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DEICORP CONSTRUCTION PTY LTD

Additional Groundwater Investigation

Tallawong Station Precinct South, Rouse Hill NSW

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Table of Contents

Schedule of Tables

Appendices

Executive Summary

Background

Deicorp Construction Pty Ltd engaged EI Australia (EI) to conduct an Additional Groundwater Investigation for the property located at Tallawong Station Precinct South, Rouse Hill NSW (‘the site’) to address data gaps with respect to potential groundwater impact.

Following the DSI (EI, 2020a) and RAP (EI, 2020b), three additional groundwater monitoring wells were installed in the vicinity of BH2M to investigate the extent of TRH contamination and the presence of any VOCs. Survey of the wells was also undertaken to determine the groundwater flow direction. In addition, a Groundwater Take Assessment was conducted to address a request from Blacktown City Council regarding potential impacts from basement construction on groundwater.

The proposed development includes bulk excavation of three basement levels to approximately RL 46m Australian Height Datum (AHD).

Findings

The key findings were as follows:

- Standing water levels (SWLs) across the site ranged between 48.75m AHD and 53.18m AHD.
- Groundwater was interpreted to be flowing north-easterly and easterly towards Second Ponds Creek.
- Groundwater sampling and analysis were conducted at the six monitoring wells in the northern portion of the site, the concentrations of BTEX, VOCs and Phenols were all reported below the adopted criteria.
- TRHs were found at levels above the adopted guidelines at wells BH2M, BH3M and BH201M. The source of the TRH was not identified.
- The concentrations of TRH-F2 at BH2M and BH201M were considered to potentially pose a vapour inhalation risk to future occupants and may warrant further investigation.
- Bulk excavation would be required to construct the two to three-level of basement car park. This would result in the removal of the majority of on-site contaminant sources in the vicinity of BH2M and BH201M, reducing the potential risk to the development.
- However, given the proposed basement will potentially be in contact with the groundwater, the petroleum hydrocarbon results warrant additional investigation and assessment to determine potential human health risk for the proposed development.
- The Groundwater Take Assessment (GTA) completed concurrently with this assessment has concluded that the estimated volume of groundwater removed beneath the basement during the operational phase of the development is expected to be approximately 3.01ML per year for Stage 1 and 6.03ML per year for Stage 2. The drawdown as a result of the dewatering will have negligible, if any, adverse impact on the neighbouring properties.

Based on the findings of this investigation, and consideration of EI's Statement of Limitations (**Section 11**), EI concluded that while localised TRH contamination in groundwater was identified in the vicinity of BH2M and BH201M, which may potentially pose a vapour inhalation risk to future occupants, the site can be made suitable for the proposed development, provided the recommendations are implemented.

Recommendations

In view of the above findings, it is recommended that:

- Conduct visual inspections during bulk excavation works in the vicinity of BH2M and BH201M;
- Following excavation confirming that the potential on-site contaminant source has been removed by an additional round of groundwater sampling in the vicinity of BH2M and BH201M. If contaminated groundwater remains, a soil vapour assessment may be required to assess the potential vapour intrusion risks; and
- If confirmed, this may require updating of the existing RAP (EI, 2020b) to address any potential groundwater and/or vapour seepage into the lower basements.

1. INTRODUCTION

1.1 Background and Purpose

Deicorp Construction Pty Ltd engaged EI Australia (EI) to undertake an Additional Groundwater Investigation for the property located at Tallawong Station Precinct South, Rouse Hill NSW ('the site'). The site can also be legally identified as Lots 293 and 294 in DP1213279.

The site is located within the Local Government Area of Blacktown City Council (**Figure A.1**), and has an area of approximately 7.8 hectares. Currently construction of internal roads and car parking has reduced the assessment area to 4.4 ha as depicted in **Figure A.2**. During the investigation the land was vacant and cleared of all structures.

EI understands that redevelopment of the site is a State Significant Development (SSD), a Secretary's Environment Assessment Requirements (SEARs) was prepared for the site.

This report follows on from previous investigations completed at the site, including:

