 0499
Email	au.environmental.sydney@sgs.com
SGS Reference	**SE245981 R0**
Date Received	14 Apr 2023
Date Reported	21 Apr 2023

COMMENTS

All the laboratory data for each environmental matrix was compared to SGS' stated Data Quality Objectives (DQO). Comments arising from the comparison were made and are reported below.

The data relating to sampling was taken from the Chain of Custody document.
This QA/QC Statement must be read in conjunction with the referenced Analytical Report.
The Statement and the Analytical Report must not be reproduced except in full.

All Data Quality Objectives were met with the exception of the following:

Extraction Date	pH in water	2 items
	Turbidity	2 items
Analysis Date	pH in water	2 items
	Turbidity	2 items

SAMPLE SUMMARY

Type of documentation received	COC	Date documentation received	14/4/2023
Samples received in good order	Yes	Samples received without headspace	Yes
Sample temperature upon receipt	10.3C	Sample container provider	SGS
Turnaround time requested	Standard	Samples received in correct containers	Yes
Sufficient sample for analysis	Yes	Sample cooling method	Ice Bricks
Samples clearly labelled	Yes	Complete documentation received	Yes

SGS holding time criteria are drawn from current regulations and are highly dependent on sample container preservation as specified in the SGS "Field Sampling Guide for Containers and Holding Time" (ref: GU-(AU)-ENV.001). Soil samples guidelines are derived from NEPM "Schedule B(3) Guideline on Laboratory Analysis of Potentially Contaminated Soils". Water sample guidelines are derived from "AS/NZS 5667.1 : 1998 Water Quality - sampling part 1" and APHA "Standard Methods for the Examination of Water and Wastewater" 21st edition 2005.

Extraction and analysis holding time due dates listed are calculated from the date sampled, although holding times may be extended after laboratory extraction for some analytes. The due dates are the suggested dates that samples may be held before extraction or analysis and still be considered valid.

Extraction and analysis dates are shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria. If the sampled date is not supplied then compliance with criteria cannot be determined. If the received date is after one or both due dates then holding time will fail by default.

Conductivity and TDS by Calculation - Water

Method: ME-(AU)-[ENV]AN106

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH101M	SE245981.001	LB276870	13 Apr 2023	14 Apr 2023	11 May 2023	17 Apr 2023	11 May 2023	18 Apr 2023
BH102M	SE245981.002	LB276870	13 Apr 2023	14 Apr 2023	11 May 2023	17 Apr 2023	11 May 2023	18 Apr 2023

Mercury (dissolved) in Water

Method: ME-(AU)-[ENV]AN311(Perth)/AN312

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH101M	SE245981.001	LB276772	13 Apr 2023	14 Apr 2023	11 May 2023	17 Apr 2023	11 May 2023	17 Apr 2023
BH102M	SE245981.002	LB276772	13 Apr 2023	14 Apr 2023	11 May 2023	17 Apr 2023	11 May 2023	17 Apr 2023

Metals in Water (Dissolved) by ICPOES

Method: ME-(AU)-[ENV]AN320

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH101M	SE245981.001	LB277055	13 Apr 2023	14 Apr 2023	10 Oct 2023	19 Apr 2023	10 Oct 2023	19 Apr 2023
BH102M	SE245981.002	LB277055	13 Apr 2023	14 Apr 2023	10 Oct 2023	19 Apr 2023	10 Oct 2023	19 Apr 2023

PAH (Polynuclear Aromatic Hydrocarbons) in Water

Method: ME-(AU)-[ENV]AN420

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH101M	SE245981.001	LB276781	13 Apr 2023	14 Apr 2023	20 Apr 2023	17 Apr 2023	27 May 2023	19 Apr 2023
BH102M	SE245981.002	LB276781	13 Apr 2023	14 Apr 2023	20 Apr 2023	17 Apr 2023	27 May 2023	19 Apr 2023

pH in water

Method: ME-(AU)-[ENV]AN101

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH101M	SE245981.001	LB276870	13 Apr 2023	14 Apr 2023	14 Apr 2023	17 Apr 2023†	14 Apr 2023	18 Apr 2023†
BH102M	SE245981.002	LB276870	13 Apr 2023	14 Apr 2023	14 Apr 2023	17 Apr 2023†	14 Apr 2023	18 Apr 2023†

Total Cyanide in water by Discrete Analyser

Method: ME-(AU)-[ENV]AN077/AN287

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH101M	SE245981.001	LB277244	13 Apr 2023	14 Apr 2023	27 Apr 2023	20 Apr 2023	27 Apr 2023	20 Apr 2023
BH102M	SE245981.002	LB277244	13 Apr 2023	14 Apr 2023	27 Apr 2023	20 Apr 2023	27 Apr 2023	20 Apr 2023

Total Dissolved Solids (TDS) in water

Method: ME-(AU)-[ENV]AN113

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH101M	SE245981.001	LB277098	13 Apr 2023	14 Apr 2023	20 Apr 2023	20 Apr 2023	20 Apr 2023	20 Apr 2023
BH102M	SE245981.002	LB277098	13 Apr 2023	14 Apr 2023	20 Apr 2023	20 Apr 2023	20 Apr 2023	20 Apr 2023

Total Phenolics in Water

Method: ME-(AU)-[ENV]AN295

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH101M	SE245981.001	LB276922	13 Apr 2023	14 Apr 2023	27 Apr 2023	18 Apr 2023	27 Apr 2023	18 Apr 2023
BH102M	SE245981.002	LB276922	13 Apr 2023	14 Apr 2023	27 Apr 2023	18 Apr 2023	27 Apr 2023	18 Apr 2023

Trace Metals (Dissolved) in Water by ICPMS

Method: ME-(AU)-[ENV]AN318

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH101M	SE245981.001	LB276766	13 Apr 2023	14 Apr 2023	10 Oct 2023	17 Apr 2023	10 Oct 2023	17 Apr 2023
BH102M	SE245981.002	LB276766	13 Apr 2023	14 Apr 2023	10 Oct 2023	17 Apr 2023	10 Oct 2023	17 Apr 2023

TRH (Total Recoverable Hydrocarbons) in Water

Method: ME-(AU)-[ENV]AN403

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH101M	SE245981.001	LB276781	13 Apr 2023	14 Apr 2023	20 Apr 2023	17 Apr 2023	27 May 2023	19 Apr 2023
BH102M	SE245981.002	LB276781	13 Apr 2023	14 Apr 2023	20 Apr 2023	17 Apr 2023	27 May 2023	19 Apr 2023

Turbidity

Method: ME-(AU)-[ENV]AN119

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH101M	SE245981.001	LB276874	13 Apr 2023	14 Apr 2023	14 Apr 2023	17 Apr 2023†	14 Apr 2023	17 Apr 2023†
BH102M	SE245981.002	LB276874	13 Apr 2023	14 Apr 2023	14 Apr 2023	17 Apr 2023†	14 Apr 2023	17 Apr 2023†

VOCs in Water

Method: ME-(AU)-[ENV]AN433

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH101M	SE245981.001	LB277074	13 Apr 2023	14 Apr 2023	27 Apr 2023	19 Apr 2023	27 Apr 2023	21 Apr 2023
BH102M	SE245981.002	LB277074	13 Apr 2023	14 Apr 2023	27 Apr 2023	19 Apr 2023	27 Apr 2023	21 Apr 2023

Volatile Petroleum Hydrocarbons in Water

Method: ME-(AU)-[ENV]AN433

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH101M	SE245981.001	LB277074	13 Apr 2023	14 Apr 2023	27 Apr 2023	19 Apr 2023	27 Apr 2023	21 Apr 2023
BH102M	SE245981.002	LB277074	13 Apr 2023	14 Apr 2023	27 Apr 2023	19 Apr 2023	27 Apr 2023	21 Apr 2023

SURROGATES

Surrogate results are evaluated against upper and lower limit criteria established in the SGS QA/QC plan (Ref: MP-(AU)-[ENV]QU-022). At least two of three routine level soil sample surrogate spike recoveries for BTEX/VOC are to be within 70-130% where control charts have not been developed and within the established control limits for charted surrogates. Matrix effects may void this as an acceptance criterion. Water sample surrogate spike recoveries are to be within 40-130%. The presence of emulsions, surfactants and particulates may void this as an acceptance criterion.

Result is shown in **Green** when within suggested criteria or **Red** with an appended reason identifer when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

PAH (Polynuclear Aromatic Hydrocarbons) in Water

Method: ME-(AU)-[ENV]AN420

Parameter	Sample Name	Sample Number	Units	Criteria	Recovery %
2-fluorobiphenyl (Surrogate)	BH101M	SE245981.001	%	40 - 130%	83
	BH102M	SE245981.002	%	40 - 130%	87
d14-p-terphenyl (Surrogate)	BH101M	SE245981.001	%	40 - 130%	71
	BH102M	SE245981.002	%	40 - 130%	75
d5-nitrobenzene (Surrogate)	BH101M	SE245981.001	%	40 - 130%	85
	BH102M	SE245981.002	%	40 - 130%	116

VOCs in Water

Method: ME-(AU)-[ENV]AN433

Parameter	Sample Name	Sample Number	Units	Criteria	Recovery %
Bromofluorobenzene (Surrogate)	BH101M	SE245981.001	%	40 - 130%	88
	BH102M	SE245981.002	%	40 - 130%	94
d4-1,2-dichloroethane (Surrogate)	BH101M	SE245981.001	%	40 - 130%	86
	BH102M	SE245981.002	%	40 - 130%	83
d8-toluene (Surrogate)	BH101M	SE245981.001	%	40 - 130%	100
	BH102M	SE245981.002	%	40 - 130%	94

Volatile Petroleum Hydrocarbons in Water

Method: ME-(AU)-[ENV]AN433

Parameter	Sample Name	Sample Number	Units	Criteria	Recovery %
Bromofluorobenzene (Surrogate)	BH101M	SE245981.001	%	40 - 130%	88
	BH102M	SE245981.002	%	40 - 130%	94
d4-1,2-dichloroethane (Surrogate)	BH101M	SE245981.001	%	60 - 130%	86
	BH102M	SE245981.002	%	60 - 130%	83
d8-toluene (Surrogate)	BH101M	SE245981.001	%	40 - 130%	100
	BH102M	SE245981.002	%	40 - 130%	94

Blank results are evaluated against the limit of reporting (LOR), for the chosen method and its associated instrumentation, typically 2.5 times the statistically determined method detection limit (MDL).

Result is shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria.

Conductivity and TDS by Calculation - Water

Method: ME-(AU)-[ENV]AN106

Sample Number	Parameter	Units	LOR	Result
LB276870.001	Conductivity @ 25 C	µS/cm	2	<2

Mercury (dissolved) in Water

Method: ME-(AU)-[ENV]AN311(Perth)/AN312

Sample Number	Parameter	Units	LOR	Result
LB276772.001	Mercury	mg/L	0.0001	<0.0001

Metals in Water (Dissolved) by ICPOES

Method: ME-(AU)-[ENV]AN320

Sample Number	Parameter	Units	LOR	Result
LB277055.001	Calcium, Ca	mg/L	0.2	<0.2
	Magnesium, Mg	mg/L	0.1	<0.1

PAH (Polynuclear Aromatic Hydrocarbons) in Water

Method: ME-(AU)-[ENV]AN420

Sample Number		Parameter	Units	LOR	Result
LB276781.001		Naphthalene	µg/L	0.1	<0.1
		2-methylnaphthalene	µg/L	0.1	<0.1
		1-methylnaphthalene	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-cd)pyrene	µg/L	0.1	<0.1
		Dibenzo(ah)anthracene	µg/L	0.1	<0.1
		Benzo(ghi)perylene	µg/L	0.1	<0.1
	Surrogates	d5-nitrobenzene (Surrogate)	%	-	98
		2-fluorobiphenyl (Surrogate)	%	-	88
		d14-p-terphenyl (Surrogate)	%	-	96

Total Cyanide in water by Discrete Analyser

Method: ME-(AU)-[ENV]AN077/AN287

Sample Number	Parameter	Units	LOR	Result
LB277244.001	Total Cyanide	mg/L	0.004	<0.004

Total Dissolved Solids (TDS) in water

Method: ME-(AU)-[ENV]AN113

Sample Number	Parameter	Units	LOR	Result
LB277098.001	Total Dissolved Solids Dried at 175-185°C	mg/L	10	<10

Total Phenolics in Water

Method: ME-(AU)-[ENV]AN295

Sample Number	Parameter	Units	LOR	Result
LB276922.001	Total Phenols	mg/L	0.05	<0.05

Trace Metals (Dissolved) in Water by ICPMS

Method: ME-(AU)-[ENV]AN318

Sample Number	Parameter	Units	LOR	Result
LB276766.001	Aluminium	µg/L	5	<5
	Arsenic	µg/L	1	<1
	Cadmium	µg/L	0.1	<0.1
	Chromium	µg/L	1	<1
	Copper	µg/L	1	<1

Blank results are evaluated against the limit of reporting (LOR), for the chosen method and its associated instrumentation, typically 2.5 times the statistically determined method detection limit (MDL).

Result is shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria.

Trace Metals (Dissolved) in Water by ICPMS (continued)

Method: ME-(AU)-[ENV]AN318

Sample Number	Parameter	Units	LOR	Result
LB276766.001	Lead	µg/L	1	<1
	Nickel	µg/L	1	<1
	Zinc	µg/L	5	<5

TRH (Total Recoverable Hydrocarbons) in Water

Method: ME-(AU)-[ENV]AN403

Sample Number	Parameter	Units	LOR	Result
LB276781.001	TRH C10-C14	µg/L	50	<50
	TRH C15-C28	µg/L	200	<200
	TRH C29-C36	µg/L	200	<200
	TRH C37-C40	µg/L	200	<200

Turbidity

Method: ME-(AU)-[ENV]AN119

Sample Number	Parameter	Units	LOR	Result
LB276874.001	Turbidity	NTU	0.5	<0.5

VOCs in Water

Method: ME-(AU)-[ENV]AN433

Sample Number		Parameter	Units	LOR	Result
LB277074.001	Fumigants	2,2-dichloropropane	µg/L	0.5	<0.5
		1,2-dichloropropane	µg/L	0.5	<0.5
		cis-1,3-dichloropropene	µg/L	0.5	<0.5
		trans-1,3-dichloropropene	µg/L	0.5	<0.5
		1,2-dibromoethane (EDB)	µg/L	0.5	<0.5
	Halogenated Aliphatics	Dichlorodifluoromethane (CFC-12)	µg/L	5	<5
		Chloromethane	µg/L	5	<5
		Vinyl chloride (Chloroethene)	µg/L	0.3	<0.3
		Bromomethane	µg/L	10	<10
		Chloroethane	µg/L	5	<5
		Trichlorofluoromethane	µg/L	1	<1
		1,1-dichloroethene	µg/L	0.5	<0.5
		Iodomethane	µg/L	5	<5
		Dichloromethane (Methylene chloride)	µg/L	5	<5
		Allyl chloride	µg/L	2	<2
		trans-1,2-dichloroethene	µg/L	0.5	<0.5
		1,1-dichloroethane	µg/L	0.5	<0.5
		cis-1,2-dichloroethene	µg/L	0.5	<0.5
		Bromochloromethane	µg/L	0.5	<0.5
		1,2-dichloroethane	µg/L	0.5	<0.5
		1,1,1-trichloroethane	µg/L	0.5	<0.5
		1,1-dichloropropene	µg/L	0.5	<0.5
		Carbon tetrachloride	µg/L	0.5	<0.5
		Dibromomethane	µg/L	0.5	<0.5
		Trichloroethene (Trichloroethylene,TCE)	µg/L	0.5	<0.5
		1,1,2-trichloroethane	µg/L	0.5	<0.5
		1,3-dichloropropane	µg/L	0.5	<0.5
		Tetrachloroethene (Perchloroethylene,PCE)	µg/L	0.5	<0.5
		1,1,1,2-tetrachloroethane	µg/L	0.5	<0.5
		1,1,2,2-tetrachloroethane	µg/L	0.5	<0.5
		1,2,3-trichloropropane	µg/L	0.5	<0.5
		trans-1,4-dichloro-2-butene	µg/L	1	<1
		1,2-dibromo-3-chloropropane	µg/L	0.5	<0.5
		Hexachlorobutadiene	µg/L	0.5	<0.5
	Halogenated Aromatics	Chlorobenzene	µg/L	0.5	<0.5
		Bromobenzene	µg/L	0.5	<0.5
		2-chlorotoluene	µg/L	0.5	<0.5
		4-chlorotoluene	µg/L	0.5	<0.5
		1,3-dichlorobenzene	µg/L	0.5	<0.5
		1,4-dichlorobenzene	µg/L	0.3	<0.3
		1,2-dichlorobenzene	µg/L	0.5	<0.5
		1,2,4-trichlorobenzene	µg/L	0.5	<0.5
		1,2,3-trichlorobenzene	µg/L	0.5	<0.5

METHOD BLANKS

Blank results are evaluated against the limit of reporting (LOR), for the chosen method and its associated instrumentation, typically 2.5 times the statistically determined method detection limit (MDL).

Result is shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria.

VOCs in Water (continued)

Method: ME-(AU)-[ENV]AN433

Sample Number		Parameter	Units	LOR	Result
LB277074.001	Monocyclic Aromatic Hydrocarbons	Benzene	µg/L	0.5	<0.5
		Toluene	µg/L	0.5	<0.5
		Ethylbenzene	µg/L	0.5	<0.5
		m/p-xylene	µg/L	1	<1
		Styrene (Vinyl benzene)	µg/L	0.5	<0.5
		o-xylene	µg/L	0.5	<0.5
		Isopropylbenzene (Cumene)	µg/L	0.5	<0.5
		n-propylbenzene	µg/L	0.5	<0.5
		1,3,5-trimethylbenzene	µg/L	0.5	<0.5
		tert-butylbenzene	µg/L	0.5	<0.5
		1,2,4-trimethylbenzene	µg/L	0.5	<0.5
		sec-butylbenzene	µg/L	0.5	<0.5
		p-isopropyltoluene	µg/L	0.5	<0.5
		n-butylbenzene	µg/L	0.5	<0.5
	Nitrogenous Compounds	Acrylonitrile	µg/L	0.5	<0.5
	Oxygenated Compounds	Acetone (2-propanone)	µg/L	10	<10
		MtBE (Methyl-tert-butyl ether)	µg/L	2	<2
		Vinyl acetate*	µg/L	10	<10
		MEK (2-butanone)	µg/L	10	<10
		MIBK (4-methyl-2-pentanone)	µg/L	5	<5
		2-hexanone (MBK)	µg/L	5	<5
	Polycyclic VOCs	Naphthalene (VOC)*	µg/L	0.5	<0.5
	Sulphonated	Carbon disulfide	µg/L	2	<2
	Surrogates	d4-1,2-dichloroethane (Surrogate)	%	-	89
		d8-toluene (Surrogate)	%	-	96
		Bromofluorobenzene (Surrogate)	%	-	102
	Trihalomethanes	Chloroform (THM)	µg/L	0.5	<0.5
		Bromodichloromethane (THM)	µg/L	0.5	<0.5
		Dibromochloromethane (THM)	µg/L	0.5	<0.5
		Bromoform (THM)	µg/L	0.5	<0.5

Volatile Petroleum Hydrocarbons in Water

Method: ME-(AU)-[ENV]AN433

Sample Number		Parameter	Units	LOR	Result
LB277074.001		TRH C6-C9	µg/L	40	<40
	Surrogates	d4-1,2-dichloroethane (Surrogate)	%	-	89
		d8-toluene (Surrogate)	%	-	96
		Bromofluorobenzene (Surrogate)	%	-	102

DUPLICATES

Duplicates are calculated as Relative Percentage Difference (RPD) using the formula: RPD = | OriginalResult - ReplicateResult | x 100 / Mean
The RPD is evaluated against the Maximum Allowable Difference (MAD) criteria and can be graphically represented by a curve calculated from the Statistical Detection Limit (SDL) and Limiting Repeatability (LR) using the formula: MAD = 100 x SDL / Mean + LR
Where the Maximum Allowable Difference evaluates to a number larger than 200 it is displayed as 200.

RPD is shown in **Green** when within suggested criteria or **Red** with an appended reason identifer when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

NOTE: The RPD reported is calculated from the unrounded data for the original and replicate result. Manual calculation of the RPD from the rounded data reported may give a different calculated RPD.

Conductivity and TDS by Calculation - Water

Method: ME-(AU)-[ENV]AN106

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE246031.001	LB276870.014	Conductivity @ 25 C	µS/cm	2	3100	3100	15	0
SE246033.001	LB276870.017	Conductivity @ 25 C	µS/cm	2	3300	3300	15	0

Mercury (dissolved) in Water

Method: ME-(AU)-[ENV]AN311(Perth)/AN312

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE245980.003	LB276772.014	Mercury	µg/L	0.0001	<0.0001	<0.0001	200	0
SE245984.009	LB276772.022	Mercury	µg/L	0.0001	<0.0001	<0.0001	200	190

Metals in Water (Dissolved) by ICPOES

Method: ME-(AU)-[ENV]AN320

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE245981.002	LB277055.014	Calcium, Ca	mg/L	0.2	1.2	1.2	32	1
		Magnesium, Mg	mg/L	0.1	3.3	3.3	18	0
SE246113.001	LB277055.020	Calcium, Ca	mg/L	0.2	40	40	15	0
		Magnesium, Mg	mg/L	0.1	9.1	9.0	16	1

Total Dissolved Solids (TDS) in water

Method: ME-(AU)-[ENV]AN113

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE245993.003	LB277098.013	Total Dissolved Solids Dried at 175-185°C	mg/L	10	270	290	19	9
SE246146.002	LB277098.019	Total Dissolved Solids Dried at 175-185°C	mg/L	10	2500	2800	15	12

Total Phenolics in Water

Method: ME-(AU)-[ENV]AN295

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE246033.001	LB276922.011	Total Phenols	mg/L	0.05	0.37	0.37	29	0

Trace Metals (Dissolved) in Water by ICPMS

Method: ME-(AU)-[ENV]AN318

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE245981.001	LB276766.014	Aluminium	µg/L	5	1200	1200	15	1
		Arsenic	µg/L	1	<1	<1	200	0
		Cadmium	µg/L	0.1	<0.1	<0.1	200	0
		Chromium	µg/L	1	1	1	97	4
		Copper	µg/L	1	4	4	40	0
		Lead	µg/L	1	1	1	110	0
		Nickel	µg/L	1	2	2	69	7
		Zinc	µg/L	5	9	8	74	5
SE245984.009	LB276766.017	Arsenic	µg/L	1	<1	<1	200	0
		Cadmium	µg/L	0.1	<0.1	<0.1	200	0
		Chromium	µg/L	1	<1	<1	200	0
		Copper	µg/L	1	<1	<1	200	0
		Lead	µg/L	1	<1	<1	200	0
		Nickel	µg/L	1	<1	<1	200	0
		Zinc	µg/L	5	<5	<5	200	0

TRH (Total Recoverable Hydrocarbons) in Water

Method: ME-(AU)-[ENV]AN403

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE245847.008	LB276781.024	TRH C10-C14	µg/L	50	<50	<50	200	0
		TRH C15-C28	µg/L	200	<200	<200	200	0
		TRH C29-C36	µg/L	200	<200	<200	200	0
		TRH C37-C40	µg/L	200	<200	<200	200	0
		TRH C10-C40	µg/L	320	<320	<320	200	0
	TRH F Bands	TRH >C10-C16	µg/L	60	<60	<60	200	0
		TRH >C10-C16 - Naphthalene (F2)	µg/L	60	<60	<60	200	0
		TRH >C16-C34 (F3)	µg/L	500	<500	<500	200	0
		TRH >C34-C40 (F4)	µg/L	500	<500	<500	200	0
SE245914.001	LB276781.014	TRH C10-C14	µg/L	50	750	820	36	8
		TRH C15-C28	µg/L	200	1200	1200	46	1
		TRH C29-C36	µg/L	200	<200	300	115	40
		TRH C37-C40	µg/L	200	<200	<200	200	0

DUPLICATES

Duplicates are calculated as Relative Percentage Difference (RPD) using the formula: RPD = | OriginalResult - ReplicateResult | x 100 / Mean
The RPD is evaluated against the Maximum Allowable Difference (MAD) criteria and can be graphically represented by a curve calculated from the Statistical Detection Limit (SDL) and Limiting Repeatability (LR) using the formula: MAD = 100 x SDL / Mean + LR
Where the Maximum Allowable Difference evaluates to a number larger than 200 it is displayed as 200.

RPD is shown in **Green** when within suggested criteria or **Red** with an appended reason identifer when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

NOTE: The RPD reported is calculated from the unrounded data for the original and replicate result. Manual calculation of the RPD from the rounded data reported may give a different calculated RPD.

TRH (Total Recoverable Hydrocarbons) in Water (continued)

Method: ME-(AU)-[ENV]AN403

Original	Duplicate		Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE245914.001	LB276781.014		TRH C10-C40	µg/L	320	2200	2400	44	9
		TRH F Bands	TRH >C10-C16	µg/L	60	940	1000	36	8
			TRH >C10-C16 - Naphthalene (F2)	µg/L	60	940	1000	36	8
			TRH >C16-C34 (F3)	µg/L	500	1200	1300	72	8
			TRH >C34-C40 (F4)	µg/L	500	<500	<500	200	0

Turbidity

Method: ME-(AU)-[ENV]AN119

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE246047.005	LB276874.015	Turbidity	NTU	0.5	0.8	0.7	84	10

VOCs in Water

Method: ME-(AU)-[ENV]AN433

Original	Duplicate		Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE245980.001	LB277074.026	Monocyclic Aromatic	Benzene	µg/L	0.5	0	0	200	0
			Toluene	µg/L	0.5	0.0286629687	0.0472509298	200	0
			Ethylbenzene	µg/L	0.5	0.0144615853	0.0261419564	200	0
			m/p-xylene	µg/L	1	0.0441065188	0.0775423281	200	0
			o-xylene	µg/L	0.5	0.0519925722	0.0639864861	200	0
		Polycyclic	Naphthalene (VOC)*	µg/L	0.5	0	0.0213033574	200	0
		Surrogates	d4-1,2-dichloroethane (Surrogate)	µg/L	-	11.9	11.0	30	8
			d8-toluene (Surrogate)	µg/L	-	9.9	9.6	30	4
			Bromofluorobenzene (Surrogate)	µg/L	-	9.2	9.2	30	1
		Totals	Total BTEX	µg/L	3	0	0	200	0
SE245980.004	LB277074.027	Monocyclic Aromatic	Benzene	µg/L	0.5	0	0	200	0
			Toluene	µg/L	0.5	0.1476371371	0.1906563340	200	0
			Ethylbenzene	µg/L	0.5	0.0106981302	0.0182807136	200	0
			m/p-xylene	µg/L	1	0.0264345021	0.0456802153	200	0
			o-xylene	µg/L	0.5	0.0136747708	0.0189716808	200	0
		Polycyclic	Naphthalene (VOC)*	µg/L	0.5	0.0004511700	0.0150586975	200	0
		Surrogates	d4-1,2-dichloroethane (Surrogate)	µg/L	-	12.3	11.6	30	6
			d8-toluene (Surrogate)	µg/L	-	10.0	9.9	30	1
			Bromofluorobenzene (Surrogate)	µg/L	-	9.3	9.4	30	1
		Totals	Total BTEX	µg/L	3	0	0	200	0

Volatile Petroleum Hydrocarbons in Water

Method: ME-(AU)-[ENV]AN433

Original	Duplicate		Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE245980.001	LB277074.026		TRH C6-C10	µg/L	50	0	2.3392072837	200	0
			TRH C6-C9	µg/L	40	0	0	200	0
		Surrogates	d4-1,2-dichloroethane (Surrogate)	µg/L	-	11.8939772865	10.957696644	30	8
			d8-toluene (Surrogate)	µg/L	-	9.9097979444	9.5656576592	30	4
			Bromofluorobenzene (Surrogate)	µg/L	-	9.2300491127	9.1664359727	30	1
		VPH F Bands	Benzene (F0)	µg/L	0.5	0	0	200	0
			TRH C6-C10 minus BTEX (F1)	µg/L	50	0	2.3392072837	200	0
SE245980.004	LB277074.027		TRH C6-C10	µg/L	50	0	2.7252097393	200	0
			TRH C6-C9	µg/L	40	0	0	200	0
		Surrogates	d4-1,2-dichloroethane (Surrogate)	µg/L	-	12.2798489495	11.577281744	30	6
			d8-toluene (Surrogate)	µg/L	-	9.9801396783	9.8954317038	30	1
			Bromofluorobenzene (Surrogate)	µg/L	-	9.2953389642	9.3617044018	30	1
		VPH F Bands	Benzene (F0)	µg/L	0.5	0	0	200	0
			TRH C6-C10 minus BTEX (F1)	µg/L	50	0	2.7252097393	200	0

Laboratory Control Standard (LCS) results are evaluated against an expected result, typically the concentration of analyte spiked into the control during the sample preparation stage, producing a percentage recovery. The criteria applied to the percentage recovery is established in the SGS QA /QC plan (Ref: MP-(AU)-[ENV]QU-022). For more information refer to the footnotes in the concluding page of this report.

Recovery is shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria.

Conductivity and TDS by Calculation - Water

Method: ME-(AU)-[ENV]AN106

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB276870.002	Conductivity @ 25 C	µS/cm	2	300	303	90 - 110	100

Metals in Water (Dissolved) by ICPOES

Method: ME-(AU)-[ENV]AN320

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB277055.002	Calcium, Ca	mg/L	0.2	50	50.5	80 - 120	98
	Magnesium, Mg	mg/L	0.1	49	50.5	80 - 120	98

PAH (Polynuclear Aromatic Hydrocarbons) in Water

Method: ME-(AU)-[ENV]AN420

Sample Number		Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB276781.002		Naphthalene	µg/L	0.1	42	40	60 - 140	104
		Acenaphthylene	µg/L	0.1	50	40	60 - 140	125
		Acenaphthene	µg/L	0.1	45	40	60 - 140	113
		Phenanthrene	µg/L	0.1	45	40	60 - 140	112
		Anthracene	µg/L	0.1	45	40	60 - 140	113
		Fluoranthene	µg/L	0.1	48	40	60 - 140	121
		Pyrene	µg/L	0.1	48	40	60 - 140	119
		Benzo(a)pyrene	µg/L	0.1	54	40	60 - 140	134
	Surrogates	d5-nitrobenzene (Surrogate)	µg/L	-	0.51	0.5	40 - 130	102
		2-fluorobiphenyl (Surrogate)	µg/L	-	0.47	0.5	40 - 130	94
		d14-p-terphenyl (Surrogate)	µg/L	-	0.47	0.5	40 - 130	94

pH in water

Method: ME-(AU)-[ENV]AN101

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB276870.003	pH**	pH Units	0.1	7.4	7.415	98 - 102	99

Total Cyanide in water by Discrete Analyser

Method: ME-(AU)-[ENV]AN077/AN287

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB277244.002	Total Cyanide	mg/L	0.004	0.024	0.025	80 - 120	96

Total Phenolics in Water

Method: ME-(AU)-[ENV]AN295

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB276922.002	Total Phenols	mg/L	0.05	0.20	0.2	80 - 120	98

Trace Metals (Dissolved) in Water by ICPMS

Method: ME-(AU)-[ENV]AN318

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB276766.002	Aluminium	µg/L	5	21	20	80 - 120	106
	Arsenic	µg/L	1	20	20	80 - 120	101
	Cadmium	µg/L	0.1	20	20	80 - 120	99
	Chromium	µg/L	1	20	20	80 - 120	99
	Copper	µg/L	1	20	20	80 - 120	98
	Lead	µg/L	1	21	20	80 - 120	103
	Nickel	µg/L	1	20	20	80 - 120	101
	Zinc	µg/L	5	20	20	80 - 120	102

TRH (Total Recoverable Hydrocarbons) in Water

Method: ME-(AU)-[ENV]AN403

Sample Number		Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB276781.002		TRH C10-C14	µg/L	50	1300	1200	60 - 140	107
		TRH C15-C28	µg/L	200	1600	1200	60 - 140	130
		TRH C29-C36	µg/L	200	1400	1200	60 - 140	116
	TRH F Bands	TRH >C10-C16	µg/L	60	1500	1200	60 - 140	122
		TRH >C16-C34 (F3)	µg/L	500	1600	1200	60 - 140	136
		TRH >C34-C40 (F4)	µg/L	500	820	600	60 - 140	136

VOCs in Water

Method: ME-(AU)-[ENV]AN433

Sample Number	Parameter	Units	LOR

Laboratory Control Standard (LCS) results are evaluated against an expected result, typically the concentration of analyte spiked into the control during the sample preparation stage, producing a percentage recovery. The criteria applied to the percentage recovery is established in the SGS QA /QC plan (Ref: MP-(AU)-[ENV]QU-022). For more information refer to the footnotes in the concluding page of this report.

Recovery is shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria.

VOCs in Water (continued)

Method: ME-(AU)-[ENV]AN433

Sample Number		Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB277074.002	Halogenated Aliphatics	1,1-dichloroethene	µg/L	0.5	54	45.45	60 - 140	118
		1,2-dichloroethane	µg/L	0.5	50	45.45	60 - 140	111
		Trichloroethene (Trichloroethylene,TCE)	µg/L	0.5	51	45.45	60 - 140	111
	Halogenated	Chlorobenzene	µg/L	0.5	52	45.45	60 - 140	115
	Monocyclic Aromatic	Benzene	µg/L	0.5	53	45.45	60 - 140	116
		Toluene	µg/L	0.5	53	45.45	60 - 140	116
		Ethylbenzene	µg/L	0.5	52	45.45	60 - 140	114
		m/p-xylene	µg/L	1	100	90.9	60 - 140	112
		o-xylene	µg/L	0.5	51	45.45	60 - 140	111
	Surrogates	d4-1,2-dichloroethane (Surrogate)	µg/L	-	11	10	60 - 140	105
		d8-toluene (Surrogate)	µg/L	-	10	10	70 - 130	104
		Bromofluorobenzene (Surrogate)	µg/L	-	10	10	70 - 130	104
	Trihalomethan	Chloroform (THM)	µg/L	0.5	56	45.45	60 - 140	124

Volatile Petroleum Hydrocarbons in Water

Method: ME-(AU)-[ENV]AN433

Sample Number		Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB277074.002		TRH C6-C10	µg/L	50	940	946.63	60 - 140	99
		TRH C6-C9	µg/L	40	780	818.71	60 - 140	95
	Surrogates	d4-1,2-dichloroethane (Surrogate)	µg/L	-	11	10	60 - 140	105
		d8-toluene (Surrogate)	µg/L	-	10	10	70 - 130	104
		Bromofluorobenzene (Surrogate)	µg/L	-	10	10	70 - 130	104
	VPH F Bands	TRH C6-C10 minus BTEX (F1)	µg/L	50	630	639.67	60 - 140	98

Matrix Spike (MS) results are evaluated as the percentage recovery of an expected result, typically the concentration of analyte spiked into a field sub-sample during the sample preparation stage. The original sample's result is subtracted from the sub-sample result before determining the percentage recovery. The criteria applied to the percentage recovery is established in the SGS QA/QC plan (ref: MP-(AU)-[ENV]QU-022). For more information refer to the footnotes in the concluding page of this report.

Recovery is shown in **Green** when within suggested criteria or **Red** with an appended reason identifer when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

Mercury (dissolved) in Water

Method: ME-(AU)-[ENV]AN311(Perth)/AN312

QC Sample	Sample Number	Parameter	Units	LOR	Result	Original	Spike	Recovery%
SE245839.042	LB276772.004	Mercury	mg/L	0.0001	0.0017	<0.0001	0.008	87

Total Phenolics in Water

Method: ME-(AU)-[ENV]AN295

QC Sample	Sample Number	Parameter	Units	LOR	Result	Original	Spike	Recovery%
SE246024.001	LB276922.004	Total Phenols	mg/L	0.05	0.20	<0.05	0.2	99

VOCs in Water

Method: ME-(AU)-[ENV]AN433

QC Sample	Sample Number		Parameter	Units	LOR	Original	Spike	Recovery%
SE245925.001	LB277074.028	Monocyclic Aromatic	Benzene	μg/L	0.5	0	45.45	124
			Toluene	μg/L	0.5	0.02422350088	45.45	126
			Ethylbenzene	μg/L	0.5	0.00303721191	45.45	123
			m/p-xylene	μg/L	1	0.00746876440	90.9	125
			o-xylene	μg/L	0.5	0.00294942045	45.45	124
		Polycyclic	Naphthalene (VOC)*	μg/L	0.5	0.00547244836	-	-
		Surrogates	d4-1,2-dichloroethane (Surrogate)	μg/L	-	11.93800737443	-	121
			d8-toluene (Surrogate)	μg/L	-	10.02531851656	-	103
			Bromofluorobenzene (Surrogate)	μg/L	-	9.49129776320	-	112
		Totals	Total BTEX	μg/L	3	0	-	-

Volatile Petroleum Hydrocarbons in Water

Method: ME-(AU)-[ENV]AN433

QC Sample	Sample Number		Parameter	Units	LOR	Original	Spike	Recovery%
SE245925.001	LB277074.028		TRH C6-C10	μg/L	50	0	946.63	93
			TRH C6-C9	μg/L	40	0	818.71	94
		Surrogates	d4-1,2-dichloroethane (Surrogate)	μg/L	-	11.93800737443	-	121
			d8-toluene (Surrogate)	μg/L	-	10.02531851656	-	103
			Bromofluorobenzene (Surrogate)	μg/L	-	9.49129776320	-	112
		VPH F Bands	Benzene (F0)	μg/L	0.5	0	-	-
			TRH C6-C10 minus BTEX (F1)	μg/L	50	0	639.67	84

MATRIX SPIKE DUPLICATES

Matrix spike duplicates are calculated as Relative Percent Difference (RPD) using the formula: RPD = | OriginalResult - ReplicateResult | x 100 / Mean

The original result is the analyte concentration of the matrix spike. The Duplicate result is the analyte concentration of the matrix spike duplicate.

The RPD is evaluated against the Maximum Allowable Difference (MAD) criteria and can be graphically represented by a curve calculated from the Statistical Detection Limit (SDL) and Limiting Repeatability (LR) using the formula: MAD = 100 x SDL / Mean + LR

Where the Maximum Allowable Difference evaluates to a number larger than 200 it is displayed as 200.

RPD is shown in **Green** when within suggested criteria or **Red** with an appended reason identifer when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

No matrix spike duplicates were required for this job.

FOOTNOTES

Samples analysed as received.

Solid samples expressed on a dry weight basis.

QC criteria are subject to internal review according to the SGS QA/QC plan and may be provided on request or alternatively can be found here: https://www.sgs.com.au/~/media/Local/Australia/Documents/Technical Documents/MP-AU-ENV-QU-022 QA QC Plan.pdf

*	NATA accreditation does not cover the performance of this service.
**	Indicative data, theoretical holding time exceeded.
***	Indicates that both * and ** apply.
-	Sample not analysed for this analyte.
IS	Insufficient sample for analysis.
LNR	Sample listed, but not received.
LOR	Limit of reporting.
QFH	QC result is above the upper tolerance.
QFL	QC result is below the lower tolerance.
①	At least 2 of 3 surrogates are within acceptance criteria.
②	RPD failed acceptance criteria due to sample heterogeneity.
③	Results less than 5 times LOR preclude acceptance criteria for RPD.
④	Recovery failed acceptance criteria due to matrix interference.
⑤	Recovery failed acceptance criteria due to the presence of significant concentration of analyte (i.e. the concentration of analyte exceeds the spike level).
⑥	LOR was raised due to sample matrix interference.
⑦	LOR was raised due to dilution of significantly high concentration of analyte in sample.
⑧	Reanalysis of sample in duplicate confirmed sample heterogeneity and inconsistency of results.
⑨	Recovery failed acceptance criteria due to sample heterogeneity.
⑩	LOR was raised due to high conductivity of the sample (required dilution).
†	Refer to relevant report comments for further information.

Sheet 1 of 1

Site: 10-28 Lawrence St, Freshwater

Project No: E25874

Laboratory:

SGS Australia
Unit 16, 33 Maddox Street,
ALEXANDRIA NSW 2015
P: 02 8594 0400 F: 02 8594 0499

Sample ID	Laboratory ID	Container Type	Sampling		Sample Matrix				Analysis																			
			Date	Time	SOIL	WATER	0.45 µm field filtered	OTHER	HM^{A} /TRH/BTEX/PAHs OCP/OP/PCB/Asbestos	HM^{A} /TRH/BTEX/PAHs	HM^{A} /TRH/BTEX	BTEX	VOCs	Asbestos	Asbestos Quantification	Excavated Natural Material (ENM) Suite	ENM Suite - Stockpile discrete (TRH/BTEX/PAHs)	ENM Suite - Stockpile composite (HM^{A} /pH / EC / Foreign Materials)	Dewatering Suite	pH / pH peroxide	sPOCAS	Chromium Reducible Sulfur (CrS)	PFAS	pH / CEC (cation exchange)	pH / EC (electrical conductivity)	Sulphate / Chloride	Lead	TCLP HM^{B} / PAH
BH/01M	1	S,P,2VC	13/4/23	AM		X	X						X						X									
BH/02M	2	↓	↓	↓		X	X						↓						↓									

Comments

HM^{A}
Arsenic
Cadmium
Chromium
Copper
Lead
Mercury
Nickel
Zinc

HM^{B}
Arsenic
Cadmium
Chromium
Lead
Mercury
Nickel

[✓ **Dewatering Suite**]
pH & EC
TDS / TDU
Hardness
Total Cyanide
Metals (Al, As, Cd, Cr, Cu, Pb, Hg, Ni, Zn)
TRH (F1, F2, F3, F4)
BTEX
PAH
Total Phenol

LABORATORY TURNAROUND

- ☒ Standard
- ☐ 24 Hours
- ☐ 48 Hours
- ☐ 72 Hours
- ☐ Other______

SGS EHS Sydney COC
SE245981

Container Type:
J = solvent washed, acid rinsed, Tefton sealed glass jar
S = solvent washed, acid rinsed glass bottle
P = natural HDPE plastic bottle
VC = glass vial, Teflon Septum
ZLB = Zip-Lock Bag BB = Bulk Bag

eiaustralia
Contamination | Remediation | Geotechnical

Suite 6.01, 55 Miller Street,
PYRMONT NSW 2009
Ph: 9516 0722
lab@eiaustralia.com.au

Investigator: I attest that these samples were collected in accordance with standard EI field sampling procedures.