- Environmental Earth Sciences, 2014 (EES 2014). *Contamination and Salinity Assessment for Proposed Rapid Transit Rail Facility, Tallawong Road, Rouse Hill NSW*, Ref. 114071;
- ADE Consulting Group, 2015a (ADE, 2015a). *Soil Characterisation Assessment, NRT Work Site, Tallawong Road and Cudgegong Road, Rouse Hill NSW*. Ref. SCA1.v1 final, dated 10th June 2015;
- ADE 2015b. *Waste Analysis and Classification, NRT Work Site, Tallawong Road, Rouse Hill NSW*. Ref WAC1.v1 final;
- Northwest Rapid Transit, 2015 (NRT 2015). *Project Integrated Management System, Spoil Management Plan for Sydney Metro Northwest Operations, Trains and Systems PPP*. Report No: NWELOTS-NRT-PRD-PMPLN-000854, dated 30th October 2015;
- NRT 2017. *Project Integrated Management System, Construction Soil and Water Management Plan for Sydney Metro Northwest Operations, Trains and Systems PPP*. Report No: NWELOTS-NRT-PRD-PM-PLN-000852, dated 28th August 2017;
- ADE, 2018. *Phase 1 Preliminary Site Investigation, Cudgegong Road Station Precinct South, Rouse Hill NSW*. Report Ref. STC-1023-13390/PSI1/v3f, dated 7 March 2018;
- EI, 2020a. *Detailed Site Investigation (DSI), Tallawong Station Precinct South, Rouse Hill NSW*. Report Ref E24445.E02_Rev2, dated 1 May 2020;
- EI, 2020b. *Remediation Action Plan (RAP), Tallawong Station Precinct South, Rouse Hill NSW*. Report Ref E24445.E06_Rev1, dated 16 April 2020;
- EI, 2020c. *Geotechnical Investigation, Tallawong Station Precinct South, Rouse Hill NSW*. Report Ref E24445.G03_Rev1, dated 15 April 2020;
- EI, 2020d. *Construction Environmental Management Plan (CEMP), Tallawong Station Precinct South, Rouse Hill NSW*. Report Ref E24445.E13_Rev0, dated 27 July 2020.

This investigation is required to address data gaps in regards to groundwater outlined in the RAP (EI, 2020b). In addition, a Groundwater Take Assessment was conducted to address an email response from Blacktown City Council regarding impacts from basement construction on groundwater, which was attached in **Appendix J** at the end of this report.

1.2 Proposed Development

Based on the supplied plans (**Appendix C**), the proposed development involves the construction of 16 mixed-use apartment towers overlying a two to three-level basement car park with associated landscaping and roads.

1.3 Regulatory Framework

The main regulatory guidelines considered for this groundwater assessment were:

- *Contaminated Land Management Act 1997* (the CLM Act);
- *Protection of the Environment Operations Act 1997* (the POEO Act)*;*
- EPA (1995) *Sampling Design Guidelines*;
- EPA (2020) *Consultants Reporting on Contaminated Land: Contaminated Land Guidelines;*
- NEPC (2013) *Schedule B(1) Guideline on Investigation Levels for Soil and Groundwater*;
- NEPC (2013) *Schedule B(2) Guideline on Site Characterisation*;
- ANZECC & ARMCANZ (2000) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*; and
- DEC (2007) *Guidelines for the Assessment and Management of Groundwater Contamination*.

The report also considered the:

- Concept State Significant Development Application Sydney Metro Northwest Tallawong Station Precinct South SSD 9063 Volume 1 (July 2018).

1.4 Project Objectives

The primary objective of this investigation was to address the concentrations of TRH and VOC in the groundwater outlined in the RAP (EI, 2020b) and to respond to a Blacktown City Council request regarding impacts from basement construction on groundwater.

1.5 Scope of Works

1.5.1Additional Groundwater Investigation

- Update of the Work, Health, Safety & Environment Plan;
- A review of existing underground services on site and carry out an underground search for buried services using elector-magnetic equipment;
- A review of previous environmental reports;
- Installation of three groundwater monitoring wells up-gradient and down-gradient of BH2M (EI, 2020a);
- A single groundwater monitoring event (GME) testing the three existing wells in the northern portion of the site (BH1M, BH2M and BH3M) and three newly installed wells;
- Completion of a monitoring well survey of existing and new monitoring wells;

- Laboratory analysis of selected groundwater samples for relevant analytical parameters as determined from the RAP (EI, 2020b) and field observations during the investigation program; and
- Data interpretation and reporting: preparation of a data gap closure investigation and revision of the RAP (if required).

1.5.2Groundwater Take Assessment

- A site visit by a qualified engineer to measure the ground water levels within the installed wells and undertake pump out tests;
- Modelling and estimation of the seepage rate of water entering the excavation using a finite element groundwater seepage analysis software, SEEP/W; and
- Preparation of a Groundwater Take Assessment Report with an estimate of the total volume and flow rate of groundwater removed during the construction and operational phase of the development, and provide comments and recommendations on the impact of the dewatering on the regional groundwater and adjoining properties, if any (See **Appendix J**).

2. SITE DESCRIPTION

2.1 Property Identification, Location and Physical Setting

The site identification details and associated information are presented in **Table 2-1**, while the site locality is shown in **Figure A.1**.

Table 2-1 Site Identification, Location and Zoning

Attribute	Description
Street Address	1 -15 & 2 - 12 Conferta Avenue, Rouse Hill NSW 2155
Location Description	The site was divided by Conferta Avenue and bounded by Themeda Avenue (north), Cudegong Road (east), Schofield Road (south) and open aired car park (west). North Eastern corner of site: GDA2020-MGA56 Easting: 306009.624, Northing: 6270038.315 (Source http://maps.six.nsw.gov.au).
Site Area	Approx. 4.33 ha (43, 300 m^2)
Lot and Deposited Plan (DP)	Lots 293 and 294 in DP1213279
Local Government Authority	Blacktown City Council
Parish	Gidley
County	Cumberland
Current Zoning	North of Conferta Avenue: B4 – Mixed Use South of Conferta Avenue: R3 – Medium Density Residential South east corner of site: SP2 – Infrastructure Source: State Environmental Planning Policy (Sydney Regional Growth Centres) Amendment (Area 20 Precinct), 2015

2.2 Regional Setting

Regional topography, geology, soil landscape and hydrogeological information are summarised in **Table 2-2**.