Report with EI Waste Classification Table ☐

Sampler's Name (EI):
Print Daniel Duffy
Signature
Date 14/4/23

Received by (SGS):
Print
Signature
Date 14/4/23 @ 1.40

Sampler's Comments: please cc Li/Fiona.

IMPORTANT:
Please e-mail laboratory results to: lab@eiaustralia.com.au

SAMPLE RECEIPT ADVICE

SE245981

CLIENT DETAILS

Contact	Daniel Duffy
Client	EI AUSTRALIA
Address	SUITE 6.01 55 MILLER STREET PYRMONT NSW 2009
Telephone	61 2 95160722
Facsimile	(Not specified)
Email	daniel.duffy@eiaustralia.com.au
Project	**E25874 10-28 Lawrence St, Freshwater**
Order Number	**E25874**
Samples	2

LABORATORY DETAILS

Manager	Huong Crawford
Laboratory	SGS Alexandria Environmental
Address	Unit 16, 33 Maddox St Alexandria NSW 2015
Telephone	+61 2 8594 0400
Facsimile	+61 2 8594 0499
Email	au.environmental.sydney@sgs.com
Samples Received	Fri 14/4/2023
Report Due	Fri 21/4/2023
SGS Reference	**SE245981**

SUBMISSION DETAILS

This is to confirm that 2 samples were received on Friday 14/4/2023. Results are expected to be ready by COB Friday 21/4/2023. Please quote SGS reference SE245981 when making enquiries. Refer below for details relating to sample integrity upon receipt.

Type of documentation received	COC	Date documentation received	14/4/2023
Samples received in good order	Yes	Samples received without headspace	Yes
Sample temperature upon receipt	10.3C	Sample container provider	SGS
Turnaround time requested	Standard	Samples received in correct containers	Yes
Sufficient sample for analysis	Yes	Sample cooling method	Ice Bricks
Samples clearly labelled	Yes	Complete documentation received	Yes

Unless otherwise instructed, water and bulk samples will be held for one month from date of report, and soil samples will be held for two months.

COMMENTS

SAMPLE RECEIPT ADVICE

SE245981

CLIENT DETAILS

Client EI AUSTRALIA

Project E25874 10-28 Lawrence St, Freshwater

SUMMARY OF ANALYSIS

No.	Sample ID	Conductivity and TDS by Calculation - Water	PAH (Polynuclear Aromatic Hydrocarbons) in Water	pH in water	Total Dissolved Solids (TDS) in water	Total Phenolics in Water	TRH (Total Recoverable Hydrocarbons) in Water	VOCs in Water	Volatile Petroleum Hydrocarbons in Water
001	BH101M	1	23	1	1	1	9	77	7
002	BH102M	1	23	1	1	1	9	77	7

CONTINUED OVERLEAF

The above table represents SGS' interpretation of the client-supplied Chain Of Custody document.
The numbers shown in the table indicate the number of results requested in each package.
Please indicate as soon as possible should your request differ from these details .
Testing as per this table shall commence immediately unless the client intervenes with a correction .

SAMPLE RECEIPT ADVICE

SE245981

CLIENT DETAILS

Client EI AUSTRALIA

Project E25874 10-28 Lawrence St, Freshwater

SUMMARY OF ANALYSIS

No.	Sample ID	Mercury (dissolved) in Water	Metals in Water (Dissolved) by ICPOES	Total Cyanide in water by Discrete Analyser	Trace Metals (Dissolved) in Water by ICPMS	Turbidity
001	BH101M	1	3	1	8	1
002	BH102M	1	3	1	8	1

The above table represents SGS' interpretation of the client-supplied Chain Of Custody document.
The numbers shown in the table indicate the number of results requested in each package.
Please indicate as soon as possible should your request differ from these details .
Testing as per this table shall commence immediately unless the client intervenes with a correction .

ANALYTICAL REPORT

Accreditation No. 2562

CLIENT DETAILS

Contact	Daniel Duffy
Client	EI AUSTRALIA
Address	SUITE 6.01 55 MILLER STREET PYRMONT NSW 2009
Telephone	61 2 95160722
Facsimile	(Not specified)
Email	daniel.duffy@eiaustralia.com.au
Project	**E25874 10-28 Lawrence St, Freshwater**
Order Number	**E25874**
Samples	2

LABORATORY DETAILS

Manager	Huong Crawford
Laboratory	SGS Alexandria Environmental
Address	Unit 16, 33 Maddox St Alexandria NSW 2015
Telephone	+61 2 8594 0400
Facsimile	+61 2 8594 0499
Email	au.environmental.sydney@sgs.com
SGS Reference	**SE245981A R0**
Date Received	24/4/2023
Date Reported	26/4/2023

COMMENTS

Accredited for compliance with ISO/IEC 17025 - Testing. NATA accredited laboratory 2562(4354).

SIGNATORIES

Akheeqar BENIAMEEN
Chemist

Ly Kim HA
Organic Section Head

TRH Silica Gel (Total Recoverable Hydrocarbons - Silica Gel) in Water [AN403] Tested: 24/4/2023

			BH101M WATER - 13/4/2023	BH102M WATER - 13/4/2023
PARAMETER	**UOM**	**LOR**	**SE245981A.001**	**SE245981A.002**
TRH C10-C14-Silica	µg/L	50	1100	710
TRH C15-C28-Silica	µg/L	200	390	260
TRH C29-C36-Silica	µg/L	200	210	<200
TRH C37-C40-Silica	µg/L	200	<200	<200
TRH >C10-C16-Silica	µg/L	60	1100	710
TRH >C16-C34-Silica	µg/L	500	570	<500
TRH >C34-C40-Silica	µg/L	500	<500	<500
TRH Sum C10-C36-Silica	µg/L	450	1700	1100
TRH Sum C10-C40-Silica	µg/L	650	1700	1100

METHOD SUMMARY

METHOD	METHODOLOGY SUMMARY
AN403	Total Recoverable Hydrocarbons: Determination of Hydrocarbons by gas chromatography after a solvent extraction. Detection is by flame ionisation detector (FID) that produces an electronic signal in proportion to the combustible matter passing through it. Total Recoverable Hydrocarbons (TRH) are routinely reported as four alkane groupings based on the carbon chain length of the compounds: C6-C9, C10-C14, C15-C28 and C29-C36.
AN403	Additionally, the volatile C6-C9 fraction may be determined by a purge and trap technique and GC/MS because of the potential for volatiles loss. Total Recoverable Hydrocarbons - Silica (TRHisilica) follows the same method of analysis after silica gel cleanup of the solvent extract. Aliphatic/Aromatic Speciation follows the same method of analysis after fractionation of the solvent extract over silica with differential polarity of the eluent solvents .
AN403	The GC/FID method is not well suited to the analysis of refined high boiling point materials (ie lubricating oils or greases) but is particularly suited for measuring diesel, kerosene and petrol if care to control volatility is taken. This method will detect naturally occurring hydrocarbons, lipids, animal fats, phenols and PAHs if they are present at sufficient levels, dependent on the use of specific cleanup/fractionation techniques. Reference USEPA 3510B, 8015B.

FOOTNOTES

*	NATA accreditation does not cover the performance of this service.
**	Indicative data, theoretical holding time exceeded.
***	Indicates that both * and ** apply.

-	Not analysed.
NVL	Not validated.
IS	Insufficient sample for analysis.
LNR	Sample listed, but not received.

UOM	Unit of Measure.
LOR	Limit of Reporting.
↑↓	Raised/lowered Limit of Reporting.

Unless it is reported that sampling has been performed by SGS, the samples have been analysed as received.
Solid samples expressed on a dry weight basis.

Where "Total" analyte groups are reported (for example, Total PAHs, Total OC Pesticides) the total will be calculated as the sum of the individual analytes, with those analytes that are reported as <LOR being assumed to be zero. The summed (Total) limit of reporting is calculated by summing the individual analyte LORs and dividing by two. For example, where 16 individual analytes are being summed and each has an LOR of 0.1 mg/kg, the "Totals" LOR will be 1.6 / 2 (0.8 mg/kg). Where only 2 analytes are being summed, the " Total" LOR will be the sum of those two LORs.

Some totals may not appear to add up because the total is rounded after adding up the raw values.

If reported, measurement uncertainty follow the ± sign after the analytical result and is expressed as the expanded uncertainty calculated using a coverage factor of 2, providing a level of confidence of approximately 95%, unless stated otherwise in the comments section of this report.

Results reported for samples tested under test methods with codes starting with ARS-SOP, radionuclide or gross radioactivity concentrations are expressed in becquerel (Bq) per unit of mass or volume or per wipe as stated on the report. Becquerel is the SI unit for activity and equals one nuclear transformation per second.
Note that in terms of units of radioactivity:

a. 1 Bq is equivalent to 27 pCi
b. 37 MBq is equivalent to 1 mCi

For results reported for samples tested under test methods with codes starting with ARS-SOP, less than (<) values indicate the detection limit for each radionuclide or parameter for the measurement system used. The respective detection limits have been calculated in accordance with ISO 11929.

The QC and MU criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here: www.sgs.com.au/en-gb/environment-health-and-safety.

This document is issued by the Company under its General Conditions of Service accessible at www.sgs.com/en/Terms-and-Conditions.aspx. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.

Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client only. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law .

This report must not be reproduced, except in full.

STATEMENT OF QA/QC PERFORMANCE

SE245981A R0

CLIENT DETAILS

Contact	Daniel Duffy	Manager	Huong Crawford
Client	EI AUSTRALIA	Laboratory	SGS Alexandria Environmental
Address	SUITE 6.01 55 MILLER STREET PYRMONT NSW 2009	Address	Unit 16, 33 Maddox St Alexandria NSW 2015
Telephone	61 2 95160722	Telephone	+61 2 8594 0400
Facsimile	(Not specified)	Facsimile	+61 2 8594 0499
Email	daniel.duffy@eiaustralia.com.au	Email	au.environmental.sydney@sgs.com
Project	**E25874 10-28 Lawrence St, Freshwater**	SGS Reference	**SE245981A R0**
Order Number	**E25874**	Date Received	24 Apr 2023
Samples	2	Date Reported	26 Apr 2023

LABORATORY DETAILS

COMMENTS

All the laboratory data for each environmental matrix was compared to SGS' stated Data Quality Objectives (DQO). Comments arising from the comparison were made and are reported below.

The data relating to sampling was taken from the Chain of Custody document.
This QA/QC Statement must be read in conjunction with the referenced Analytical Report.
The Statement and the Analytical Report must not be reproduced except in full.

All Data Quality Objectives were met with the exception of the following:

Extraction Date	TRH Silica Gel (Total Recoverable Hydrocarbons - Silica Gel) in Water	2 items

SAMPLE SUMMARY

Type of documentation received	Email	Date documentation received	24/4/2023@9:37am
Samples received in good order	Yes	Samples received without headspace	Yes
Sample temperature upon receipt	10.3C	Sample container provider	SGS
Turnaround time requested	Next Day	Samples received in correct containers	Yes
Sufficient sample for analysis	Yes	Sample cooling method	Ice Bricks
Samples clearly labelled	Yes	Complete documentation received	Yes

HOLDING TIME SUMMARY

SGS holding time criteria are drawn from current regulations and are highly dependent on sample container preservation as specified in the SGS "Field Sampling Guide for Containers and Holding Time" (ref: GU-(AU)-ENV.001). Soil samples guidelines are derived from NEPM "Schedule B(3) Guideline on Laboratory Analysis of Potentially Contaminated Soils". Water sample guidelines are derived from "AS/NZS 5667.1 : 1998 Water Quality - sampling part 1" and APHA "Standard Methods for the Examination of Water and Wastewater" 21st edition 2005.

Extraction and analysis holding time due dates listed are calculated from the date sampled, although holding times may be extended after laboratory extraction for some analytes. The due dates are the suggested dates that samples may be held before extraction or analysis and still be considered valid.

Extraction and analysis dates are shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria. If the sampled date is not supplied then compliance with criteria cannot be determined. If the received date is after one or both due dates then holding time will fail by default.

TRH Silica Gel (Total Recoverable Hydrocarbons - Silica Gel) in Water

Method: ME-(AU)-[ENV]AN403

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH101M	SE245981A.001	LB277601	13 Apr 2023	24 Apr 2023	20 Apr 2023	24 Apr 2023†	03 Jun 2023	26 Apr 2023
BH102M	SE245981A.002	LB277601	13 Apr 2023	24 Apr 2023	20 Apr 2023	24 Apr 2023†	03 Jun 2023	26 Apr 2023

SURROGATES

Surrogate results are evaluated against upper and lower limit criteria established in the SGS QA /QC plan (Ref: MP-(AU)-[ENV]QU-022). At least two of three routine level soil sample surrogate spike recoveries for BTEX/VOC are to be within 70-130% where control charts have not been developed and within the established control limits for charted surrogates. Matrix effects may void this as an acceptance criterion. Water sample surrogate spike recoveries are to be within 40-130%. The presence of emulsions, surfactants and particulates may void this as an acceptance criterion.

Result is shown in **Green** when within suggested criteria or **Red** with an appended reason identifer when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

No surrogates were required for this job.

Blank results are evaluated against the limit of reporting (LOR), for the chosen method and its associated instrumentation, typically 2.5 times the statistically determined method detection limit (MDL).

Result is shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria.

TRH Silica Gel (Total Recoverable Hydrocarbons - Silica Gel) in Water

Method: ME-(AU)-[ENV]AN403

Sample Number	Parameter	Units	LOR	Result
LB277601.001	TRH C10-C14-Silica	µg/L	50	<50
	TRH C15-C28-Silica	µg/L	200	<200
	TRH C29-C36-Silica	µg/L	200	<200
	TRH C37-C40-Silica	µg/L	200	<200

Duplicates are calculated as Relative Percentage Difference (RPD) using the formula: RPD = | OriginalResult - ReplicateResult | x 100 / Mean
The RPD is evaluated against the Maximum Allowable Difference (MAD) criteria and can be graphically represented by a curve calculated from the Statistical Detection Limit (SDL) and Limiting Repeatability (LR) using the formula: MAD = 100 x SDL / Mean + LR
Where the Maximum Allowable Difference evaluates to a number larger than 200 it is displayed as 200.

RPD is shown in **Green** when within suggested criteria or **Red** with an appended reason identifer when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

NOTE: The RPD reported is calculated from the unrounded data for the original and replicate result. Manual calculation of the RPD from the rounded data reported may give a different calculated RPD.

Original	Duplicate	Parameter	Units	LOR

Laboratory Control Standard (LCS) results are evaluated against an expected result, typically the concentration of analyte spiked into the control during the sample preparation stage, producing a percentage recovery. The criteria applied to the percentage recovery is established in the SGS QA /QC plan (Ref: MP-(AU)-[ENV]QU-022). For more information refer to the footnotes in the concluding page of this report.

Recovery is shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria.

TRH Silica Gel (Total Recoverable Hydrocarbons - Silica Gel) in Water

Method: ME-(AU)-[ENV]AN403

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB277601.002	TRH C10-C14-Silica	µg/L	50	1400	1200	60 - 140	115
	TRH C15-C28-Silica	µg/L	200	1100	1200	60 - 140	90
	TRH C29-C36-Silica	µg/L	200	900	1200	60 - 140	75
	TRH >C10-C16-Silica	µg/L	60	1400	1200	60 - 140	121
	TRH >C16-C34-Silica	µg/L	500	1100	1200	60 - 140	94
	TRH >C34-C40-Silica	µg/L	500	600	600	60 - 140	101

MATRIX SPIKES

Matrix Spike (MS) results are evaluated as the percentage recovery of an expected result, typically the concentration of analyte spiked into a field sub-sample during the sample preparation stage. The original sample's result is subtracted from the sub-sample result before determining the percentage recovery. The criteria applied to the percentage recovery is established in the SGS QA/QC plan (ref: MP-(AU)-[ENV]QU-022). For more information refer to the footnotes in the concluding page of this report.

Recovery is shown in **Green** when within suggested criteria or **Red** with an appended reason identifer when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

QC Sample	Sample Number	Parameter	Units	LOR

MATRIX SPIKE DUPLICATES

Matrix spike duplicates are calculated as Relative Percent Difference (RPD) using the formula: RPD = | OriginalResult - ReplicateResult | x 100 / Mean

The original result is the analyte concentration of the matrix spike. The Duplicate result is the analyte concentration of the matrix spike duplicate.

The RPD is evaluated against the Maximum Allowable Difference (MAD) criteria and can be graphically represented by a curve calculated from the Statistical Detection Limit (SDL) and Limiting Repeatability (LR) using the formula: MAD = 100 x SDL / Mean + LR

Where the Maximum Allowable Difference evaluates to a number larger than 200 it is displayed as 200.

RPD is shown in **Green** when within suggested criteria or **Red** with an appended reason identifer when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

No matrix spike duplicates were required for this job.

FOOTNOTES

Samples analysed as received.

Solid samples expressed on a dry weight basis.

QC criteria are subject to internal review according to the SGS QA/QC plan and may be provided on request or alternatively can be found here: https://www.sgs.com.au/~/media/Local/Australia/Documents/Technical Documents/MP-AU-ENV-QU-022 QA QC Plan.pdf

*	NATA accreditation does not cover the performance of this service.
**	Indicative data, theoretical holding time exceeded.
***	Indicates that both * and ** apply.
-	Sample not analysed for this analyte.
IS	Insufficient sample for analysis.
LNR	Sample listed, but not received.
LOR	Limit of reporting.
QFH	QC result is above the upper tolerance.
QFL	QC result is below the lower tolerance.
①	At least 2 of 3 surrogates are within acceptance criteria.
②	RPD failed acceptance criteria due to sample heterogeneity.
③	Results less than 5 times LOR preclude acceptance criteria for RPD.
④	Recovery failed acceptance criteria due to matrix interference.
⑤	Recovery failed acceptance criteria due to the presence of significant concentration of analyte (i.e. the concentration of analyte exceeds the spike level).
⑥	LOR was raised due to sample matrix interference.
⑦	LOR was raised due to dilution of significantly high concentration of analyte in sample.
⑧	Reanalysis of sample in duplicate confirmed sample heterogeneity and inconsistency of results.
⑨	Recovery failed acceptance criteria due to sample heterogeneity.
⑩	LOR was raised due to high conductivity of the sample (required dilution).
†	Refer to relevant report comments for further information.

Hi GBS team.

Please book this in as an A job.
Thanks.

Matthew Tyler
Industries and Environment
Client Services Officer
SGS
Unit 16/33 Maddox St
Alexandria, 2015
Phone: (02) 8594 0400
E-mail: Matthew.Tyler@sgs.com

From: Fiona Zhang - EIAustralia <fiona.zhang@eiaustralia.com.au>
Sent: Monday, 24 April 2023 9:37 AM
To: AU.Environmental.Sydney, AU (Sydney) <AU.Environmental.Sydney@SGS.com>; AU.SampleReceipt.Sydney, AU (Sydney) <AU.SampleReceipt.Sydney@sgs.com>; Crawford, Huong (Sydney) <Huong.Crawford@sgs.com>
Cc: Li Wei - EIAustralia <li.wei@eiaustralia.com.au>
Subject: [EXTERNAL] RE: Report Job SE245981, your reference E25874 10-28 Lawrence St, Freshwater, order number E25874

Hi SGS,

Could you please do silica gel clean-up for TRH for the following samples, 24h TAT please:

- BH101M
- BH102M

Kind regards,
Fiona Zhang
BEng (Env), MEng (Env)
Environmental Engineer

T 02 9516 0722 **M** 0405 380 237
E fiona.zhang@eiaustralia.com.au

Suite 6.01, 55 Miller Street
Pyrmont, NSW 2009

www.eiaustralia.com.au

eiaustralia
Practical Solutions for Built Environments

FINANCIAL REVIEW
CLIENT CHOICE AWARDS 2019
WINNER
beaton

Environmental | Geotechnical | Structural | Civil | Hazardous Materials

EI Australia is a proud member of the Australian Contaminated Land Consultants Association and the Australian Geomechanics Society.

From: AU.Environmental.Sydney@SGS.com [mailto:AU.Environmental.Sydney@SGS.com]
Sent: Friday, 21 April 2023 5:18 PM
To: Daniel Duffy - EIAustralia; Fiona Zhang - EIAustralia; Laboratory Results - EIAustralia; Li Wei - EIAustralia
Subject: Report Job SE245981, your reference E25874 10-28 Lawrence St, Freshwater, order number E25874

Dear Valued Customer,

Please find attached the report for SGS job SE245981, your reference E25874 10-28 Lawrence St, Freshwater, order number E25874.

If you have any questions or concerns, please don’t hesitate to contact your SGS Client Services representative.