Table 2-2 Regional Setting Information

Attribute	Description
Ground Topography	The site sloped to the south east, with the north-western portion of the site at approx. 58 mAHD sloping to the south east corner at RL 50 mAHD.
Site Drainage	Site drainage is likely to consist of mostly surface infiltration. Any run off would be expected to flow into the dam in the southern portion of the site or to municipal stormwater pits on Schofields Road and Conferta Avenue and then flow to the nearest drainage line (Second Pond Creek).

Attribute	Description
Regional Geology	The site lies on the boundary of two formations within the Wianamatta Group, comprising the Bringelly Shale (Rwb) and Ashfield Shale (Rwa) 1:100,000 scale Geological Series Sheet 9130 (Penrith).
Soil Landscapes	The Soil Conservation Service of NSW Soil Landscapes of the Sydney 1:100,000 Sheet (Chapman and Murphy, 2002) indicates that the site overlies the Blacktown (bt) residual landscape, which is described as gently undulating rises on Wianamatta Group shales.
Acid Sulfate Soil Risk	The previous acid sulfate soil assessment indicated no ASS were present (EI, 2020b).
Typical Soil Profile	A layer of anthropogenic filling overlying residual clays then weathered shale. Deeper fill was largely located on the northern portion of site, and in pockets on the southern portion of site, such as in the former retention pond (EI, 2020b).
Depth to Groundwater	The Standing Water Level (SWL) recorded during this investigation on 22 and 23 September 2020 ranged between 1.6 m and 8.87 m BGL across the site.
Nearest Surface Water Feature	Second Ponds Creek, located approximately 182m east of the site.
Groundwater Flow Direction	Groundwater was interpreted to flow north-easterly and easterly towards Second Ponds Creek generally in accordance with the site topography.

3. PREVIOUS INVESTIGATIONS

Five previous investigations have been conducted at the site by ADE (2018) and EI (2020), as listed in **Section 1.1**. The following reports in relation to this assessment are summarised below in **Table 3-1**.

- EI, 2020a. *Detailed Site Investigation (DSI), Tallawong Station Precinct South, Rouse Hill NSW*. Report Ref E24445.E02_Rev2, dated 1 May 2020;
- EI, 2020b. *Remediation Action Plan (RAP), Tallawong Station Precinct South, Rouse Hill NSW*. Report Ref E24445.E06_Rev1, dated 16 April 2020;

Table 3-1 Summary of Previous Investigation Works and Findings

Assessment Details	Project Task and Findings
EI (2020a) – Detailed Site Investigation	
Objective	▪ To evaluate the potential for site contamination by means of intrusive sampling and laboratory analysis for relevant contaminants of concern.
Scope of Works	▪ Excavation of test pits at 58 locations distributed in a broad grid pattern across accessible areas of the site; ▪ Drilling of boreholes to assess Acid Sulfate Soils (ASS) at 4 locations (2 in each site) and Salinity at 6 locations (2 in the northern and 4 in the southern site) to approx. 1m below the proposed bulk excavation (approx. 15 mBGL or prior refusal on bedrock); ▪ Drilling of seven groundwater monitoring bores (3 in the northern site and 4 in the southern site) drilled to a maximum depth of 12m (or refusal) both up gradient and downgradient of the proposed redevelopment area. Groundwater monitoring bores will be installed to standard environmental protocols to investigate the potential for groundwater contamination, and potential migration of contaminants off-site; ▪ Multiple level soil sampling within fill and natural soils and one round of groundwater sampling from the seven newly constructed groundwater monitoring bores; ▪ Collection of representative surface soil samples from the following areas where previous stockpiled soils (specifically the large stockpile located in the south west corner of the site) were located; ▪ Collection of representative water and sediment samples from the dams onsite; ▪ Laboratory analysis of selected soil samples for relevant analytical parameters as determined from the site history survey and field observations during the investigation program; and ▪ Data interpretation and reporting.
Findings	▪ The site comprised an irregularly shaped block, covering a total area of approximately 4.33 hectares. The site was bisected by Conferta Avenue and bound by Themeda Avenue (north), Cudegong Road (east), Schofields Road (south) and open aired car park (west); ▪ The site was historically occupied by four rural residential properties, with an indication of agricultural and livestock use throughout prior to acquisition, then used as a holding yard for the Sydney Metro Northwest Project; ▪ A former retention pond was noted from historical aerial photography on the south east corner of site. During the investigation it was found that the retention pond had been emptied and back filled;