Please provide any feedback you have on our service via this link http://bit.ly/3XpzDFe

Best Regards,
SGS Alexandria Customer Service Team
SGS Australia Pty Ltd
Phone: +61 (0)2 8594 0400

SAMPLE RECEIPT ADVICE

SE245981A

CLIENT DETAILS

Contact	Daniel Duffy
Client	EI AUSTRALIA
Address	SUITE 6.01 55 MILLER STREET PYRMONT NSW 2009
Telephone	61 2 95160722
Facsimile	(Not specified)
Email	daniel.duffy@eiaustralia.com.au
Project	**E25874 10-28 Lawrence St, Freshwater**
Order Number	**E25874**
Samples	2

LABORATORY DETAILS

Manager	Huong Crawford
Laboratory	SGS Alexandria Environmental
Address	Unit 16, 33 Maddox St Alexandria NSW 2015
Telephone	+61 2 8594 0400
Facsimile	+61 2 8594 0499
Email	au.environmental.sydney@sgs.com
Samples Received	Mon 24/4/2023
Report Due	Wed 26/4/2023
SGS Reference	**SE245981A**

SUBMISSION DETAILS

This is to confirm that 2 samples were received on Monday 24/4/2023. Results are expected to be ready by COB Wednesday 26/4/2023. Please quote SGS reference SE245981A when making enquiries. Refer below for details relating to sample integrity upon receipt.

Type of documentation received	Email	Date documentation received	24/4/2023@9:37am
Samples received in good order	Yes	Samples received without headspace	Yes
Sample temperature upon receipt	10.3C	Sample container provider	SGS
Turnaround time requested	Next Day	Samples received in correct containers	Yes
Sufficient sample for analysis	Yes	Sample cooling method	Ice Bricks
Samples clearly labelled	Yes	Complete documentation received	Yes

Unless otherwise instructed, water and bulk samples will be held for one month from date of report, and soil samples will be held for two months.

COMMENTS

SAMPLE RECEIPT ADVICE

SE245981A

CLIENT DETAILS

Client EI AUSTRALIA

Project E25874 10-28 Lawrence St, Freshwater

SUMMARY OF ANALYSIS

No.	Sample ID	TRH Silica Gel (Total Recoverable
001	BH101M	9
002	BH102M	9

The above table represents SGS' interpretation of the client-supplied Chain Of Custody document.
The numbers shown in the table indicate the number of results requested in each package.
Please indicate as soon as possible should your request differ from these details .
Testing as per this table shall commence immediately unless the client intervenes with a correction .

ANALYTICAL REPORT

Accreditation No. 2562

CLIENT DETAILS

Contact	Li Wei
Client	EI AUSTRALIA
Address	SUITE 6.01 55 MILLER STREET PYRMONT NSW 2009
Telephone	61 2 95160722
Facsimile	(Not specified)
Email	li.wei@eiaustralia.com.au
Project	**E25874 10-28 Lawrence St Freshwater**
Order Number	**E25874**
Samples	2

LABORATORY DETAILS

Manager	Huong Crawford
Laboratory	SGS Alexandria Environmental
Address	Unit 16, 33 Maddox St Alexandria NSW 2015
Telephone	+61 2 8594 0400
Facsimile	+61 2 8594 0499
Email	au.environmental.sydney@sgs.com
SGS Reference	**SE246397 R0**
Date Received	24/4/2023
Date Reported	2/5/2023

COMMENTS

Accredited for compliance with ISO/IEC 17025 - Testing. NATA accredited laboratory 2562(4354).

SIGNATORIES

Dong LIANG	**Kamrul AHSAN**	**Ly Kim HA**
Metals/Inorganics Team Leader	Senior Chemist	Organic Section Head

VOCs in Water [AN433] Tested: 28/4/2023

PARAMETER	UOM	LOR	BH103M WATER - 21/4/2023 SE246397.001	GW-QD1 WATER - 21/4/2023 SE246397.002
Benzene	µg/L	0.5	<0.5	<0.5
Toluene	µg/L	0.5	<0.5	<0.5
Ethylbenzene	µg/L	0.5	<0.5	<0.5
m/p-xylene	µg/L	1	<1	<1
o-xylene	µg/L	0.5	<0.5	<0.5
Total Xylenes	µg/L	1.5	<1.5	<1.5
Total BTEX	µg/L	3	<3	<3
Naphthalene (VOC)*	µg/L	0.5	<0.5	<0.5
Dichlorodifluoromethane (CFC-12)	µg/L	5	<5	-
Chloromethane	µg/L	5	<5	-
Vinyl chloride (Chloroethene)	µg/L	0.3	<0.3	-
Bromomethane	µg/L	10	<10	-
Chloroethane	µg/L	5	<5	-
Trichlorofluoromethane	µg/L	1	<1	-
Acetone (2-propanone)	µg/L	10	<10	-
Iodomethane	µg/L	5	<5	-
1,1-dichloroethene	µg/L	0.5	<0.5	-
Acrylonitrile	µg/L	0.5	<0.5	-
Dichloromethane (Methylene chloride)	µg/L	5	<5	-
Allyl chloride	µg/L	2	<2	-
Carbon disulfide	µg/L	2	<2	-
trans-1,2-dichloroethene	µg/L	0.5	<0.5	-
MtBE (Methyl-tert-butyl ether)	µg/L	2	<2	-
1,1-dichloroethane	µg/L	0.5	<0.5	-
Vinyl acetate*	µg/L	10	<10	-
MEK (2-butanone)	µg/L	10	<10	-
cis-1,2-dichloroethene	µg/L	0.5	<0.5	-
Bromochloromethane	µg/L	0.5	<0.5	-
Chloroform (THM)	µg/L	0.5	<0.5	-
2,2-dichloropropane	µg/L	0.5	<0.5	-
1,2-dichloroethane	µg/L	0.5	<0.5	-
1,1,1-trichloroethane	µg/L	0.5	<0.5	-
1,1-dichloropropene	µg/L	0.5	<0.5	-
Carbon tetrachloride	µg/L	0.5	<0.5	-
Dibromomethane	µg/L	0.5	<0.5	-
1,2-dichloropropane	µg/L	0.5	<0.5	-
Trichloroethene (Trichloroethylene,TCE)	µg/L	0.5	<0.5	-
2-nitropropane	µg/L	100	<100	-
Bromodichloromethane (THM)	µg/L	0.5	<0.5	-
MIBK (4-methyl-2-pentanone)	µg/L	5	<5	-
cis-1,3-dichloropropene	µg/L	0.5	<0.5	-
trans-1,3-dichloropropene	µg/L	0.5	<0.5	-
1,1,2-trichloroethane	µg/L	0.5	<0.5	-
1,3-dichloropropane	µg/L	0.5	<0.5	-
Dibromochloromethane (THM)	µg/L	0.5	<0.5	-
2-hexanone (MBK)	µg/L	5	<5	-
1,2-dibromoethane (EDB)	µg/L	0.5	<0.5	-
Tetrachloroethene (Perchloroethylene,PCE)	µg/L	0.5	<0.5	-
1,1,1,2-tetrachloroethane	µg/L	0.5	<0.5	-
Chlorobenzene	µg/L	0.5	<0.5	-
Bromoform (THM)	µg/L	0.5	<0.5	-
Styrene (Vinyl benzene)	µg/L	0.5	<0.5	-
1,1,2,2-tetrachloroethane	µg/L	0.5	<0.5	-
1,2,3-trichloropropane	µg/L	0.5	<0.5	-
trans-1,4-dichloro-2-butene	µg/L	1	<1	-
Isopropylbenzene (Cumene)	µg/L	0.5	<0.5	-

VOCs in Water [AN433] Tested: 28/4/2023 (continued)

PARAMETER	UOM	LOR	BH103M WATER - 21/4/2023 SE246397.001	GW-QD1 WATER - 21/4/2023 SE246397.002
Bromobenzene	µg/L	0.5	<0.5	-
n-propylbenzene	µg/L	0.5	<0.5	-
2-chlorotoluene	µg/L	0.5	<0.5	-
4-chlorotoluene	µg/L	0.5	<0.5	-
1,3,5-trimethylbenzene	µg/L	0.5	<0.5	-
tert-butylbenzene	µg/L	0.5	<0.5	-
1,2,4-trimethylbenzene	µg/L	0.5	<0.5	-
sec-butylbenzene	µg/L	0.5	<0.5	-
1,3-dichlorobenzene	µg/L	0.5	<0.5	-
1,4-dichlorobenzene	µg/L	0.3	<0.3	-
p-isopropyltoluene	µg/L	0.5	<0.5	-
1,2-dichlorobenzene	µg/L	0.5	<0.5	-
n-butylbenzene	µg/L	0.5	<0.5	-
1,2-dibromo-3-chloropropane	µg/L	0.5	<0.5	-
1,2,4-trichlorobenzene	µg/L	0.5	<0.5	-
Hexachlorobutadiene	µg/L	0.5	<0.5	-
1,2,3-trichlorobenzene	µg/L	0.5	<0.5	-
Total VOC	µg/L	10	<10	-

Volatile Petroleum Hydrocarbons in Water [AN433] Tested: 28/4/2023

PARAMETER	UOM	LOR	BH103M WATER - 21/4/2023 SE246397.001	GW-QD1 WATER - 21/4/2023 SE246397.002
TRH C6-C9	µg/L	40	<40	<40
Benzene (F0)	µg/L	0.5	<0.5	<0.5
TRH C6-C10	µg/L	50	<50	96
TRH C6-C10 minus BTEX (F1)	µg/L	50	<50	96

TRH (Total Recoverable Hydrocarbons) in Water [AN403] Tested: 26/4/2023

PARAMETER	UOM	LOR	BH103M WATER - 21/4/2023 SE246397.001	GW-QD1 WATER - 21/4/2023 SE246397.002
TRH C10-C14	µg/L	50	**37000**	**22000**
TRH C15-C28	µg/L	200	**13000**	**8200**
TRH C29-C36	µg/L	200	**9100**	**5900**
TRH C37-C40	µg/L	200	**320**	<200
TRH >C10-C16	µg/L	60	**37000**	**22000**
TRH >C10-C16 - Naphthalene (F2)	µg/L	60	**37000**	**22000**
TRH >C16-C34 (F3)	µg/L	500	**21000**	**13000**
TRH >C34-C40 (F4)	µg/L	500	**1200**	**770**
TRH C10-C40	µg/L	320	**59000**	**36000**

PAH (Polynuclear Aromatic Hydrocarbons) in Water [AN420] Tested: 26/4/2023

PARAMETER	UOM	LOR	BH103M WATER - 21/4/2023 SE246397.001
Naphthalene	µg/L	0.1	<0.1
2-methylnaphthalene	µg/L	0.1	<0.1
1-methylnaphthalene	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)fluoranthene	µg/L	0.1	<0.1
Benzo(k)fluoranthene	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-cd)pyrene	µg/L	0.1	<0.1
Dibenzo(ah)anthracene	µg/L	0.1	<0.1
Benzo(ghi)perylene	µg/L	0.1	<0.1
Total PAH (18)	µg/L	1	<1

Total Phenolics in Water [AN295] Tested: 27/4/2023

PARAMETER	UOM	LOR	BH103M WATER - 21/4/2023 SE246397.001
Total Phenols	mg/L	0.05	<0.05

pH in water [AN101] Tested: 24/4/2023

PARAMETER	UOM	LOR	BH103M WATER - 21/4/2023 SE246397.001
pH**	pH Units	0.1	5.4

Conductivity and TDS by Calculation - Water [AN106] Tested: 24/4/2023

			BH103M WATER - 21/4/2023
PARAMETER	**UOM**	**LOR**	**SE246397.001**
Conductivity @ 25 C	µS/cm	2	300

Total Dissolved Solids (TDS) in water [AN113] Tested: 27/4/2023

PARAMETER	UOM	LOR	BH103M WATER - 21/4/2023 SE246397.001
Total Dissolved Solids Dried at 175-185°C	mg/L	10	200

Turbidity [AN119] Tested: 24/4/2023

			BH103M WATER - 21/4/2023
PARAMETER	**UOM**	**LOR**	**SE246397.001**
Turbidity	NTU	0.5	380

Total Cyanide in water by Discrete Analyser [AN077/AN287] Tested: 27/4/2023

PARAMETER	UOM	LOR	BH103M WATER - 21/4/2023 SE246397.001
Total Cyanide	mg/L	0.004	<0.004

Metals in Water (Dissolved) by ICPOES [AN320] Tested: 28/4/2023

			BH103M WATER - 21/4/2023
PARAMETER	UOM	LOR	SE246397.001
Calcium, Ca	mg/L	0.2	**5.4**
Magnesium, Mg	mg/L	0.1	**5.7**
Total Hardness by Calculation	mg CaCO3/L	1	**37**

Trace Metals (Dissolved) in Water by ICPMS [AN318] Tested: 27/4/2023

PARAMETER	UOM	LOR	BH103M WATER - 21/4/2023 SE246397.001	GW-QD1 WATER - 21/4/2023 SE246397.002
Aluminium	µg/L	5	260	-
Arsenic	µg/L	1	<1	<1
Cadmium	µg/L	0.1	<0.1	<0.1
Chromium	µg/L	1	5	5
Copper	µg/L	1	3	2
Lead	µg/L	1	<1	<1
Nickel	µg/L	1	1	2
Zinc	µg/L	5	22	19

Mercury (dissolved) in Water [AN311(Perth)/AN312] Tested: 28/4/2023

			BH103M WATER - 21/4/2023	GW-QD1 WATER - 21/4/2023
PARAMETER	**UOM**	**LOR**	**SE246397.001**	**SE246397.002**
Mercury	mg/L	0.0001	<0.0001	<0.0001

METHOD	METHODOLOGY SUMMARY
AN020	Unpreserved water sample is filtered through a 0.45µm membrane filter and acidified with nitric acid similar to APHA3030B.
AN077	Hydrogen cyanide is liberated from an acidified sample by distillation and purging with air. The hydrogen cyanide gas is then collected by passing it through a sodium hydroxide scrubbing solution. The scrubbing solution will then be analysed for cyanide by the appropriate method.
AN101	pH in Soil Sludge Sediment and Water: pH is measured electrometrically using a combination electrode (glass plus reference electrode) and is calibrated against 3 buffers purchased commercially. For soils, an extract with water is made at a ratio of 1:5 and the pH determined and reported on the extract. Reference APHA 4500-H+.
AN106	Conductivity and TDS by Calculation: Conductivity is measured by meter with temperature compensation and is calibrated against a standard solution of potassium chloride. Conductivity is generally reported as µmhos/cm or µS/cm @ 25°C. For soils, an extract with water is made at a ratio of 1:5 and the EC determined and reported on the extract, or calculated back to the as-received sample. Total Dissolved Salts can be estimated from conductivity using a conversion factor, which for natural waters, is in the range 0.55 to 0.75. SGS use 0.6. Reference APHA 2510 B.
AN106	Salinity may be calculated in terms of NaCl from the sample conductivity. This assumes all soluble salts present, measured by the conductivity, are present as NaCl.
AN113	Total Dissolved Solids: A well-mixed filtered sample of known volume is evaporated to dryness at 180°C and the residue weighed. Approximate methods for correlating chemical analysis with dissolved solids are available. Reference APHA 2540 C.
AN113	The Total Dissolved Solids residue may also be ignited at 550 C and volatile TDS (Organic TDS) and non-volatile TDS (Inorganic) can be determined.
AN119	Turbidity by Nepholometry: Small particles in a light beam scatter light at a range of angles. A turbidimeter measures this scatter and reports results compared to turbidity standards, in NTU. This procedure is not suitable for very dark coloured liquids or samples with high solids because light absorption causes artificially low light scatter and low turbidity. Reference APHA 2130B.
AN287	A buffered distillate or water sample is treated with chloramine/barbituric acid reagents and the intensity of the colour developed is proportional to the cyanide concentration by DA.
AN295	The water sample or extract of sample is distilled in a phosphoric acid stream. Phenolic compounds in the distillate react with a reagent stream of potassium hexacyanoferrate(III) and 4-Amino-2,3-dimethyl-3-pryazolin-5-one in an alkaline medium to form a coloured complex which is analysed spectrophotometrically onboard a continuous flow analyser.
AN311(Perth)/AN312	Mercury by Cold Vapour AAS in Waters: Mercury ions are reduced by stannous chloride reagent in acidic solution to elemental mercury. This mercury vapour is purged by nitrogen into a cold cell in an atomic absorption spectrometer or mercury analyser. Quantification is made by comparing absorbances to those of the calibration standards. Reference APHA 3112/3500.
AN318	Determination of elements at trace level in waters by ICP-MS technique,, referenced to USEPA 6020B and USEPA 200.8 (5.4).
AN320	Metals by ICP-OES: Samples are preserved with 10% nitric acid for a wide range of metals and some non-metals. This solution is measured by Inductively Coupled Plasma. Solutions are aspirated into an argon plasma at 8000-10000K and emit characteristic energy or light as a result of electron transitions through unique energy levels. The emitted light is focused onto a diffraction grating where it is separated into components.
AN320	Photomultipliers or CCDs are used to measure the light intensity at specific wavelengths. This intensity is directly proportional to concentration. Corrections are required to compensate for spectral overlap between elements. Reference APHA 3120 B.
AN403	Total Recoverable Hydrocarbons: Determination of Hydrocarbons by gas chromatography after a solvent extraction. Detection is by flame ionisation detector (FID) that produces an electronic signal in proportion to the combustible matter passing through it. Total Recoverable Hydrocarbons (TRH) are routinely reported as four alkane groupings based on the carbon chain length of the compounds: C6-C9, C10-C14, C15-C28 and C29-C36 and in recognition of the NEPM 1999 (2013), >C10-C16 (F2), >C16-C34 (F3) and >C34-C40 (F4). Where F2 is corrected for Naphthalene, the VOC data for Naphthalene is used.
AN403	Additionally, the volatile C6-C9/C6-C10 fractions may be determined by a purge and trap technique and GC/MS because of the potential for volatiles loss. Total Recoveerable Hydrocarbons - Silica (TRH-Silica) follows the same method of analysis after silica gel cleanup of the solvent extract. Aliphatic/Aromatic Speciation follows the same method of analysis after fractionation of the solvent extract over silica with differential polarity of the eluent solvents.
AN403	The GC/FID method is not well suited to the analysis of refined high boiling point materials (ie lubricating oils or greases) but is particularly suited for measuring diesel, kerosene and petrol if care to control volatility is taken. This method will detect naturally occurring hydrocarbons, lipids, animal fats, phenols and PAHs if they are present at sufficient levels, dependent on the use of specific cleanup/fractionation techniques. Reference USEPA 3510B, 8015B.

AN420	(SVOCs) including OC, OP, PCB, Herbicides, PAH, Phthalates and Speciated Phenols (etc) in soils, sediments and waters are determined by GCMS/ECD technique following appropriate solvent extraction process (Based on USEPA 3500C and 8270D). Total PAH calculated from individual analyte detections at or above the limit of reporting .
AN433	VOCs and C6-C9 Hydrocarbons by GC-MS P&T: VOC`s are volatile organic compounds. The sample is presented to a gas chromatograph via a purge and trap (P&T) concentrator and autosampler and is detected with a Mass Spectrometer (MSD). Solid samples are initially extracted with methanol whilst liquid samples are processed directly. References: USEPA 5030B, 8020A, 8260.

FOOTNOTES

*	NATA accreditation does not cover the performance of this service.	-	Not analysed.	UOM	Unit of Measure.
**	Indicative data, theoretical holding time exceeded.	NVL	Not validated.	LOR	Limit of Reporting.
***	Indicates that both * and ** apply.	IS	Insufficient sample for analysis.	↑↓	Raised/lowered Limit of Reporting.
		LNR	Sample listed, but not received.		

Unless it is reported that sampling has been performed by SGS, the samples have been analysed as received.
Solid samples expressed on a dry weight basis.

Where "Total" analyte groups are reported (for example, Total PAHs, Total OC Pesticides) the total will be calculated as the sum of the individual analytes, with those analytes that are reported as <LOR being assumed to be zero. The summed (Total) limit of reporting is calculated by summing the individual analyte LORs and dividing by two. For example, where 16 individual analytes are being summed and each has an LOR of 0.1 mg/kg, the "Totals" LOR will be 1.6 / 2 (0.8 mg/kg). Where only 2 analytes are being summed, the " Total" LOR will be the sum of those two LORs.

Some totals may not appear to add up because the total is rounded after adding up the raw values.

If reported, measurement uncertainty follow the ± sign after the analytical result and is expressed as the expanded uncertainty calculated using a coverage factor of 2, providing a level of confidence of approximately 95%, unless stated otherwise in the comments section of this report.

Results reported for samples tested under test methods with codes starting with ARS-SOP, radionuclide or gross radioactivity concentrations are expressed in becquerel (Bq) per unit of mass or volume or per wipe as stated on the report. Becquerel is the SI unit for activity and equals one nuclear transformation per second.
Note that in terms of units of radioactivity:

a. 1 Bq is equivalent to 27 pCi
b. 37 MBq is equivalent to 1 mCi

For results reported for samples tested under test methods with codes starting with ARS-SOP, less than (<) values indicate the detection limit for each radionuclide or parameter for the measurement system used. The respective detection limits have been calculated in accordance with ISO 11929.

The QC and MU criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here: www.sgs.com.au/en-gb/environment-health-and-safety.

STATEMENT OF QA/QC PERFORMANCE

SE246397 R0

CLIENT DETAILS

Contact	Li Wei
Client	EI AUSTRALIA
Address	SUITE 6.01 55 MILLER STREET PYRMONT NSW 2009
Telephone	61 2 95160722
Facsimile	(Not specified)
Email	li.wei@eiaustralia.com.au
Project	**E25874 10-28 Lawrence St Freshwater**
Order Number	**E25874**
Samples	2

LABORATORY DETAILS

Manager	Huong Crawford
Laboratory	SGS Alexandria Environmental
Address	Unit 16, 33 Maddox St Alexandria NSW 2015
Telephone	+61 2 8594 0400
Facsimile	+61 2 8594 0499
Email	au.environmental.sydney@sgs.com
SGS Reference	**SE246397 R0**
Date Received	24 Apr 2023
Date Reported	02 May 2023

COMMENTS

All the laboratory data for each environmental matrix was compared to SGS' stated Data Quality Objectives (DQO). Comments arising from the comparison were made and are reported below.