Assessment Details	Project Task and Findings
	▪ The site was free of statutory notices issued by the NSW EPA; ▪ Soil sampling and analysis were conducted at 58 targeted test bore locations (BH1M – TP58). Sampling regime was considered to be appropriate and comprised judgemental and systematic (triangular grid) sampling patterns, with allowance for structural obstacles (e.g. building walls, underground and overhanging services and other physical obstructions in use by existing operating businesses); ▪ The sub-surface layers comprised of anthropogenic fill underlain by residual clays and shale bedrock at depth; ▪ All contaminant concentrations were found to be below the adopted human health criteria, indicating a low to minimal risk to human health posed by soil; ▪ Asbestos was detected in fill at location TP26 and TP50. Asbestos impacted fill will require removal during redevelopment; ▪ Groundwater was encountered at depths ranging from 1.44 to 8.60 mBGL; ▪ The heavy metals, copper, nickel, zinc and manganese were detected in groundwater at levels above the adopted GILs. EI considers the reported concentrations to pose a low probability of unacceptable risk to be present, and the presence of a complete migration pathway to the end users of the building was low due to the availability of a reticulated water supply in the area; ▪ TRHs were found at levels above the adopted guidelines at wells BH1M, BH2M, BH7M and BH13M; ▪ On review of the Conceptual Site Model (CSM) developed as part of the DSI, it was concluded that the model remains valid for the proposed development. Analytical testing of the site media did not report concentrations of many of the identified potential contaminants of concern as highlighted within the CSM. Overall, the actual likelihood for complete exposure pathways to exist as highlighted within the CSM was low.
Recommendations	▪ Preparation of a Remediation Action Plan (RAP) ▪ Additional groundwater investigation in the vicinity of BH2M to confirm and delineate TRH impacts; ▪ Surveying of onsite groundwater wells to accurately model groundwater flow direction; ▪ Management of the asbestos impacted material in accordance with the EPA (2014) *Waste Classification Guidelines*. Any area where asbestos is removed must be validated in accordance with the WaDOH (2009) Guidelines; and ▪ Classification of any soils to be disposed of off-site in accordance with the EPA (2014) *Waste Classification Guidelines*.
EI (2020b) – Remediation Action Plan	
Remediation Objectives	▪ to inform and guide the site remediation process by providing detailed procedures to enable the works to be undertaken in a safe and acceptable manner which complies with relevant guidelines including SEPP 55 and the SEARs (Item 16 Section 8.16) while preventing adverse effects on human and environmental receptors. The remedial works are to be undertaken to enable the site to be rendered suitable for the proposed mixed use development.
Scope of Works	▪ Outlining the legislative framework and provision of guidance on approvals and licences required for the remediation works; ▪ Identifying stakeholders and their responsibilities required to complete the

Assessment Details	Project Task and Findings
	remediation; ▪ Provide a summary of previous investigations and available data, the site setting and contamination status which were relied on for development of the RAP; ▪ Definition of remediation goals and acceptance criteria; ▪ Review remediation technologies and evaluation of the most appropriate (or combination of) for the site, including methods and procedures to ensure works are completed in accordance with relevant environmental legislation (e.g. SEPP 55); ▪ Provision of information to assist the contractor in their preparation of a Work, Health and Safety Plan and other site management/planning documents; and ▪ Provision of a preliminary Sampling and Analytical Quality Plan (SAQP) for site validation and to evaluate the effectiveness of the remedial works.
Site Characterisation and Data Gaps	From the DSI (EI, 2020a), the site surface has been significantly altered during its use as a holding yard for works on the Sydney Metro North West Project. The investigation found that the tested fill soils generally met the adopted site criteria, with the exception of two locations which exceeded the asbestos guidelines, as well as identified TRH and heavy metal groundwater contamination. The chemicals of concern (COC) for site remediation, validation and data gap closure are as follows: ▪ Soil – Asbestos; ▪ Groundwater – TRH, BTEXN and other VOCs. Data gaps and uncertainties were identified as follows: ▪ Extent of groundwater TRH contamination and presence of any VOCs; ▪ Condition of sediments under the current retention pond after it has been drained; and ▪ Extent of asbestos contamination at the two identified locations.
Conclusions	The preferred approach involves excavation and offsite disposal of impacted fill materials. Groundwater requires additional assessment to confirm site suitability. It is envisaged that the remediation works will be implemented in stages, as follows: ▪ Preliminaries/Site Establishment ▪ Additional Assessment ▪ Waste Management ▪ Excavation ▪ Validation

4. CONCEPTUAL SITE MODEL

In accordance with NEPM (2013) *Schedule B2 – Guideline on Site Characterisation* and to aid in the assessment of data collection for the site, EI developed a conceptual site model (CSM) to assess plausible pollutant linkages between potential contamination sources, migration pathways and receptors.

From the DSI (EI, 2020a), the site surface has been significantly altered during its use as a holding yard for works on the Sydney Metro North West Project. In regards to groundwater, the investigation identified TRH and heavy metal contamination in groundwater.