The data relating to sampling was taken from the Chain of Custody document.
This QA/QC Statement must be read in conjunction with the referenced Analytical Report.
The Statement and the Analytical Report must not be reproduced except in full.

All Data Quality Objectives were met with the exception of the following:

Extraction Date	pH in water	1 item
	Turbidity	1 item
Analysis Date	pH in water	1 item
	Turbidity	1 item
Surrogate	PAH (Polynuclear Aromatic Hydrocarbons) in Water	1 item

SAMPLE SUMMARY

Type of documentation received	COC	Date documentation received	24/4/2023
Samples received in good order	Yes	Samples received without headspace	Yes
Sample temperature upon receipt	7.8°C	Sample container provider	SGS
Turnaround time requested	Standard	Samples received in correct containers	Yes
Sufficient sample for analysis	Yes	Sample cooling method	Ice Bricks
Samples clearly labelled	Yes	Complete documentation received	Yes

HOLDING TIME SUMMARY

SGS holding time criteria are drawn from current regulations and are highly dependent on sample container preservation as specified in the SGS "Field Sampling Guide for Containers and Holding Time" (ref: GU-(AU)-ENV.001). Soil samples guidelines are derived from NEPM "Schedule B(3) Guideline on Laboratory Analysis of Potentially Contaminated Soils". Water sample guidelines are derived from "AS/NZS 5667.1 : 1998 Water Quality - sampling part 1" and APHA "Standard Methods for the Examination of Water and Wastewater" 21st edition 2005.

Extraction and analysis holding time due dates listed are calculated from the date sampled, although holding times may be extended after laboratory extraction for some analytes. The due dates are the suggested dates that samples may be held before extraction or analysis and still be considered valid.

Extraction and analysis dates are shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria. If the sampled date is not supplied then compliance with criteria cannot be determined. If the received date is after one or both due dates then holding time will fail by default.

Conductivity and TDS by Calculation - Water

Method: ME-(AU)-[ENV]AN106

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH103M	SE246397.001	LB277625	21 Apr 2023	24 Apr 2023	19 May 2023	24 Apr 2023	19 May 2023	24 Apr 2023

Mercury (dissolved) in Water

Method: ME-(AU)-[ENV]AN311(Perth)/AN312

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH103M	SE246397.001	LB277706	21 Apr 2023	24 Apr 2023	19 May 2023	28 Apr 2023	19 May 2023	28 Apr 2023
GW-QD1	SE246397.002	LB277706	21 Apr 2023	24 Apr 2023	19 May 2023	28 Apr 2023	19 May 2023	28 Apr 2023

Metals in Water (Dissolved) by ICPOES

Method: ME-(AU)-[ENV]AN320

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH103M	SE246397.001	LB277945	21 Apr 2023	24 Apr 2023	18 Oct 2023	28 Apr 2023	18 Oct 2023	28 Apr 2023

PAH (Polynuclear Aromatic Hydrocarbons) in Water

Method: ME-(AU)-[ENV]AN420

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH103M	SE246397.001	LB277672	21 Apr 2023	24 Apr 2023	28 Apr 2023	26 Apr 2023	05 Jun 2023	01 May 2023
GW-QD1	SE246397.002	LB277672	21 Apr 2023	24 Apr 2023	28 Apr 2023	26 Apr 2023	05 Jun 2023	02 May 2023

pH in water

Method: ME-(AU)-[ENV]AN101

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH103M	SE246397.001	LB277625	21 Apr 2023	24 Apr 2023	22 Apr 2023	24 Apr 2023†	22 Apr 2023	24 Apr 2023†

Total Cyanide in water by Discrete Analyser

Method: ME-(AU)-[ENV]AN077/AN287

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH103M	SE246397.001	LB277828	21 Apr 2023	24 Apr 2023	05 May 2023	27 Apr 2023	05 May 2023	27 Apr 2023

Total Dissolved Solids (TDS) in water

Method: ME-(AU)-[ENV]AN113

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH103M	SE246397.001	LB277833	21 Apr 2023	24 Apr 2023	28 Apr 2023	27 Apr 2023	28 Apr 2023	28 Apr 2023

Total Phenolics in Water

Method: ME-(AU)-[ENV]AN295

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH103M	SE246397.001	LB277799	21 Apr 2023	24 Apr 2023	05 May 2023	27 Apr 2023	05 May 2023	27 Apr 2023

Trace Metals (Dissolved) in Water by ICPMS

Method: ME-(AU)-[ENV]AN318

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH103M	SE246397.001	LB277783	21 Apr 2023	24 Apr 2023	18 Oct 2023	27 Apr 2023	18 Oct 2023	27 Apr 2023
GW-QD1	SE246397.002	LB277783	21 Apr 2023	24 Apr 2023	18 Oct 2023	27 Apr 2023	18 Oct 2023	27 Apr 2023

TRH (Total Recoverable Hydrocarbons) in Water

Method: ME-(AU)-[ENV]AN403

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH103M	SE246397.001	LB277672	21 Apr 2023	24 Apr 2023	28 Apr 2023	26 Apr 2023	05 Jun 2023	01 May 2023
GW-QD1	SE246397.002	LB277672	21 Apr 2023	24 Apr 2023	28 Apr 2023	26 Apr 2023	05 Jun 2023	01 May 2023

Turbidity

Method: ME-(AU)-[ENV]AN119

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH103M	SE246397.001	LB277627	21 Apr 2023	24 Apr 2023	22 Apr 2023	24 Apr 2023†	22 Apr 2023	24 Apr 2023†

VOCs in Water

Method: ME-(AU)-[ENV]AN433

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH103M	SE246397.001	LB277972	21 Apr 2023	24 Apr 2023	05 May 2023	28 Apr 2023	05 May 2023	02 May 2023
GW-QD1	SE246397.002	LB277972	21 Apr 2023	24 Apr 2023	05 May 2023	28 Apr 2023	05 May 2023	02 May 2023

Volatile Petroleum Hydrocarbons in Water

Method: ME-(AU)-[ENV]AN433

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH103M	SE246397.001	LB277972	21 Apr 2023	24 Apr 2023	05 May 2023	28 Apr 2023	05 May 2023	02 May 2023
GW-QD1	SE246397.002	LB277972	21 Apr 2023	24 Apr 2023	05 May 2023	28 Apr 2023	05 May 2023	02 May 2023

SURROGATES

Surrogate results are evaluated against upper and lower limit criteria established in the SGS QA/QC plan (Ref: MP-(AU)-[ENV]QU-022). At least two of three routine level soil sample surrogate spike recoveries for BTEX/VOC are to be within 70-130% where control charts have not been developed and within the established control limits for charted surrogates. Matrix effects may void this as an acceptance criterion. Water sample surrogate spike recoveries are to be within 40-130%. The presence of emulsions, surfactants and particulates may void this as an acceptance criterion.

Result is shown in **Green** when within suggested criteria or **Red** with an appended reason identifer when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

PAH (Polynuclear Aromatic Hydrocarbons) in Water

Method: ME-(AU)-[ENV]AN420

Parameter	Sample Name	Sample Number	Units	Criteria	Recovery %
2-fluorobiphenyl (Surrogate)	BH103M	SE246397.001	%	40 - 130%	67
d14-p-terphenyl (Surrogate)	BH103M	SE246397.001	%	40 - 130%	72
d5-nitrobenzene (Surrogate)	BH103M	SE246397.001	%	40 - 130%	484 ④

VOCs in Water

Method: ME-(AU)-[ENV]AN433

Parameter	Sample Name	Sample Number	Units	Criteria	Recovery %
Bromofluorobenzene (Surrogate)	BH103M	SE246397.001	%	40 - 130%	103
	GW-QD1	SE246397.002	%	40 - 130%	123
d4-1,2-dichloroethane (Surrogate)	BH103M	SE246397.001	%	40 - 130%	91
	GW-QD1	SE246397.002	%	40 - 130%	100
d8-toluene (Surrogate)	BH103M	SE246397.001	%	40 - 130%	95
	GW-QD1	SE246397.002	%	40 - 130%	96

Volatile Petroleum Hydrocarbons in Water

Method: ME-(AU)-[ENV]AN433

Parameter	Sample Name	Sample Number	Units	Criteria	Recovery %
Bromofluorobenzene (Surrogate)	BH103M	SE246397.001	%	40 - 130%	103
	GW-QD1	SE246397.002	%	40 - 130%	123
d4-1,2-dichloroethane (Surrogate)	BH103M	SE246397.001	%	60 - 130%	91
	GW-QD1	SE246397.002	%	60 - 130%	100
d8-toluene (Surrogate)	BH103M	SE246397.001	%	40 - 130%	95
	GW-QD1	SE246397.002	%	40 - 130%	96

METHOD BLANKS

Blank results are evaluated against the limit of reporting (LOR), for the chosen method and its associated instrumentation, typically 2.5 times the statistically determined method detection limit (MDL).

Result is shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria.

Conductivity and TDS by Calculation - Water

Method: ME-(AU)-[ENV]AN106

Sample Number	Parameter	Units	LOR	Result
LB277625.001	Conductivity @ 25 C	µS/cm	2	<2

Mercury (dissolved) in Water

Method: ME-(AU)-[ENV]AN311(Perth)/AN312

Sample Number	Parameter	Units	LOR	Result
LB277706.001	Mercury	mg/L	0.0001	<0.0001

Metals in Water (Dissolved) by ICPOES

Method: ME-(AU)-[ENV]AN320

Sample Number	Parameter	Units	LOR	Result
LB277945.001	Calcium, Ca	mg/L	0.2	<0.2
	Magnesium, Mg	mg/L	0.1	<0.1

PAH (Polynuclear Aromatic Hydrocarbons) in Water

Method: ME-(AU)-[ENV]AN420

Sample Number	Parameter	Units	LOR	Result
LB277672.001	Naphthalene	µg/L	0.1	<0.1
	2-methylnaphthalene	µg/L	0.1	<0.1
	1-methylnaphthalene	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-cd)pyrene	µg/L	0.1	<0.1
	Dibenzo(ah)anthracene	µg/L	0.1	<0.1
	Benzo(ghi)perylene	µg/L	0.1	<0.1
Surrogates	d5-nitrobenzene (Surrogate)	%	-	44
	2-fluorobiphenyl (Surrogate)	%	-	52
	d14-p-terphenyl (Surrogate)	%	-	82

Total Cyanide in water by Discrete Analyser

Method: ME-(AU)-[ENV]AN077/AN287

Sample Number	Parameter	Units	LOR	Result
LB277828.001	Total Cyanide	mg/L	0.004	<0.004

Total Dissolved Solids (TDS) in water

Method: ME-(AU)-[ENV]AN113

Sample Number	Parameter	Units	LOR	Result
LB277833.001	Total Dissolved Solids Dried at 175-185°C	mg/L	10	<10

Total Phenolics in Water

Method: ME-(AU)-[ENV]AN295

Sample Number	Parameter	Units	LOR	Result
LB277799.001	Total Phenols	mg/L	0.05	<0.05

Trace Metals (Dissolved) in Water by ICPMS

Method: ME-(AU)-[ENV]AN318

Sample Number	Parameter	Units	LOR	Result
LB277783.001	Aluminium	µg/L	5	<5
	Arsenic	µg/L	1	<1
	Cadmium	µg/L	0.1	<0.1
	Chromium	µg/L	1	<1
	Copper	µg/L	1	<1

Blank results are evaluated against the limit of reporting (LOR), for the chosen method and its associated instrumentation, typically 2.5 times the statistically determined method detection limit (MDL).

Result is shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria.

Trace Metals (Dissolved) in Water by ICPMS (continued)

Method: ME-(AU)-[ENV]AN318

Sample Number	Parameter	Units	LOR	Result
LB277783.001	Lead	µg/L	1	<1
	Nickel	µg/L	1	<1
	Zinc	µg/L	5	<5

TRH (Total Recoverable Hydrocarbons) in Water

Method: ME-(AU)-[ENV]AN403

Sample Number	Parameter	Units	LOR	Result
LB277672.001	TRH C10-C14	µg/L	50	<50
	TRH C15-C28	µg/L	200	<200
	TRH C29-C36	µg/L	200	<200
	TRH C37-C40	µg/L	200	<200

Turbidity

Method: ME-(AU)-[ENV]AN119

Sample Number	Parameter	Units	LOR	Result
LB277627.001	Turbidity	NTU	0.5	<0.5

VOCs in Water

Method: ME-(AU)-[ENV]AN433

Sample Number		Parameter	Units	LOR	Result
LB277972.001	Fumigants	2,2-dichloropropane	µg/L	0.5	<0.5
		1,2-dichloropropane	µg/L	0.5	<0.5
		cis-1,3-dichloropropene	µg/L	0.5	<0.5
		trans-1,3-dichloropropene	µg/L	0.5	<0.5
		1,2-dibromoethane (EDB)	µg/L	0.5	<0.5
	Halogenated Aliphatics	Dichlorodifluoromethane (CFC-12)	µg/L	5	<5
		Chloromethane	µg/L	5	<5
		Vinyl chloride (Chloroethene)	µg/L	0.3	<0.3
		Bromomethane	µg/L	10	<10
		Chloroethane	µg/L	5	<5
		Trichlorofluoromethane	µg/L	1	<1
		1,1-dichloroethene	µg/L	0.5	<0.5
		Iodomethane	µg/L	5	<5
		Dichloromethane (Methylene chloride)	µg/L	5	<5
		Allyl chloride	µg/L	2	<2
		trans-1,2-dichloroethene	µg/L	0.5	<0.5
		1,1-dichloroethane	µg/L	0.5	<0.5
		cis-1,2-dichloroethene	µg/L	0.5	<0.5
		Bromochloromethane	µg/L	0.5	<0.5
		1,2-dichloroethane	µg/L	0.5	<0.5
		1,1,1-trichloroethane	µg/L	0.5	<0.5
		1,1-dichloropropene	µg/L	0.5	<0.5
		Carbon tetrachloride	µg/L	0.5	<0.5
		Dibromomethane	µg/L	0.5	<0.5
		Trichloroethene (Trichloroethylene,TCE)	µg/L	0.5	<0.5
		1,1,2-trichloroethane	µg/L	0.5	<0.5
		1,3-dichloropropane	µg/L	0.5	<0.5
		Tetrachloroethene (Perchloroethylene,PCE)	µg/L	0.5	<0.5
		1,1,1,2-tetrachloroethane	µg/L	0.5	<0.5
		1,1,2,2-tetrachloroethane	µg/L	0.5	<0.5
		1,2,3-trichloropropane	µg/L	0.5	<0.5
		trans-1,4-dichloro-2-butene	µg/L	1	<1
		1,2-dibromo-3-chloropropane	µg/L	0.5	<0.5
		Hexachlorobutadiene	µg/L	0.5	<0.5
	Halogenated Aromatics	Chlorobenzene	µg/L	0.5	<0.5
		Bromobenzene	µg/L	0.5	<0.5
		2-chlorotoluene	µg/L	0.5	<0.5
		4-chlorotoluene	µg/L	0.5	<0.5
		1,3-dichlorobenzene	µg/L	0.5	<0.5
		1,4-dichlorobenzene	µg/L	0.3	<0.3
		1,2-dichlorobenzene	µg/L	0.5	<0.5
		1,2,4-trichlorobenzene	µg/L	0.5	<0.5
		1,2,3-trichlorobenzene	µg/L	0.5	<0.5

METHOD BLANKS

Blank results are evaluated against the limit of reporting (LOR), for the chosen method and its associated instrumentation, typically 2.5 times the statistically determined method detection limit (MDL).

Result is shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria.

VOCs in Water (continued)

Method: ME-(AU)-[ENV]AN433

Sample Number		Parameter	Units	LOR	Result
LB277972.001	Monocyclic Aromatic Hydrocarbons	Benzene	µg/L	0.5	<0.5
		Toluene	µg/L	0.5	<0.5
		Ethylbenzene	µg/L	0.5	<0.5
		m/p-xylene	µg/L	1	<1
		Styrene (Vinyl benzene)	µg/L	0.5	<0.5
		o-xylene	µg/L	0.5	<0.5
		Isopropylbenzene (Cumene)	µg/L	0.5	<0.5
		n-propylbenzene	µg/L	0.5	<0.5
		1,3,5-trimethylbenzene	µg/L	0.5	<0.5
		tert-butylbenzene	µg/L	0.5	<0.5
		1,2,4-trimethylbenzene	µg/L	0.5	<0.5
		sec-butylbenzene	µg/L	0.5	<0.5
		p-isopropyltoluene	µg/L	0.5	<0.5
		n-butylbenzene	µg/L	0.5	<0.5
	Nitrogenous Compounds	Acrylonitrile	µg/L	0.5	<0.5
	Oxygenated Compounds	Acetone (2-propanone)	µg/L	10	<10
		MtBE (Methyl-tert-butyl ether)	µg/L	2	<1
		Vinyl acetate*	µg/L	10	<10
		MEK (2-butanone)	µg/L	10	<10
		MIBK (4-methyl-2-pentanone)	µg/L	5	<5
		2-hexanone (MBK)	µg/L	5	<5
	Polycyclic VOCs	Naphthalene (VOC)*	µg/L	0.5	<0.5
	Sulphonated	Carbon disulfide	µg/L	2	<2
	Surrogates	d4-1,2-dichloroethane (Surrogate)	%	-	92
		d8-toluene (Surrogate)	%	-	97
		Bromofluorobenzene (Surrogate)	%	-	99
	Trihalomethanes	Chloroform (THM)	µg/L	0.5	<0.5
		Bromodichloromethane (THM)	µg/L	0.5	<0.5
		Dibromochloromethane (THM)	µg/L	0.5	<0.5
		Bromoform (THM)	µg/L	0.5	<0.5

Volatile Petroleum Hydrocarbons in Water

Method: ME-(AU)-[ENV]AN433

Sample Number		Parameter	Units	LOR	Result
LB277972.001		TRH C6-C9	µg/L	40	<40
	Surrogates	d4-1,2-dichloroethane (Surrogate)	%	-	92
		d8-toluene (Surrogate)	%	-	97
		Bromofluorobenzene (Surrogate)	%	-	99

Duplicates are calculated as Relative Percentage Difference (RPD) using the formula: RPD = | OriginalResult - ReplicateResult | x 100 / Mean
The RPD is evaluated against the Maximum Allowable Difference (MAD) criteria and can be graphically represented by a curve calculated from the Statistical Detection Limit (SDL) and Limiting Repeatability (LR) using the formula: MAD = 100 x SDL / Mean + LR
Where the Maximum Allowable Difference evaluates to a number larger than 200 it is displayed as 200.

RPD is shown in **Green** when within suggested criteria or **Red** with an appended reason identifer when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

NOTE: The RPD reported is calculated from the unrounded data for the original and replicate result. Manual calculation of the RPD from the rounded data reported may give a different calculated RPD.

Conductivity and TDS by Calculation - Water

Method: ME-(AU)-[ENV]AN106

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE246404.001	LB277625.014	Conductivity @ 25 C	µS/cm	2	2800	2800	15	0
SE246406.001	LB277625.017	Conductivity @ 25 C	µS/cm	2	3100	3100	15	0

Metals in Water (Dissolved) by ICPOES

Method: ME-(AU)-[ENV]AN320

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE246316.001	LB277945.014	Calcium, Ca	mg/L	0.2	350	350	15	0
SE246529.001	LB277945.028	Calcium, Ca	mg/L	0.2	71	72	15	1
		Magnesium, Mg	mg/L	0.1	7.5	7.6	16	2
SE246550.001	LB277945.031	Calcium, Ca	mg/L	0.2	130	130	15	0
		Magnesium, Mg	mg/L	0.1	43	44	15	1

Total Dissolved Solids (TDS) in water

Method: ME-(AU)-[ENV]AN113

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE246317.001	LB277833.012	Total Dissolved Solids Dried at 175-185°C	mg/L	10	3700	3600	15	3
SE246405.001	LB277833.021	Total Dissolved Solids Dried at 175-185°C	mg/L	10	4300	4400	15	1

Total Phenolics in Water

Method: ME-(AU)-[ENV]AN295

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE246445.001	LB277799.009	Total Phenols	mg/L	0.05	0.73	0.83	21	12

Trace Metals (Dissolved) in Water by ICPMS

Method: ME-(AU)-[ENV]AN318

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE246441.001	LB277783.013	Aluminium	µg/L	5	21	21	39	2
		Arsenic	µg/L	1	1	1	112	4
		Cadmium	µg/L	0.1	<0.1	<0.1	200	0
		Chromium	µg/L	1	<1	<1	173	0
		Copper	µg/L	1	<1	<1	154	0
		Lead	µg/L	1	<1	<1	200	0
		Nickel	µg/L	1	1	1	111	1
		Zinc	µg/L	5	7	7	88	7

TRH (Total Recoverable Hydrocarbons) in Water

Method: ME-(AU)-[ENV]AN403

Original	Duplicate		Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE246347.001	LB277672.028		TRH C10-C14	µg/L	50	<0.05	<0.05	200	0
			TRH C15-C28	µg/L	200	1.0	1.2	48	16
			TRH C29-C36	µg/L	200	<0.2	<0.2	200	0
			TRH C37-C40	µg/L	200	<200	<200	200	0
			TRH C10-C40	µg/L	320	1.0	1.2	59	16
		TRH F Bands	TRH >C10-C16	µg/L	60	<0.06	<0.06	200	0
			TRH >C10-C16 - Naphthalene (F2)	µg/L	60	<0.06	<0.06	200	0
			TRH >C16-C34 (F3)	µg/L	500	1.0	1.2	75	16
			TRH >C34-C40 (F4)	µg/L	500	<0.5	<0.5	200	0

Turbidity

Method: ME-(AU)-[ENV]AN119

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE246397.001	LB277627.009	Turbidity	NTU	0.5	380	380	15	0

VOCs in Water

Method: ME-(AU)-[ENV]AN433

Original	Duplicate		Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE246397.001	LB277972.025	Fumigants	2,2-dichloropropane	µg/L	0.5	<0.5	0	200	0
			1,2-dichloropropane	µg/L	0.5	<0.5	0	200	0
			cis-1,3-dichloropropene	µg/L	0.5	<0.5	0	200	0
			trans-1,3-dichloropropene	µg/L	0.5	<0.5	0	200	0
			1,2-dibromoethane (EDB)	µg/L	0.5	<0.5	0	200	0
		Halogenated Aliphatics	Dichlorodifluoromethane (CFC-12)	µg/L	5	<5	0	200	0
			Chloromethane	µg/L	5	<5	0	200	0
			Vinyl chloride (Chloroethene)	µg/L	0.3	<0.3	0	200	0

DUPLICATES

Duplicates are calculated as Relative Percentage Difference (RPD) using the formula: RPD = | OriginalResult - ReplicateResult | x 100 / Mean
The RPD is evaluated against the Maximum Allowable Difference (MAD) criteria and can be graphically represented by a curve calculated from the Statistical Detection Limit (SDL) and Limiting Repeatability (LR) using the formula: MAD = 100 x SDL / Mean + LR
Where the Maximum Allowable Difference evaluates to a number larger than 200 it is displayed as 200.