4.1 Groundwater Contamination Review

The heavy metals, including copper (Cu), nickel (Ni), zinc (Zn) and manganese (Mn) were detected in groundwater at levels above the adopted groundwater investigation levels during the DSI (EI, 2020a). Given the proposed basement does not intercept groundwater and a reticulated water supply is available in the area, EI considered a low probability of an unacceptable risk to be posed to users of the site and surrounds, as a result of the heavy metal contaminants within groundwater.

TRH concentrations in groundwater were found to exceed the adopted environmental guidelines at groundwater wells BH1M, BH2M, BH7M and BH13M. With the exception of BH2M, all these exceedances were at low concentrations and did not exceed the adopted human health criteria.

The concentration of TRH at location BH2M exceeded the adopted criteria for F2, F3 and F4 hydrocarbon fractions. The concentrations of F3 and F4 hydrocarbons were of low risk, as analysis showed these compounds consisted of long chain aliphatic organic compounds which have a low volatility. However, the concentration of F2 hydrocarbons reported at this location (7,200 µg/L) was a potential hazard to future occupants and warranted further investigation.

4.2 Potential Contaminants

The potential contaminants in groundwater were:

- Total Recoverable Hydrocarbons (TRH);
- Benzene, Toluene, Ethylbenzene and Xylenes (BTEX); and
- Volatile Organic Compounds (VOC).

4.3 Potential Sources, Exposure Pathways and Receptors

EI considered that additional groundwater investigation was required for data gap closure purposes. In addition, all on-site wells should be surveyed to determine the groundwater flow direction within the site boundary.

Potential contamination sources, exposure pathways and human and environmental receptors that were considered relevant for this investigation works at the site are summarised in **Table 4-1**.

Table 4-1 Conceptual Site Model

Potential Sources	Impacted Media	COPC	Transport Mechanism	Exposure Pathway	Potential Receptor
Contamination derived from historical site uses	Groundwater	TRH, BTEX and VOC	Volatilisation of contamination from groundwater to indoor or outdoor air spaces (onsite and offsite)	Inhalation of vapours	Basement / End users of the site (commercial end users on ground floor) Construction and maintenance workers
			Migration of dissolved phase impacts in groundwater	Biota uptake Ingestion Dermal contact	Aquatic ecosystems
			Potential seepage into deep basement intercepting water table (on and offsite) Seepage from behind retaining walls	Dermal contact Ingestion	Residential / Basement users Construction and maintenance workers

5. Methodology

5.1 Sampling and Analysis Quality Plan (SAQP)

The SAQP ensures that the data collected is representative, and provide a robust basis for site assessment decisions and includes:

- Data quality objectives, including a summary of the objectives of the ESA;
- Investigation methodology including media to be sampled, details of analytes and parameters to be monitored and a description of intended sampling points;
- Sampling methods and procedures;
- Field screening methods;
- Analysis Methods;
- Sample handling, preservation and storage; and
- Analytical QA/QC.

5.2 Data Quality Objectives (DQO)

In accordance with the USEPA (2006) *Data Quality Assessment* and the EPA (2017) *Guidelines for the NSW Site Auditor Scheme*, the process of developing Data Quality Objectives (DQO) was used by the EI assessment team to determine the appropriate level of data quality needed for the specific data requirements of the project. The DQO process that was applied for this assessment is documented in **Table 5-1**.

Table 5-1 Summary of Project Data Quality Objectives

DQO Steps	Details
1. State the Problem Summarise the contamination problem that will require new environmental data, and identify the resources available to resolve the problem; develop a conceptual site model	The site is to be developed for up to 16 buildings of varying heights, to a maximum of eight storeys overlying a 3 level basement. Previous investigation (EI, 2020a) identified groundwater contamination at the site as discussed in **Section 4**. Additional groundwater investigation is required to address data gaps in regards to groundwater outlined in the RAP (EI, 2020b).
2. Identify the Goal of the Study (Identify the decisions) Identify the decisions that need to be made on the contamination problem and the new environmental data required to make them	Based on the objectives outlined in **Section 1.4** the decisions that need to be made are: ▪ Has the nature, extent and source of any onsite contamination been defined? ▪ What impact do the site specific, geologic and hydrogeological conditions have on the fate and transport of any impacts that may be identified? ▪ Does the level of impact coupled with the fate and transport of identified COPCs represent an unacceptable risk to identified human and/or environmental receptors on or offsite? ▪ Does the collected data provide sufficient information to allow the selection and design of an appropriate remedial strategy, if necessary? If not, what are the remaining data gaps requiring closure?
3. Identify Information Inputs (Identify inputs to decision) Identify the information needed to support any decision and specify which inputs require new environmental measurements	Inputs to the decision making process include: ▪ Proposed development plans and future land use; ▪ Previous environmental investigations conducted at the site; ▪ Areas of concern identified from previous investigations and field observations prior to intrusive investigations; ▪ National and NSW EPA guidelines endorsed under the NSW Contaminated Land Management Act 1997; ▪ Investigation sampling (groundwater) and laboratory analysis for COPCs to verify the presence of onsite contamination and to evaluate the potential risks to sensitive receptors; and ▪ At the end of the assessment, a decision must be made regarding whether the groundwater are suitable for the proposed development, or if additional investigation or remedial works are required to make the site suitable for proposed use.
4. Define the Boundaries of the Study Specify the spatial and temporal aspects of the environmental media that the data must represent to support decision	Lateral – The boundaries of the study are defined as shown in **Figure A.2**. Vertical – From the existing ground level, fill and natural soils. Temporal – Results are valid on the day of data and sample collection and remain valid as long as no changes occur on site or contamination (if present) does not migrate on site or on to the site from off-site sources.

DQO Steps	Details
5. Develop the Analytic Approach (Develop a decision rule) To define the parameter of interest, specify the action level, and integrate previous DQO outputs into a single statement that describes a logical basis for choosing from alternative actions	Laboratory analytical results were assessed against the adopted criteria identified in **Section 5.4**. Should the criteria be exceeded then additional remediation, investigation, or risk assessment will be required. Laboratory analytical results were to be accepted if: ▪ All contracted laboratories were accredited by NATA for the analyses undertaken; ▪ All detection limits fell below the adopted criteria; ▪ Analyte concentrations in rinsate (i.e. blank) samples did not vary significantly from concentrations in the distilled water used for equipment rinsing; ▪ RPDs for duplicate samples were within accepted limits; and ▪ Laboratory QA/QC protocols and results complied with NEPM requirements.
6. Specify Performance or Acceptance Criteria (Specify limits on decision errors) Specify the decision-maker's acceptable limits on decision errors, which are used to establish performance goals for limiting uncertainties in the data	Specific limits for this project are to be in accordance with NEPM, appropriate data quality indicators (DQIs) for assessing the useability of the data, and EI standard procedures for field sampling and handling. To assess the useability of the data, pre-determined DQIs for completeness, comparability, representativeness, precision and accuracy, as presented below in **Table 5-2**. If any of the DQIs are not met, further assessment will be necessary to determine whether the non-conformance will significantly affect the useability of the data. Corrective actions may include requesting further information from samplers and/or analytical laboratories, downgrading of the quality of the data or alternatively, re-collection of samples.
7. Develop the Detailed Plan for Obtaining Data (Optimise the design for obtaining data) Identify the most resource-effective sampling and analysis design for general data that are expected to satisfy the DQOs	The DSI (EI, 2020a) identified groundwater contamination at BH2M. The sampling and analysis design included: ▪ One round of groundwater sampling from the three existing wells in the northern portion of the site (BH1M, BH2M and BH3M) and three newly constructed groundwater monitoring wells in the vicinity of BH2M; ▪ Representative groundwater samples were collected and analysed for groundwater characterisation. Review of the results will be undertaken to determine if further intrusive investigation and additional sampling is warranted.

5.3 Data Quality Indicators

To ensure that the analytical results were of an acceptable quality, the data set was assessed against the data quality indicators (DQI) outlined in **Table 5-2**. The assessment of data quality is discussed in **Section 6** and **Appendix I**.

Table 5-2 Data Quality Indicators

QA/QC Component	Data Quality Indicator
Precision – A quantitative measure of the variability (or reproducibility) of data	Data precision was assessed by reviewing the performance of blind field duplicate sample sets, through calculation of relative percentage differences (RPDs). Data precision was deemed acceptable if RPDs were found to be less than 30%. RPDs that exceeded this range were considered acceptable where: ▪ Results were less than 10 times the limit of reporting (LOR); ▪ Results were less than 20 times the LOR and the RPD was less than 50%; or ▪ Heterogeneous materials or volatile compounds were encountered. Note that each contracted analytical laboratory conducted duplicate testing, in accordance with NATA requirements.
Accuracy – A quantitative measure of the closeness of reported data to the "true" value	Data accuracy was assessed through the analysis of split field duplicate sample sets, with calculation of RPDs (the DQI being the same as per the blind field duplicates, above). Note that each contracted analytical laboratory conducted: ▪ Method blanks, which are analysed for the analytes targeted in the primary samples; ▪ Matrix spike and matrix spike duplicate sample sets; ▪ Laboratory control samples; and ▪ Calibration of instruments against known standards.
Representativeness – The confidence (expressed qualitatively) that data are representative of each medium present onsite	To ensure the data produced by the laboratory were representative of conditions encountered in the field, the following measures were carried out: ▪ Collect samples that were representative of the material being sampled and biased to any suspect locations based on physical evidence; ▪ Blank samples were run in parallel with field samples to confirm there were no unacceptable instances of laboratory artefacts; ▪ Review of RPD values for field and laboratory duplicates to provide an indication that the samples are generally homogeneous, with no unacceptable instances of significant sample matrix heterogeneities; ▪ The appropriateness of collection methodologies, handling, storage and preservation techniques were assessed to ensure/confirm there was minimal opportunity for sample interference or degradation (i.e. volatile loss during transport due to incorrect preservation / transport methods); and ▪ Checking for consistency between field vapour screening information and laboratory results.
Completeness – A measure of the amount of useable data from a data collection activity	Analytical data sets acquired during the assessment were evaluated as complete, upon confirmation that: ▪ Standard operating procedures for sampling protocols were adhered to; and ▪ Copies of all COC documentation were presented, reviewed and found to be properly completed. It could therefore be considered whether the proportion of "useable data" generated in the data collection activities was sufficient for the purposes of the land use assessment.
Comparability – The confidence (expressed qualitatively) that data may be considered to be equivalent for each sampling and analytical event	Given that the combined (final) data set comprised several separate sampling episodes, issues of comparability between data sets were reduced through adherence to standard operation procedures and regulator-endorsed or published guidelines and standards on each data gathering activity. Sampling was conducted by the same sampler where possible, to enhance project continuity and minimise variability in sampling technique. Sampling under inclement weather conditions were avoided to minimise variability contributed by weather conditions.