RPD is shown in **Green** when within suggested criteria or **Red** with an appended reason identifer when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

NOTE: The RPD reported is calculated from the unrounded data for the original and replicate result. Manual calculation of the RPD from the rounded data reported may give a different calculated RPD.

VOCs in Water (continued)

Method: ME-(AU)-[ENV]AN433

Original	Duplicate		Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE246397.001	LB277972.025	Halogenated Aliphatics	Bromomethane	µg/L	10	<10	0	200	0
			Chloroethane	µg/L	5	<5	0	200	0
			Trichlorofluoromethane	µg/L	1	<1	0	200	0
			1,1-dichloroethene	µg/L	0.5	<0.5	0.0303020093	200	0
			Iodomethane	µg/L	5	<5	0.0276261372	200	0
			Dichloromethane (Methylene chloride)	µg/L	5	<5	0	200	0
			Allyl chloride	µg/L	2	<2	0	200	0
			trans-1,2-dichloroethene	µg/L	0.5	<0.5	0	200	0
			1,1-dichloroethane	µg/L	0.5	<0.5	0	200	0
			cis-1,2-dichloroethene	µg/L	0.5	<0.5	0.0616658100	200	0
			Bromochloromethane	µg/L	0.5	<0.5	0	200	0
			1,2-dichloroethane	µg/L	0.5	<0.5	0.0533549018	200	0
			1,1,1-trichloroethane	µg/L	0.5	<0.5	0	200	0
			1,1-dichloropropene	µg/L	0.5	<0.5	0	200	0
			Carbon tetrachloride	µg/L	0.5	<0.5	0	200	0
			Dibromomethane	µg/L	0.5	<0.5	0	200	0
			Trichloroethene (Trichloroethylene,TCE)	µg/L	0.5	<0.5	0.1268582048	200	0
			1,1,2-trichloroethane	µg/L	0.5	<0.5	0	200	0
			1,3-dichloropropane	µg/L	0.5	<0.5	0	200	0
			Tetrachloroethene (Perchloroethylene,PCE)	µg/L	0.5	<0.5	0	200	0
			1,1,1,2-tetrachloroethane	µg/L	0.5	<0.5	0	200	0
			1,1,2,2-tetrachloroethane	µg/L	0.5	<0.5	0	200	0
			1,2,3-trichloropropane	µg/L	0.5	<0.5	0	200	0
			trans-1,4-dichloro-2-butene	µg/L	1	<1	0	200	0
			1,2-dibromo-3-chloropropane	µg/L	0.5	<0.5	0	200	0
			Hexachlorobutadiene	µg/L	0.5	<0.5	0.0060829759	200	0
		Halogenated Aromatics	Chlorobenzene	µg/L	0.5	<0.5	0.1002664144	200	0
			Bromobenzene	µg/L	0.5	<0.5	0	200	0
			2-chlorotoluene	µg/L	0.5	<0.5	0	200	0
			4-chlorotoluene	µg/L	0.5	<0.5	0	200	0
			1,3-dichlorobenzene	µg/L	0.5	<0.5	0.0668528563	200	0
			1,4-dichlorobenzene	µg/L	0.3	<0.3	0.0271081860	200	0
			1,2-dichlorobenzene	µg/L	0.5	<0.5	0.0097085048	200	0
			1,2,4-trichlorobenzene	µg/L	0.5	<0.5	0.0135734397	200	0
			1,2,3-trichlorobenzene	µg/L	0.5	<0.5	0.1079443305	200	0
		Monocyclic Aromatic	Benzene	µg/L	0.5	<0.5	<0.5	200	0
			Toluene	µg/L	0.5	<0.5	<0.5	200	0
			Ethylbenzene	µg/L	0.5	<0.5	<0.5	200	0
			m/p-xylene	µg/L	1	<1	<1	200	0
			Styrene (Vinyl benzene)	µg/L	0.5	<0.5	0.0278684865	200	0
			o-xylene	µg/L	0.5	<0.5	<0.5	200	0
			Isopropylbenzene (Cumene)	µg/L	0.5	<0.5	0.0297891563	200	0
			n-propylbenzene	µg/L	0.5	<0.5	0.0235939448	200	0
			1,3,5-trimethylbenzene	µg/L	0.5	<0.5	0.0385764946	200	0
			tert-butylbenzene	µg/L	0.5	<0.5	0.0180403750	200	0
			1,2,4-trimethylbenzene	µg/L	0.5	<0.5	0.0673807902	200	0
			sec-butylbenzene	µg/L	0.5	<0.5	0	200	0
			p-isopropyltoluene	µg/L	0.5	<0.5	0.0852505003	200	0
			n-butylbenzene	µg/L	0.5	<0.5	0	200	0
		Nitrogenous Compounds	Acrylonitrile	µg/L	0.5	<0.5	0.0126558011	200	0
			2-nitropropane	µg/L	100	<100	0.1230706742	200	0
		Oxygenated Compounds	Acetone (2-propanone)	µg/L	10	<10	0	200	0
			MtBE (Methyl-tert-butyl ether)	µg/L	2	<2	0.0047005826	200	0
			Vinyl acetate*	µg/L	10	<10	0.0312789953	200	0
			MEK (2-butanone)	µg/L	10	<10	0	200	0
			MIBK (4-methyl-2-pentanone)	µg/L	5	<5	0.2291735532	200	0
			2-hexanone (MBK)	µg/L	5	<5	0	200	0
		Polycyclic	Naphthalene (VOC)*	µg/L	0.5	<0.5	<0.5	200	0
		Sulphonated	Carbon disulfide	µg/L	2	<2	0.3011466985	200	0
		Surrogates	d4-1,2-dichloroethane (Surrogate)	µg/L	-	9.1	8.9	30	3
			d8-toluene (Surrogate)	µg/L	-	9.5	10	30	9

Duplicates are calculated as Relative Percentage Difference (RPD) using the formula: RPD = | OriginalResult - ReplicateResult | x 100 / Mean
The RPD is evaluated against the Maximum Allowable Difference (MAD) criteria and can be graphically represented by a curve calculated from the Statistical Detection Limit (SDL) and Limiting Repeatability (LR) using the formula: MAD = 100 x SDL / Mean + LR
Where the Maximum Allowable Difference evaluates to a number larger than 200 it is displayed as 200.

RPD is shown in **Green** when within suggested criteria or **Red** with an appended reason identifer when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

NOTE: The RPD reported is calculated from the unrounded data for the original and replicate result. Manual calculation of the RPD from the rounded data reported may give a different calculated RPD.

VOCs in Water (continued)

Method: ME-(AU)-[ENV]AN433

Original	Duplicate		Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE246397.001	LB277972.025	Surrogates	Bromofluorobenzene (Surrogate)	µg/L	-	10	10	30	1
		Totals	Total BTEX	µg/L	3	<3	<3	200	0
			Total VOC	µg/L	10	<10	0.2918373419	200	0
		Trihalomethanes	Chloroform (THM)	µg/L	0.5	<0.5	0.2861410050	200	0
			Bromodichloromethane (THM)	µg/L	0.5	<0.5	0	200	0
			Dibromochloromethane (THM)	µg/L	0.5	<0.5	0	200	0
			Bromoform (THM)	µg/L	0.5	<0.5	0	200	0

Volatile Petroleum Hydrocarbons in Water

Method: ME-(AU)-[ENV]AN433

Original	Duplicate		Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE246383.007	LB277972.025	Surrogates	d4-1,2-dichloroethane (Surrogate)	µg/L	-	0.0	0.0	30	16
			d8-toluene (Surrogate)	µg/L	-	0.0	0.0	30	1
			Bromofluorobenzene (Surrogate)	µg/L	-	0.0	0.0	30	8
		VPH F Bands	Benzene (F0)	µg/L	0.5	<0.5	<0.5	200	0
SE246397.001	LB277972.023		TRH C6-C10	µg/L	50	<50	<50	200	0
			TRH C6-C9	µg/L	40	<40	<40	200	0
		Surrogates	d4-1,2-dichloroethane (Surrogate)	µg/L	-	9.1	0.0	30	3
			d8-toluene (Surrogate)	µg/L	-	9.5	0.0	30	9
			Bromofluorobenzene (Surrogate)	µg/L	-	10	0.0	30	1
		VPH F Bands	Benzene (F0)	µg/L	0.5	<0.5	<0.5	200	0
			TRH C6-C10 minus BTEX (F1)	µg/L	50	<50	<50	200	0

Laboratory Control Standard (LCS) results are evaluated against an expected result, typically the concentration of analyte spiked into the control during the sample preparation stage, producing a percentage recovery. The criteria applied to the percentage recovery is established in the SGS QA /QC plan (Ref: MP-(AU)-[ENV]QU-022). For more information refer to the footnotes in the concluding page of this report.

Recovery is shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria.

Conductivity and TDS by Calculation - Water

Method: ME-(AU)-[ENV]AN106

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB277625.002	Conductivity @ 25 C	µS/cm	2	290	303	90 - 110	97

Metals in Water (Dissolved) by ICPOES

Method: ME-(AU)-[ENV]AN320

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB277945.002	Calcium, Ca	mg/L	0.2	51	50.5	80 - 120	100
	Magnesium, Mg	mg/L	0.1	51	50.5	80 - 120	102

PAH (Polynuclear Aromatic Hydrocarbons) in Water

Method: ME-(AU)-[ENV]AN420

Sample Number		Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB277672.002		Naphthalene	µg/L	0.1	31	40	60 - 140	78
		Acenaphthylene	µg/L	0.1	33	40	60 - 140	83
		Acenaphthene	µg/L	0.1	32	40	60 - 140	80
		Phenanthrene	µg/L	0.1	36	40	60 - 140	90
		Anthracene	µg/L	0.1	34	40	60 - 140	84
		Fluoranthene	µg/L	0.1	35	40	60 - 140	87
		Pyrene	µg/L	0.1	34	40	60 - 140	84
		Benzo(a)pyrene	µg/L	0.1	36	40	60 - 140	89
	Surrogates	d5-nitrobenzene (Surrogate)	µg/L	-	0.39	0.5	40 - 130	78
		2-fluorobiphenyl (Surrogate)	µg/L	-	0.38	0.5	40 - 130	76
		d14-p-terphenyl (Surrogate)	µg/L	-	0.36	0.5	40 - 130	72

pH in water

Method: ME-(AU)-[ENV]AN101

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB277625.003	pH**	pH Units	0.1	7.4	7.415	98 - 102	100

Total Cyanide in water by Discrete Analyser

Method: ME-(AU)-[ENV]AN077/AN287

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB277828.002	Total Cyanide	mg/L	0.004	0.027	0.025	80 - 120	108

Total Phenolics in Water

Method: ME-(AU)-[ENV]AN295

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB277799.002	Total Phenols	mg/L	0.05	0.21	0.2	80 - 120	103

Trace Metals (Dissolved) in Water by ICPMS

Method: ME-(AU)-[ENV]AN318

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB277783.002	Aluminium	µg/L	5	21	20	80 - 120	104
	Arsenic	µg/L	1	20	20	80 - 120	100
	Cadmium	µg/L	0.1	20	20	80 - 120	99
	Chromium	µg/L	1	19	20	80 - 120	97
	Copper	µg/L	1	20	20	80 - 120	99
	Lead	µg/L	1	21	20	80 - 120	103
	Nickel	µg/L	1	21	20	80 - 120	103
	Zinc	µg/L	5	19	20	80 - 120	93

TRH (Total Recoverable Hydrocarbons) in Water

Method: ME-(AU)-[ENV]AN403

Sample Number		Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB277672.002		TRH C10-C14	µg/L	50	970	1200	60 - 140	81
		TRH C15-C28	µg/L	200	1100	1200	60 - 140	94
		TRH C29-C36	µg/L	200	1300	1200	60 - 140	106
	TRH F Bands	TRH >C10-C16	µg/L	60	1100	1200	60 - 140	90
		TRH >C16-C34 (F3)	µg/L	500	1200	1200	60 - 140	97
		TRH >C34-C40 (F4)	µg/L	500	690	600	60 - 140	114

VOCs in Water

Method: ME-(AU)-[ENV]AN433

Sample Number	Parameter	Units	LOR

Laboratory Control Standard (LCS) results are evaluated against an expected result, typically the concentration of analyte spiked into the control during the sample preparation stage, producing a percentage recovery. The criteria applied to the percentage recovery is established in the SGS QA /QC plan (Ref: MP-(AU)-[ENV]QU-022). For more information refer to the footnotes in the concluding page of this report.

Recovery is shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria.

VOCs in Water (continued)

Method: ME-(AU)-[ENV]AN433

Sample Number		Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB277972.002	Halogenated Aliphatics	1,1-dichloroethene	µg/L	0.5	44	45.45	60 - 140	97
		1,2-dichloroethane	µg/L	0.5	52	45.45	60 - 140	114
		Trichloroethene (Trichloroethylene,TCE)	µg/L	0.5	49	45.45	60 - 140	109
	Halogenated	Chlorobenzene	µg/L	0.5	59	45.45	60 - 140	129
	Monocyclic Aromatic	Benzene	µg/L	0.5	47	45.45	60 - 140	104
		Toluene	µg/L	0.5	52	45.45	60 - 140	113
		Ethylbenzene	µg/L	0.5	52	45.45	60 - 140	115
		m/p-xylene	µg/L	1	110	90.9	60 - 140	116
		o-xylene	µg/L	0.5	55	45.45	60 - 140	121
	Surrogates	d4-1,2-dichloroethane (Surrogate)	µg/L	-	10	10	60 - 140	100
		d8-toluene (Surrogate)	µg/L	-	9.2	10	70 - 130	92
		Bromofluorobenzene (Surrogate)	µg/L	-	10	10	70 - 130	105
	Trihalomethan	Chloroform (THM)	µg/L	0.5	54	45.45	60 - 140	119

Volatile Petroleum Hydrocarbons in Water

Method: ME-(AU)-[ENV]AN433

Sample Number		Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB277972.002		TRH C6-C10	µg/L	50	850	946.63	60 - 140	90
		TRH C6-C9	µg/L	40	770	818.71	60 - 140	94
	Surrogates	d4-1,2-dichloroethane (Surrogate)	µg/L	-	10	10	60 - 140	100
		d8-toluene (Surrogate)	µg/L	-	9.2	10	70 - 130	92
		Bromofluorobenzene (Surrogate)	µg/L	-	10	10	70 - 130	105
	VPH F Bands	TRH C6-C10 minus BTEX (F1)	µg/L	50	540	639.67	60 - 140	84

MATRIX SPIKES

Matrix Spike (MS) results are evaluated as the percentage recovery of an expected result, typically the concentration of analyte spiked into a field sub-sample during the sample preparation stage. The original sample's result is subtracted from the sub-sample result before determining the percentage recovery. The criteria applied to the percentage recovery is established in the SGS QA/QC plan (ref: MP-(AU)-[ENV]QU-022). For more information refer to the footnotes in the concluding page of this report.

Recovery is shown in **Green** when within suggested criteria or **Red** with an appended reason identifer when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

Metals in Water (Dissolved) by ICPOES

Method: ME-(AU)-[ENV]AN320

QC Sample	Sample Number	Parameter	Units	LOR	Result	Original	Spike	Recovery%
SE246251.001	LB277945.004	Calcium, Ca	mg/L	0.2	110	63	50.5	93
		Magnesium, Mg	mg/L	0.1	88	40	50.5	96

Total Cyanide in water by Discrete Analyser

Method: ME-(AU)-[ENV]AN077/AN287

QC Sample	Sample Number	Parameter	Units	LOR	Result	Original	Spike	Recovery%
SE246441.001	LB277828.008	Total Cyanide	mg/L	0.004	0.025	<0.004	0.025	100

Total Phenolics in Water

Method: ME-(AU)-[ENV]AN295

QC Sample	Sample Number	Parameter	Units	LOR	Result	Original	Spike	Recovery%
SE246441.001	LB277799.004	Total Phenols	mg/L	0.05	0.20	<0.05	0.2	102

Trace Metals (Dissolved) in Water by ICPMS

Method: ME-(AU)-[ENV]AN318

QC Sample	Sample Number	Parameter	Units	LOR	Result	Original	Spike	Recovery%
SE246331.001	LB277783.004	Arsenic	μg/L	1	21	<1	20	102
		Cadmium	μg/L	0.1	20	<0.1	20	100
		Chromium	μg/L	1	20	<1	20	98
		Copper	μg/L	1	22	2	20	99
		Lead	μg/L	1	21	<1	20	104
		Nickel	μg/L	1	21	<1	20	103
		Zinc	μg/L	5	47	25	20	106

Volatile Petroleum Hydrocarbons in Water

Method: ME-(AU)-[ENV]AN433

QC Sample	Sample Number		Parameter	Units	LOR	Result	Original	Spike	Recovery%
SE246383.001	LB277972.024	Surrogates	d4-1,2-dichloroethane (Surrogate)	μg/L	-	0.0	0.0	-	92
			d8-toluene (Surrogate)	μg/L	-	0.0	0.0	-	90
			Bromofluorobenzene (Surrogate)	μg/L	-	0.0	0.0	-	91
		VPH F	Benzene (F0)	μg/L	0.5		0.02040921963	-	-

MATRIX SPIKE DUPLICATES

Matrix spike duplicates are calculated as Relative Percent Difference (RPD) using the formula: RPD = | OriginalResult - ReplicateResult | x 100 / Mean

The original result is the analyte concentration of the matrix spike. The Duplicate result is the analyte concentration of the matrix spike duplicate.

The RPD is evaluated against the Maximum Allowable Difference (MAD) criteria and can be graphically represented by a curve calculated from the Statistical Detection Limit (SDL) and Limiting Repeatability (LR) using the formula: MAD = 100 x SDL / Mean + LR

Where the Maximum Allowable Difference evaluates to a number larger than 200 it is displayed as 200.

RPD is shown in **Green** when within suggested criteria or **Red** with an appended reason identifer when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

No matrix spike duplicates were required for this job.

FOOTNOTES

Samples analysed as received.

Solid samples expressed on a dry weight basis.

QC criteria are subject to internal review according to the SGS QA/QC plan and may be provided on request or alternatively can be found here: https://www.sgs.com.au/~/media/Local/Australia/Documents/Technical Documents/MP-AU-ENV-QU-022 QA QC Plan.pdf

*	NATA accreditation does not cover the performance of this service.
**	Indicative data, theoretical holding time exceeded.
***	Indicates that both * and ** apply.
-	Sample not analysed for this analyte.
IS	Insufficient sample for analysis.
LNR	Sample listed, but not received.
LOR	Limit of reporting.
QFH	QC result is above the upper tolerance.
QFL	QC result is below the lower tolerance.
①	At least 2 of 3 surrogates are within acceptance criteria.
②	RPD failed acceptance criteria due to sample heterogeneity.
③	Results less than 5 times LOR preclude acceptance criteria for RPD.
④	Recovery failed acceptance criteria due to matrix interference.
⑤	Recovery failed acceptance criteria due to the presence of significant concentration of analyte (i.e. the concentration of analyte exceeds the spike level).
⑥	LOR was raised due to sample matrix interference.
⑦	LOR was raised due to dilution of significantly high concentration of analyte in sample.
⑧	Reanalysis of sample in duplicate confirmed sample heterogeneity and inconsistency of results.
⑨	Recovery failed acceptance criteria due to sample heterogeneity.
⑩	LOR was raised due to high conductivity of the sample (required dilution).
†	Refer to relevant report comments for further information.

Sheet 1 of 1

Site: 10 - 28 Lawrence St, Freshwater

Project No: E25874

Laboratory:

SGS Australia
Unit 16, 33 Maddox Street,
ALEXANDRIA NSW 2015
P: 02 8594 0400 F: 02 8594 0499

Sample ID	Laboratory ID	Container Type	Sampling		Sample Matrix				Analysis																			
			Date	Time	SOIL	WATER	0.45 µm field filtered	OTHER	HM ^{A} /TRH/BTEX/PAHs OCP/OP/PCB/Asbestos	HM ^{A} /TRH/BTEX/PAHs	HM ^{A} /TRH/BTEX	BTEX	VOCs	Asbestos	Asbestos Quantification	Excavated Natural Material (ENM) Suite	ENM Suite - Stockpile discrete (TRH/BTEX/PAHs)	ENM Suite - Stockpile composite (HM ^{A} /pH / EC / Foreign Materials)	Dewatering Suite	pH / pH peroxide	sPOCAS	Chromium Reducible Sulfur (CrS)	PFAS	pH / CEC (cation exchange)	pH / EC (electrical conductivity)	Sulphate / Chloride	Lead	TCLP HM ^{B} / PAH
BH03M	1	S, P, 2VC	21/4/23	pm		X	X						X						X									
GW-QD1	2	↓	↓	↓		X	X				X																	

Comments

HM ^{A}
Arsenic
Cadmium
Chromium
Copper
Lead
Mercury
Nickel
Zinc

HM ^{B}
Arsenic
Cadmium
Chromium
Lead
Mercury
Nickel

Dewatering Suite
pH & EC
TDS / TDU
Hardness
Total Cyanide
Metals (Al, As, Cd, Cr, Cu, Pb, Hg, Ni, Zn)
TRH (F1, F2, F3, F4)
BTEX
PAH
Total Phenol

SGS EHS Sydney COC
SE246397

LABORATORY TURNAROUND

☒ Standard
☐ 24 Hours
☐ 48 Hours
☐ 72 Hours
☐ Other_____

Container Type:
J = solvent washed, acid rinsed, Teflon sealed glass jar
S = solvent washed, acid rinsed glass bottle
P = natural HDPE plastic bottle
VC = glass vial, Teflon Septum
ZLB = Zip-Lock Bag BB = Bulk Bag

eiaustralia

Suite 6.01, 55 Miller Street,
PYRMONT NSW 2009
Ph: 9516 0722
lab@eiaustralia.com.au

COC June 2021 FORM v.5 - SGS

Investigator: I attest that these samples were collected in accordance with standard EI field sampling procedures.

Report with EI Waste Classification Table ☐

Sampler's Name (EI):	Received by (SGS):
Print Fiona Zhang	Print
Signature	Signature
Date 24/4/23	Date 24/04/23 @ 1:50

Sampler's Comments: P/S CC Li

IMPORTANT:
Please e-mail laboratory results to: lab@eiaustralia.com.au

SAMPLE RECEIPT ADVICE

SE246397

CLIENT DETAILS

Contact	Li Wei	Manager	Huong Crawford
Client	EI AUSTRALIA	Laboratory	SGS Alexandria Environmental
Address	SUITE 6.01 55 MILLER STREET PYRMONT NSW 2009	Address	Unit 16, 33 Maddox St Alexandria NSW 2015
Telephone	61 2 95160722	Telephone	+61 2 8594 0400
Facsimile	(Not specified)	Facsimile	+61 2 8594 0499
Email	li.wei@eiaustralia.com.au	Email	au.environmental.sydney@sgs.com
Project	**E25874 10-28 Lawrence St Freshwater**	Samples Received	Mon 24/4/2023
Order Number	**E25874**	Report Due	Tue 2/5/2023
Samples	2	SGS Reference	**SE246397**

LABORATORY DETAILS

SUBMISSION DETAILS

This is to confirm that 2 samples were received on Monday 24/4/2023. Results are expected to be ready by COB Tuesday 2/5/2023. Please quote SGS reference SE246397 when making enquiries. Refer below for details relating to sample integrity upon receipt.

Type of documentation received	COC	Date documentation received	24/4/2023
Samples received in good order	Yes	Samples received without headspace	Yes
Sample temperature upon receipt	7.8°C	Sample container provider	SGS
Turnaround time requested	Standard	Samples received in correct containers	Yes
Sufficient sample for analysis	Yes	Sample cooling method	Ice Bricks
Samples clearly labelled	Yes	Complete documentation received	Yes

Unless otherwise instructed, water and bulk samples will be held for one month from date of report, and soil samples will be held for two months.

COMMENTS

SAMPLE RECEIPT ADVICE

SE246397

CLIENT DETAILS

Client EI AUSTRALIA

Project E25874 10-28 Lawrence St Freshwater

SUMMARY OF ANALYSIS

No.	Sample ID	Conductivity and TDS by Calculation - Water	PAH (Polynuclear Aromatic Hydrocarbons) in Water	pH in water	Total Dissolved Solids (TDS) in water	Total Phenolics in Water	TRH (Total Recoverable Hydrocarbons) in Water	VOCs in Water	Volatile Petroleum Hydrocarbons in Water
001	BH103M	1	23	1	1	1	9	77	7
002	GW-QD1	-	-	-	-	-	9	11	7

CONTINUED OVERLEAF

The above table represents SGS' interpretation of the client-supplied Chain Of Custody document.
The numbers shown in the table indicate the number of results requested in each package.
Please indicate as soon as possible should your request differ from these details .
Testing as per this table shall commence immediately unless the client intervenes with a correction .

SAMPLE RECEIPT ADVICE

SE246397

CLIENT DETAILS

Client EI AUSTRALIA

Project E25874 10-28 Lawrence St Freshwater

SUMMARY OF ANALYSIS

No.	Sample ID	Mercury (dissolved) in Water	Metals in Water (Dissolved) by ICPOES	Total Cyanide in water by Discrete Analyser	Trace Metals (Dissolved) in Water by ICPMS	Turbidity
001	BH103M	1	3	1	8	1
002	GW-QD1	1	-	-	7	-

The above table represents SGS' interpretation of the client-supplied Chain Of Custody document.
The numbers shown in the table indicate the number of results requested in each package.
Please indicate as soon as possible should your request differ from these details .
Testing as per this table shall commence immediately unless the client intervenes with a correction .

ANALYTICAL REPORT

Accreditation No. 2562

CLIENT DETAILS

Contact	Li Wei
Client	EI AUSTRALIA
Address	SUITE 6.01 55 MILLER STREET PYRMONT NSW 2009
Telephone	61 2 95160722
Facsimile	(Not specified)
Email	li.wei@eiaustralia.com.au
Project	**E25874 10-28 Lawrence St Freshwater-Add**
Order Number	**E25874**
Samples	2

LABORATORY DETAILS

Manager	Huong Crawford
Laboratory	SGS Alexandria Environmental
Address	Unit 16, 33 Maddox St Alexandria NSW 2015
Telephone	+61 2 8594 0400
Facsimile	+61 2 8594 0499
Email	au.environmental.sydney@sgs.com
SGS Reference	**SE246397A R0**
Date Received	3/5/2023
Date Reported	10/5/2023

COMMENTS

Accredited for compliance with ISO/IEC 17025 - Testing. NATA accredited laboratory 2562(4354).

SIGNATORIES

Akheeqar BENIAMEEN
Chemist

Ly Kim HA
Organic Section Head

TRH Silica Gel (Total Recoverable Hydrocarbons - Silica Gel) in Water [AN403] Tested: 8/5/2023

			BH103M	GW_QD1
			WATER	WATER
			-	-
			21/4/2023	21/4/2023
PARAMETER	**UOM**	**LOR**	**SE246397A.001**	**SE246397A.002**
TRH C10-C14-Silica	µg/L	50	5200	30000
TRH C15-C28-Silica	µg/L	200	1600	10000
TRH C29-C36-Silica	µg/L	200	1000	6200
TRH C37-C40-Silica	µg/L	200	<200	<200
TRH >C10-C16-Silica	µg/L	60	5200	30000
TRH >C16-C34-Silica	µg/L	500	2500	16000
TRH >C34-C40-Silica	µg/L	500	<500	<500
TRH Sum C10-C36-Silica	µg/L	450	7800	46000
TRH Sum C10-C40-Silica	µg/L	650	7800	46000

METHOD	METHODOLOGY SUMMARY
AN403	Total Recoverable Hydrocarbons: Determination of Hydrocarbons by gas chromatography after a solvent extraction. Detection is by flame ionisation detector (FID) that produces an electronic signal in proportion to the combustible matter passing through it. Total Recoverable Hydrocarbons (TRH) are routinely reported as four alkane groupings based on the carbon chain length of the compounds: C6-C9, C10-C14, C15-C28 and C29-C36.
AN403	Additionally, the volatile C6-C9 fraction may be determined by a purge and trap technique and GC/MS because of the potential for volatiles loss. Total Recoverable Hydrocarbons - Silica (TRHisilica) follows the same method of analysis after silica gel cleanup of the solvent extract. Aliphatic/Aromatic Speciation follows the same method of analysis after fractionation of the solvent extract over silica with differential polarity of the eluent solvents .
AN403	The GC/FID method is not well suited to the analysis of refined high boiling point materials (ie lubricating oils or greases) but is particularly suited for measuring diesel, kerosene and petrol if care to control volatility is taken. This method will detect naturally occurring hydrocarbons, lipids, animal fats, phenols and PAHs if they are present at sufficient levels, dependent on the use of specific cleanup/fractionation techniques. Reference USEPA 3510B, 8015B.

FOOTNOTES

*	NATA accreditation does not cover the performance of this service.	-	Not analysed.	UOM	Unit of Measure.
		NVL	Not validated.	LOR	Limit of Reporting.
**	Indicative data, theoretical holding time exceeded.	IS	Insufficient sample for analysis.	↑↓	Raised/lowered Limit of Reporting.
		LNR	Sample listed, but not received.		
***	Indicates that both * and ** apply.				

Unless it is reported that sampling has been performed by SGS, the samples have been analysed as received.
Solid samples expressed on a dry weight basis.

Where "Total" analyte groups are reported (for example, Total PAHs, Total OC Pesticides) the total will be calculated as the sum of the individual analytes, with those analytes that are reported as <LOR being assumed to be zero. The summed (Total) limit of reporting is calculated by summing the individual analyte LORs and dividing by two. For example, where 16 individual analytes are being summed and each has an LOR of 0.1 mg/kg, the "Totals" LOR will be 1.6 / 2 (0.8 mg/kg). Where only 2 analytes are being summed, the " Total" LOR will be the sum of those two LORs.

Some totals may not appear to add up because the total is rounded after adding up the raw values.

If reported, measurement uncertainty follow the ± sign after the analytical result and is expressed as the expanded uncertainty calculated using a coverage factor of 2, providing a level of confidence of approximately 95%, unless stated otherwise in the comments section of this report.

Results reported for samples tested under test methods with codes starting with ARS-SOP, radionuclide or gross radioactivity concentrations are expressed in becquerel (Bq) per unit of mass or volume or per wipe as stated on the report. Becquerel is the SI unit for activity and equals one nuclear transformation per second.
Note that in terms of units of radioactivity:

a. 1 Bq is equivalent to 27 pCi
b. 37 MBq is equivalent to 1 mCi

For results reported for samples tested under test methods with codes starting with ARS-SOP, less than (<) values indicate the detection limit for each radionuclide or parameter for the measurement system used. The respective detection limits have been calculated in accordance with ISO 11929.

The QC and MU criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here: www.sgs.com.au/en-gb/environment-health-and-safety.

STATEMENT OF QA/QC PERFORMANCE

SE246397A R0

CLIENT DETAILS

Contact	Li Wei
Client	EI AUSTRALIA
Address	SUITE 6.01 55 MILLER STREET PYRMONT NSW 2009
Telephone	61 2 95160722
Facsimile	(Not specified)
Email	li.wei@eiaustralia.com.au
Project	**E25874 10-28 Lawrence St Freshwater-Add**
Order Number	**E25874**
Samples	2

LABORATORY DETAILS

Manager	Huong Crawford
Laboratory	SGS Alexandria Environmental
Address	Unit 16, 33 Maddox St Alexandria NSW 2015
Telephone	+61 2 8594 0400
Facsimile	+61 2 8594 0499
Email	au.environmental.sydney@sgs.com
SGS Reference	**SE246397A R0**
Date Received	03 May 2023
Date Reported	10 May 2023

COMMENTS

All the laboratory data for each environmental matrix was compared to SGS' stated Data Quality Objectives (DQO). Comments arising from the comparison were made and are reported below.

The data relating to sampling was taken from the Chain of Custody document.
This QA/QC Statement must be read in conjunction with the referenced Analytical Report.
The Statement and the Analytical Report must not be reproduced except in full.

All Data Quality Objectives were met with the exception of the following:

Extraction Date	TRH Silica Gel (Total Recoverable Hydrocarbons - Silica Gel) in Water	2 items

SAMPLE SUMMARY

Type of documentation received	Email	Date documentation received	3/5/2023@11:18am
Samples received in good order	Yes	Samples received without headspace	Yes
Sample temperature upon receipt	7.8°C	Sample container provider	SGS
Turnaround time requested	Standard	Samples received in correct containers	Yes
Sufficient sample for analysis	Yes	Sample cooling method	Ice Bricks
Samples clearly labelled	Yes	Complete documentation received	Yes

HOLDING TIME SUMMARY

SGS holding time criteria are drawn from current regulations and are highly dependent on sample container preservation as specified in the SGS "Field Sampling Guide for Containers and Holding Time" (ref: GU-(AU)-ENV.001). Soil samples guidelines are derived from NEPM "Schedule B(3) Guideline on Laboratory Analysis of Potentially Contaminated Soils". Water sample guidelines are derived from "AS/NZS 5667.1 : 1998 Water Quality - sampling part 1" and APHA "Standard Methods for the Examination of Water and Wastewater" 21st edition 2005.

Extraction and analysis holding time due dates listed are calculated from the date sampled, although holding times may be extended after laboratory extraction for some analytes. The due dates are the suggested dates that samples may be held before extraction or analysis and still be considered valid.

Extraction and analysis dates are shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria. If the sampled date is not supplied then compliance with criteria cannot be determined. If the received date is after one or both due dates then holding time will fail by default.

TRH Silica Gel (Total Recoverable Hydrocarbons - Silica Gel) in Water

Method: ME-(AU)-[ENV]AN403

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH103M	SE246397A.001	LB278743	21 Apr 2023	03 May 2023	28 Apr 2023	08 May 2023†	17 Jun 2023	09 May 2023
GW_QD1	SE246397A.002	LB278743	21 Apr 2023	03 May 2023	28 Apr 2023	08 May 2023†	17 Jun 2023	09 May 2023

SURROGATES

Surrogate results are evaluated against upper and lower limit criteria established in the SGS QA/QC plan (Ref: MP-(AU)-[ENV]QU-022). At least two of three routine level soil sample surrogate spike recoveries for BTEX/VOC are to be within 70-130% where control charts have not been developed and within the established control limits for charted surrogates. Matrix effects may void this as an acceptance criterion. Water sample surrogate spike recoveries are to be within 40-130%. The presence of emulsions, surfactants and particulates may void this as an acceptance criterion.

Result is shown in **Green** when within suggested criteria or **Red** with an appended reason identifer when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

No surrogates were required for this job.

Blank results are evaluated against the limit of reporting (LOR), for the chosen method and its associated instrumentation, typically 2.5 times the statistically determined method detection limit (MDL).

Result is shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria.

TRH Silica Gel (Total Recoverable Hydrocarbons - Silica Gel) in Water

Method: ME-(AU)-[ENV]AN403

Sample Number	Parameter	Units	LOR	Result
LB278743.001	TRH C10-C14-Silica	µg/L	50	<50
	TRH C15-C28-Silica	µg/L	200	<200
	TRH C29-C36-Silica	µg/L	200	<200
	TRH C37-C40-Silica	µg/L	200	<200

DUPLICATES

Duplicates are calculated as Relative Percentage Difference (RPD) using the formula: RPD = | OriginalResult - ReplicateResult | x 100 / Mean
The RPD is evaluated against the Maximum Allowable Difference (MAD) criteria and can be graphically represented by a curve calculated from the Statistical Detection Limit (SDL) and Limiting Repeatability (LR) using the formula: MAD = 100 x SDL / Mean + LR
Where the Maximum Allowable Difference evaluates to a number larger than 200 it is displayed as 200.

RPD is shown in **Green** when within suggested criteria or **Red** with an appended reason identifer when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

NOTE: The RPD reported is calculated from the unrounded data for the original and replicate result. Manual calculation of the RPD from the rounded data reported may give a different calculated RPD.

Original	Duplicate	Parameter	Units	LOR

Laboratory Control Standard (LCS) results are evaluated against an expected result, typically the concentration of analyte spiked into the control during the sample preparation stage, producing a percentage recovery. The criteria applied to the percentage recovery is established in the SGS QA /QC plan (Ref: MP-(AU)-[ENV]QU-022). For more information refer to the footnotes in the concluding page of this report.

Recovery is shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria.

TRH Silica Gel (Total Recoverable Hydrocarbons - Silica Gel) in Water

Method: ME-(AU)-[ENV]AN403

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB278743.002	TRH C10-C14-Silica	µg/L	50	1200	1200	60 - 140	100
	TRH C15-C28-Silica	µg/L	200	1600	1200	60 - 140	129
	TRH C29-C36-Silica	µg/L	200	1600	1200	60 - 140	131
	TRH >C10-C16-Silica	µg/L	60	1300	1200	60 - 140	108
	TRH >C16-C34-Silica	µg/L	500	1700	1200	60 - 140	138
	TRH >C34-C40-Silica	µg/L	500	780	600	60 - 140	129

MATRIX SPIKES

Matrix Spike (MS) results are evaluated as the percentage recovery of an expected result, typically the concentration of analyte spiked into a field sub -sample during the sample preparation stage. The original sample's result is subtracted from the sub-sample result before determining the percentage recovery. The criteria applied to the percentage recovery is established in the SGS QA/QC plan (ref: MP-(AU)-[ENV]QU-022). For more information refer to the footnotes in the concluding page of this report.

Recovery is shown in **Green** when within suggested criteria or **Red** with an appended reason identifer when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

QC Sample	Sample Number	Parameter	Units	LOR

MATRIX SPIKE DUPLICATES

Matrix spike duplicates are calculated as Relative Percent Difference (RPD) using the formula: RPD = | OriginalResult - ReplicateResult | x 100 / Mean

The original result is the analyte concentration of the matrix spike. The Duplicate result is the analyte concentration of the matrix spike duplicate.

The RPD is evaluated against the Maximum Allowable Difference (MAD) criteria and can be graphically represented by a curve calculated from the Statistical Detection Limit (SDL) and Limiting Repeatability (LR) using the formula: MAD = 100 x SDL / Mean + LR

Where the Maximum Allowable Difference evaluates to a number larger than 200 it is displayed as 200.

RPD is shown in **Green** when within suggested criteria or **Red** with an appended reason identifer when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

No matrix spike duplicates were required for this job.

FOOTNOTES

Samples analysed as received.

Solid samples expressed on a dry weight basis.

QC criteria are subject to internal review according to the SGS QA/QC plan and may be provided on request or alternatively can be found here: https://www.sgs.com.au/~/media/Local/Australia/Documents/Technical Documents/MP-AU-ENV-QU-022 QA QC Plan.pdf

*	NATA accreditation does not cover the performance of this service.
**	Indicative data, theoretical holding time exceeded.
***	Indicates that both * and ** apply.
-	Sample not analysed for this analyte.
IS	Insufficient sample for analysis.
LNR	Sample listed, but not received.
LOR	Limit of reporting.
QFH	QC result is above the upper tolerance.
QFL	QC result is below the lower tolerance.
①	At least 2 of 3 surrogates are within acceptance criteria.
②	RPD failed acceptance criteria due to sample heterogeneity.
③	Results less than 5 times LOR preclude acceptance criteria for RPD.
④	Recovery failed acceptance criteria due to matrix interference.
⑤	Recovery failed acceptance criteria due to the presence of significant concentration of analyte (i.e. the concentration of analyte exceeds the spike level).
⑥	LOR was raised due to sample matrix interference.
⑦	LOR was raised due to dilution of significantly high concentration of analyte in sample.
⑧	Reanalysis of sample in duplicate confirmed sample heterogeneity and inconsistency of results.
⑨	Recovery failed acceptance criteria due to sample heterogeneity.
⑩	LOR was raised due to high conductivity of the sample (required dilution).
†	Refer to relevant report comments for further information.

Yin, Emily (Sydney)

From:	Li Wei - EIAustralia <li.wei@eiaustralia.com.au>
Sent:	Wednesday, 3 May 2023 11:18 AM
To:	AU.Environmental.Sydney, AU (Sydney); AU.SampleReceipt.Sydney, AU (Sydney)
Cc:	Fiona Zhang - EIAustralia
Subject:	[EXTERNAL] RE: Report Job SE246397, your reference E25874 10-28 Lawrence St Freshwater, order number E25874
Attachments:	Report Job SE246397, your reference E25874 10-28 Lawrence St Freshwater, order number E25874

*** WARNING: this message is from an EXTERNAL SENDER. Please be cautious, particularly with links and attachments. ***

Hi SGS,

Can I request silica gel clean up on both samples BH103M and GW_QD1.