	Samples were collected using procedures meeting NSW EPA endorsed guidelines. In addition the data will be collected by experienced samplers and NATA-accredited laboratory methodologies will be employed in all laboratory testing programs.
Required Sampling Frequency	▪ Intra-laboratory Duplicate – 1 in 20 samples ▪ Inter-laboratory Duplicate – 1 in 20 samples ▪ Rinsate Blanks – 1 per batch where non-dedicated sampling equipment used ▪ Trip Blanks – 1 sample per batch ▪ Trip Spike – 1 sample per batch

5.4 Sampling Rationale

With reference to the RAP (EI, 2020b), the additional groundwater investigation works were planned in accordance with the following rationale:

- Completion of a well-head survey of existing monitoring wells prior to installation of new wells to determine the groundwater flow direction;
- Installation of three groundwater monitoring wells in the vicinity of BH2M located both up gradient and downgradient and a single groundwater monitoring event at the three existing wells in the northern portion of the site and the three newly installed wells to further assess the groundwater impacts; and
- Laboratory analysis of representative groundwater samples for the identified potential contaminants.

5.5 Assessment Criteria

The assessment criteria adopted for this project are outlined in **Table 5-3**. These were selected from available published guidelines that are endorsed by national or state regulatory authorities, with due consideration of the exposure scenarios that are expected for various parts of the site, the likely exposure pathways, and the identified potential receptors.

Table 5-3 Adopted Investigation Levels for Groundwater

Adopted Guidelines	Rationale
ANZG 2018, GILs for Fresh Waters; and NEPM, 2013 Groundwater HSLs.	**Groundwater Investigation Levels (GILs) for Fresh Water** NEPM 2013 provides GILs for typical, slightly-moderately disturbed aquatic ecosystems, which are based on the ANZECC & ARMCANZ 2000 Trigger Values (TVs) for the 95% level of protection of aquatic ecosystems; however, the 99% TVs were applied for the bio-accumulative metals *cadmium* and *mercury*. The fresh water criteria were considered relevant as Second Ponds Creek was the closest surface water receptor to the site. **Health-based Screening Levels (HSLs)** The HSL *D* thresholds for industrial/commercial sites were applied for groundwater due to the basement car park across the majority of the site. Where no marine based criteria were available, The NEPM (2013) GILs for drinking water quality were applied for specific parameters, for which freshwater/marine GILs were not provided. These were based on the Australian Drinking Water Guidelines (Ref. NHMRC, 2011).

5.6 Groundwater Investigation

The additional groundwater investigation works conducted at the site are described in **Table 5-4**. Monitoring well locations are illustrated in **Figure A.2**.

Table 5-4 Summary of Groundwater Investigation Methodology

Activity/Item	Details
Fieldwork	Groundwater monitoring wells were installed and developed on 16 September 2020. Water level gauging, well purging, field testing and groundwater sampling was conducted on 22 September 2020.
Well Construction	The three groundwater monitoring wells installed are as follows: One, 9.6m deep, onsite well identified as BH201M (up-gradient); One, 9.3m deep, onsite well identified as BH202M (up-gradient); and One, 9.1m deep, onsite well identified as BH203M (down-gradient); Drilled by Geosense using a track-mounted, solid flight auger rig. Well construction details are tabulated in **Table 7-1** and documented in the bore logs presented in **Appendix D**.
Well Construction (continued)	Well construction was in general accordance with the standards described in the National Uniform Drillers Licensing Committee(NUDLC), 2012 Minimum Construction Requirements for Water Bores in Australia, and involved: ▪ The use of 50 mm, Class 18 uPVC, threaded, machine-slotted screen and casing, with slotted intervals positioned to screen at least 500 mm above the standing water level to allow sampling of phase-separated hydrocarbon product, if present; ▪ Base and top of each well was sealed with a uPVC cap; ▪ Annular, graded sand filter was used to approximately 300 mm above top of screen interval; ▪ Granular bentonite was applied above annular filter to seal the screened interval; ▪ Drill cuttings were used to backfill the bore annulus to just below ground level; and ▪ Surface completion comprised a PVC stick-up pipe, with plastic cap.
Well Development	Well development was conducted for each well directly following installation. This involved agitation within the full length of the water column and removal of all water and accumulated sediment using a 12V, HDPE submersible bore pump (Proactive Environmental, model Super Twister) until dry.
Well Survey	Well survey was completed on 15 September 2020 on all the existing monitoring wells prior to installation of new wells. The well survey on the newly installed wells was completed on 22 September 2020. The original well elevations were surveyed from a spot height from a known elevation marked on the survey plan (**Appendix C**) and measured in metres relative to Australian Height Datum (AHD).
Well Gauging and Groundwater Flow Direction	All monitoring wells were gauged for standing water level (SWL) prior to sampling at the commencement of the GME on 22 September 2020. The measured SWLs are shown in **Table 7-2**. PSH was not detected in any well. Based on the well survey, groundwater was noted to flow north-easterly and easterly towards Second Ponds Creek.
Well Purging and Field Testing	No volatile or organic odours were detected during any stage of well purging or sampling. The measurement of water quality parameters was conducted repeatedly during purging and the details were recorded onto field data sheets, once water quality parameters stabilised. Field measurements for dissolved oxygen (DO), electrical conductivity (EC), reduction-oxidation potential (redox), temperature (T) and pH were also recorded during well purging. Details are summarised in **Table 7-2**.