Standard TAT.

Best Regards

Li Wei
BSc (Env), MEng (Env)
Environmental Engineer | Project Manager
SafeWork NSW Licenced Asbestos Assessor

T 02 9516 0722 M 0416 080 578
E li.wei@eiaustralia.com.au

Suite 6.01, 55 Miller Street
Pyrmont, NSW 2009

www.eiaustralia.com.au

eiaustralia
Practical Solutions for Built Environments

FINANCIAL REVIEW CLIENT CHOICE AWARDS 2019 WINNER beaton

Environmental | Geotechnical | Structural | Civil | Hazardous Materials

EI Australia is a proud member of the Australian Contaminated Land Consultants Association and the Australian Geomechanics Society.

SAMPLE RECEIPT ADVICE

SE246397A

CLIENT DETAILS

Contact	Li Wei
Client	EI AUSTRALIA
Address	SUITE 6.01 55 MILLER STREET PYRMONT NSW 2009
Telephone	61 2 95160722
Facsimile	(Not specified)
Email	li.wei@eiaustralia.com.au
Project	**E25874 10-28 Lawrence St Freshwater-Add**
Order Number	**E25874**
Samples	2

LABORATORY DETAILS

Manager	Huong Crawford
Laboratory	SGS Alexandria Environmental
Address	Unit 16, 33 Maddox St Alexandria NSW 2015
Telephone	+61 2 8594 0400
Facsimile	+61 2 8594 0499
Email	au.environmental.sydney@sgs.com
Samples Received	Wed 3/5/2023
Report Due	Wed 10/5/2023
SGS Reference	**SE246397A**

SUBMISSION DETAILS

This is to confirm that 2 samples were received on Wednesday 3/5/2023. Results are expected to be ready by COB Wednesday 10/5/2023. Please quote SGS reference SE246397A when making enquiries. Refer below for details relating to sample integrity upon receipt.

Type of documentation received	Email	Date documentation received	3/5/2023@11:18am
Samples received in good order	Yes	Samples received without headspace	Yes
Sample temperature upon receipt	7.8°C	Sample container provider	SGS
Turnaround time requested	Standard	Samples received in correct containers	Yes
Sufficient sample for analysis	Yes	Sample cooling method	Ice Bricks
Samples clearly labelled	Yes	Complete documentation received	Yes

Unless otherwise instructed, water and bulk samples will be held for one month from date of report, and soil samples will be held for two months.

COMMENTS

SAMPLE RECEIPT ADVICE

SE246397A

CLIENT DETAILS

Client EI AUSTRALIA

Project E25874 10-28 Lawrence St Freshwater-Add

SUMMARY OF ANALYSIS

No.	Sample ID	TRH Silica Gel (Total Recoverable
001	BH103M	9
002	GW_QD1	9

The above table represents SGS' interpretation of the client-supplied Chain Of Custody document.
The numbers shown in the table indicate the number of results requested in each package.
Please indicate as soon as possible should your request differ from these details .
Testing as per this table shall commence immediately unless the client intervenes with a correction .

Appendix F - Groundwater Take Assessment

EI Australia
Suite 6.01, 55 Miller Street
PYRMONT, NSW 2009

ABN 42 909 129 957

E service@eiaustralia.com.au
W www.eiaustralia.com.au
T 02 9516 0722

14 November 2024
E25874.G12_Rev2

RMB Group Pty Ltd
c/- MD Living Pty Ltd
Suite 203, 20 Clarke Street,
CROWS NEST NSW 2065

Groundwater Take Assessment Proposed Residential Development 10-28 Lawrence Street, Freshwater NSW

1. INTRODUCTION

1.1. BACKGROUND

At the request of RMB Group Pty Ltd (the Client), EI Australia (EI) has prepared this Groundwater Take Assessment for 10-28 Lawrence Street, Freshwater NSW (the site).

EI has prepared the following reports for this site:

- Additional Geotechnical Investigation (AGI) report, referenced E25874.G04_Rev1, dated 12 November 2024; and
- Groundwater Monitoring Report No.1, referenced E25874.G11, dated 21 November 2023.

1.2. PROPOSED DEVELOPMENT

The following documents were used to assist in the preparation of this analysis:

- Previous Geotechnical Investigation (GI) report prepared by Geotechnique – Ref 12446/1-AA, dated 31 March 2011.
- Architectural drawings prepared by CHROFI – Project No. 21053, Drawing Nos. A-DA-000 to A-DA-002, A-DA-097 to A-DA-104, A-DA-201, A-DA-301, A-DA-302, Revision 03-WIP, dated 29 October 2024.
- Survey plan prepared by Norton Survey Partners – Reference 53094, dated 25 November 2022.

Based on the provided documents, EI understands that the proposed development involves the demolition of the existing site structures and the construction of a four-storey mixed-use building overlying a two-level basement. The lowest basement level is proposed to have a Finished Floor Level (FFL) of RL 15.37m. A Bulk Excavation Level (BEL) of RL 15.1m is assumed, which includes allowance for the construction of the basement slab. To achieve the BEL, excavation depths from 5.5m to 12m Below Existing Ground Level (BEGL) have been estimated. Locally deeper excavations may be required for footings, lift overrun pits, crane pads, and service trenches.

1.3. ASSESSMENT OBJECTIVES

The objective of this GTA is to provide an estimation of the groundwater take volumes that require pumping out during the construction and operational stage of the development, estimation of the groundwater drawdown as a result of the dewatering, and its associated ground settlements (if any).

2. SITE MODEL

2.1. SUBSURFACE CONDITIONS

For the purpose of the groundwater take assessment, the average subsurface conditions outlined our AGI and the previous GI have been adopted. A summary of the permeability values which were adopted for the assessment of groundwater take volumes are presented in **Table 3** below.

Table 1 Summary of Subsurface Conditions and Adopted Design Parameters

Material[1]	Adopted depth to Top of Unit (m BEGL)[2]	Adopted RL of Top of Unit (m AHD)[2]	Adopted Permeability (m/s)
Fill [3]	0	30.0 [5]	1.0×10^{-5}
Sandstone [4]	1.0	29.0	3.0×10^{-8}

Notes:

1 For more detailed descriptions of subsurface conditions reference should be made to the Geotechnical Investigation Report.
2 Depths and levels presented in **Table 1** above are generalised using the average levels from the Geotechnical Investigation across the excavation area for the purpose of groundwater seepage modelling.
3 Permeability values have been correlated for material encountered during the GTA using Look (2014).
4 Permeability value of the Class V/IV and Class III Sandstone were calculated based on the pump out test carried out by EI.
5 The ground surface level of RL 30m has been conservative used as it is the highest RL of this site, which slopes down to the north to RL of about 25m. This is a conservative simplification of the model as it allows for a higher water table level, which also falls from south to north.

The permeability the Class V/IV and Class III Sandstone were calculated based on the pump-out test rests completed within monitoring wells. The monitoring wells and pump out test results are summarised in **Table 2** below.

2.2. GROUNDWATER OBSERVATIONS AND PUMP OUT TESTS

EI had installed 3 monitoring well (BH101M to BH103M) for groundwater monitoring. EI undertook a Groundwater Monitoring Event (GME) on 13 and 21 April 2023, and carried out Pump Out tests within the monitoring wells. Groundwater measurements and the results of the pump out tests are presented in **Table 2** below.

Table 2 Summary of Groundwater Levels and Pump out test results

Monitoring Well ID	Total Well Depth (m BEGL)	Screen Length (m)	Screened Section	Date of Test	Approximate RL of Groundwater Level (m AHD)	Adopted Permeability (m/s) 3
BH101M	16.1	12	Sandstone	13/04/2023	15.65	3.2×10^{-8}
BH102M	20.0	15	Sandstone	13/04/2023	19.02	3.1×10^{-8}
BH103M	23.7	18	Sandstone	21/04/2023	25.40	1.1×10^{-8}

Notes:

1 Assumed bulk excavation level (RL 35.70m) has been adopted based on the supplied architectural drawings and our geotechnical investigation.

Additionally, EI has completed long-term groundwater level monitoring at this site within BH101M, BH102M and BH103M, from the period between 13 April 2023 and 24 October 2023. The summary of long-term groundwater level monitoring data is presented in **Table 3** below.

Table 3 Summary of Long-Term Groundwater Levels

Borehole ID	Average Groundwater RL (m AHD)	Highest Groundwater RL (mAHD)	Lowest Groundwater RL (mAHD)
BH101M	15.92	16.58	14.8
BH102M	19.83	20.29	19.4
BH103M	25.60	25.94	25.09

A design groundwater level of RL 26.4m has been adopted for assessment of groundwater seepage inflow rates and groundwater take volumes within the excavation. The design ground water is about 0.5m higher than the highest measured groundwater level within monitoring well BH103M to account for the possible seasonal groundwater variations. We note that site levels vary across the site and fall towards the north; however for simplicity of the model the highest, most conservative water level was used across the entire model.

2.3. SHORING SYSTEM

At the time of this assessment, no detailed structural designs were available. Hence, a drained basement design is considered in this seepage analysis: vertical excavation within the sandstone bedrock was assumed as per the recommendations of the AGI. This excavation will allow seepage to freely enter the drained basement.

This assessment does not assess the overall stability of the excavation. Once final designs are made available, this assessment should be revised accordingly.

3. GROUNDWATER TAKE ASSESSMENT

3.1. GROUNDWATER SEEPAGE VOLUMES DURING CONSTRUCTION PHASE

Groundwater seepage analysis for flow through and beneath the shoring wall during construction has been undertaken using SEEP/W, a finite element groundwater seepage analysis software. SEEP/W estimates the seepage rate of water entering the excavation from beneath the shoring wall. This model estimates the volume of water which will be required to be dewatered during the construction of the basement.

For the purpose of this modelling, it has been assumed that:

- The subsurface conditions were horizontal along the site. The permeability values presented in **Table 1** above were adopted for each unit.
- For the drained basement design, the excavation face is assumed to be permeable and free to drain, using sub-soil drainage and a sump-and-pump system.
- For the simplicity of this model, temporary dewatering will be undertaken within the basement retaining wall perimeter to BEL, or about RL 15.1m.
- An external design groundwater level of RL 25.4m was assumed to be constant at 50 m away from the excavation.
- A “No-Flow” boundary is defined along the symmetric line (the centre of the excavation), at 15 m from the perimeter excavation.
- The basement excavation has a total length of about 220m.

The SEEP/W model is presented in **Appendix A. Table 4** below provides the estimated groundwater inflow rate into the basement.

Table 4 Summary of Analysis Results

Basement Design	Inflow per m length of perimeter wall (m^3/sec)	Inflow per m length of perimeter wall (m^3/day)	Inflow into excavation (m^3/day)	Total Inflow during construction (ML/year)
Drained	2.17 x 10^{-7}	0.0187	4.12	1.50

3.2. ASSESSMENT OF GROUNDWATER TAKE DURING OPERATIONAL PHASE

Based on the SEEP/W results, the estimated volume of groundwater removed beneath the basement during the operational phase of the development is expected to be approximately 1.50ML per year for a drained basement.

4. CONCLUSIONS AND COMMENTS

Based on the findings of this report and within the limitations of available data, EI concludes that:

- For the drained basement design, groundwater take will be approximately:
    - 1.50ML / year during construction and operational phase.
- The above estimate is based on the following assumptions:
    - For the drained basement analysis, the vertical excavation face is freely draining.
    - Continuous dewatering in order to maintain the groundwater at a depth of BEL during construction.
    - This assessment does not take into consideration any excavation that may be required for footings, service trenches, lift pits, or crane pads. This additional excavation, if required, is not expected to affect the retention or the dewatering system.

Should any design or construction conditions differ from that adopted in this report; this GTA should be reviewed and updated as required.

5. LIMITATIONS

This report has been prepared for the exclusive use of RMB Group Pty Ltd who is the only intended beneficiary of EI's work. The scope of the inspections carried out for the purpose of this report is limited to those agreed with RMB Group Pty Ltd.

No other party should rely on the document without the prior written consent of EI, and EI undertakes no duty, or accepts any responsibility or liability, to any third party who purports to rely upon this document without EI's approval.

EI has used a degree of care and skill ordinarily exercised in similar tasks by reputable members of the geotechnical industry in Australia as at the date of this document. No other warranty, expressed or implied, is made or intended. Each section of this report must be read in conjunction with the whole of this report, including its appendices and attachments.

The conclusions presented in this report are based on a limited assessment of conditions, with specific locations chosen to be as representative as possible under the given circumstances.

EI's professional opinions are reasonable and based on its professional judgment, experience, training and results from analytical data. EI may also have relied upon information provided by the Client and other third parties to prepare this document, some of which may not have been verified by EI.

EI's professional opinions contained in this document are subject to modification if additional information is obtained through further investigation, observations, or validation testing and analysis during remedial activities. In some cases, further testing and analysis may be required, which may result in a further report with different conclusions.

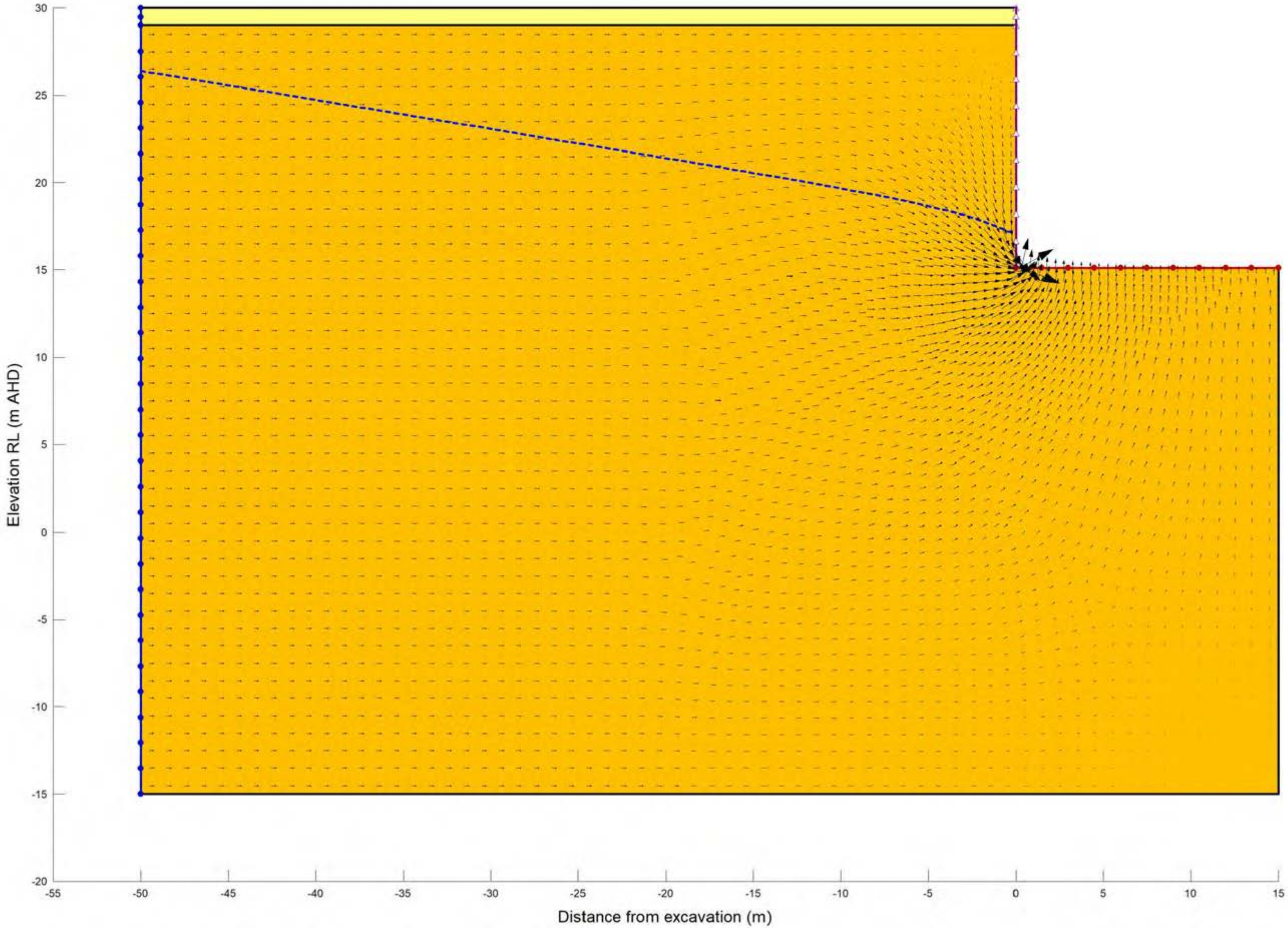
6. CLOSURE

Please do not hesitate to contact the undersigned should you have any questions.

For and on behalf of
EI Australia

Author	Technical Reviewer
Kaiyu Xu	Stephen Kim
Geotechnical Engineer	Senior Geotechnical Engineer

Attachments: Appendix A – SEEP/W Model and Results for Drained Basement
Important Information



eiaustralia

Contamination | Remediation | Geotechnical

Suite 6.01, 55 Miller Street, PYRMONT 2009
Ph (02) 9516 0722 Fax (02) 9518 5088

Drawn:	K.X.
Approved:	S.K.
Date:	6/11/24
Approx Scale:	As Shown

MD Living Pty Ltd
Groundwater Take Assessment
10-28 Lawrence Street, Freshwater NSW
SEEP/W Model and Results for **Drained Basement**

Appendix:

A

Project: E25874.G12_Rev2

Important Information

SCOPE OF SERVICES

The geotechnical report ("the report") has been prepared in accordance with the scope of services as set out in the contract, or as otherwise agreed, between the Client And EI Australia ("EI"). The scope of work may have been limited by a range of factors such as time, budget, access and/or site disturbance constraints.

RELIANCE ON DATA

EI has relied on data provided by the Client and other individuals and organizations, to prepare the report. Such data may include surveys, analyses, designs, maps and plans. EI has not verified the accuracy or completeness of the data except as stated in the report. To the extent that the statements, opinions, facts, information, conclusions and/or recommendations ("conclusions") are based in whole or part on the data, EI will not be liable in relation to incorrect conclusions should any data, information or condition be incorrect or have been concealed, withheld, misrepresented or otherwise not fully disclosed to EI.

GEOTECHNICAL ENGINEERING

Geotechnical engineering is based extensively on judgment and opinion. It is far less exact than other engineering disciplines. Geotechnical engineering reports are prepared for a specific client, for a specific project and to meet specific needs, and may not be adequate for other clients or other purposes (e.g. a report prepared for a consulting civil engineer may not be adequate for a construction contractor). The report should not be used for other than its intended purpose without seeking additional geotechnical advice. Also, unless further geotechnical advice is obtained, the report cannot be used where the nature and/or details of the proposed development are changed.

LIMITATIONS OF SITE INVESTIGATION

The investigation programme undertaken is a professional estimate of the scope of investigation required to provide a general profile of subsurface conditions. The data derived from the site investigation programme and subsequent laboratory testing are extrapolated across the site to form an inferred geological model, and an engineering opinion is rendered about overall subsurface conditions and their likely behaviour with regard to the proposed development. Despite investigation, the actual conditions at the site might differ from those inferred to exist, since no subsurface exploration program, no matter how comprehensive, can reveal all subsurface details and anomalies. The engineering logs are the subjective interpretation of subsurface conditions at a particular location and time, made by trained personnel. The actual interface between materials may be more gradual or abrupt than a report indicates.

SUBSURFACE CONDITIONS ARE TIME DEPENDENT

Subsurface conditions can be modified by changing natural forces or man-made influences. The report is based on conditions that existed at the time of subsurface exploration. Construction operations adjacent to the site, and natural events such as floods, or ground water fluctuations, may also affect subsurface conditions, and thus the continuing adequacy of a geotechnical report. EI should be kept appraised of any such events, and should be consulted to determine if any additional tests are necessary.

VERIFICATION OF SITE CONDITIONS

Where ground conditions encountered at the site differ significantly from those anticipated in the report, either due to natural variability of subsurface conditions or construction activities, it is a condition of the report that EI be notified of any variations and be provided with an opportunity to review the recommendations of this report. Recognition of change of soil and rock conditions requires experience and it is recommended that a suitably experienced geotechnical engineer be engaged to visit the site with sufficient frequency to detect if conditions have changed significantly.

REPRODUCTION OF REPORTS

This report is the subject of copyright and shall not be reproduced either totally or in part without the express permission of this Company. Where information from the accompanying report is to be included in contract documents or engineering specification for the project, the entire report should be included in order to minimize the likelihood of misinterpretation from logs.

REPORT FOR BENEFIT OF CLIENT

The report has been prepared for the benefit of the Client and no other party. EI assumes no responsibility and will not be liable to any other person or organisation for or in relation to any matter dealt with or conclusions expressed in the report, or for any loss or damage suffered by any other person or organisation arising from matters dealt with or conclusions expressed in the report (including without limitation matters arising from any negligent act or omission of EI or for any loss or damage suffered by any other party relying upon the matters dealt with or conclusions expressed in the report). Other parties should not rely upon the report or the accuracy or completeness of any conclusions and should make their own inquiries and obtain independent advice in relation to such matters.

OTHER LIMITATIONS

EI will not be liable to update or revise the report to take into account any events or emergent circumstances or fact occurring or becoming apparent after the date of the report.