Activity/Item	Details
Groundwater Sampling	Groundwater was sampled using a micro-purge system (With the exception of BH1M, BH2M and BH3M which were sampled using a HDPE bailer due to low volumes of water available in the well). Water was continuously measured for T, EC, Redox, DO and pH. Once three consecutive field measurements were recorded for the purged waters to within ± 10% for DO, ± 3% for EC , ± 0.2 for pH, ± 0.2° for temperature and ± 20mV for redox, this was considered to indicate that representative groundwater quality had been achieved and final physio-chemical measurements were recorded. Groundwater samples were then collected from the micro-purge sampling pump discharge point.
Sample Containers and Preservation	Sample containers were supplied by the laboratory with the following preservatives: ▪ One, 1 litre amber glass, acid-washed and solvent-rinsed bottle; and ▪ Two, 40ml glass vials, pre-preserved with dilute hydrochloric acid, Teflon-sealed. All containers were filled with sample to the brim then capped and stored in ice-filled chests, until completion of the fieldwork and during sample transit to the laboratory.
Decontamination Procedures	▪ The micro-purge pump was decontaminated in a solution of potable water and *Decon 90* and then rinsed with potable water between each location. ▪ The micro-purge system employed a disposable bladder and tubing system to further minimise potential cross contamination. ▪ All sample containers were supplied by the laboratory and were only opened once, immediately prior to sampling. ▪ Ice packs were kept in the insulated chest to keep the samples cool. ▪ The water level probe and sampling kit were washed in a solution of potable water and Decon 90 and then rinsed with potable water between uses.
Sample Transport	After sampling, refrigerated sample chests were transported to SGS Australia Pty Ltd using strict Chain-of-Custody (COC) procedures. Inter-laboratory duplicate (ILD) samples were forwarded to Envirolab Services Pty Ltd (Envirolab) for QA/QC analysis. A Sample Receipt Advice (SRA) was provided by each laboratory to document sample condition upon receipt. Copies of SRA and COC certificates are presented in **Appendix F**.
Quality Control and Laboratory Analysis	All groundwater samples were analysed by SGS and Envirolab for the COPC. All samples were analysed within the required holding period, as documented in the corresponding laboratory reports (**Appendix G**). In addition to the split (inter-laboratory) field duplicate (GWQT2; analysed by Envirolab), QC testing comprised a blind (intra-laboratory) field duplicate (GWQD2), an equipment rinsate blank, a laboratory-prepared, trip spike soil sample and a laboratory-prepared, trip blank soil sample, all analysed by SGS.

6. DATA QUALITY ASSESSMENT

The assessment of data quality is defined as the scientific and statistical evaluation of environmental results to determine if they meet the objectives of the project (USEPA, 2006). For this investigation, data quality assessment involved an evaluation of the compliance of the field (sampling) and laboratory procedures with established protocols, as well as the accuracy and precision of the associated results from the quality control measures. The findings are summarised in **Table 6-1** and discussed in detail in **Appendix I**.

In summary, the overall quality of the analytical data from this investigation was considered to be of an acceptable standard for interpretive use and preparation of an updated CSM.

Table 6-1 Quality Control Process

Stage	Control	Conformance [Yes, Part, No]	Report Section(s)
Preliminaries	DQO established	Yes	See DQO/DQI, **Section 5.1** and **5.2**
Field work	Suitable documentation of fieldwork observations including borehole logs, field notes.	Yes	See **Appendix D** and **E**
Sampling plan	Use of relevant and appropriate sampling plan (density, type, and location)	Yes	See sample rationale **Section 5.3**
	All media sampled and duplicates collected	Yes	Groundwater Only See **Appendix F** and **G**
	Use of approved and appropriate sampling methods (soil, groundwater, soil vapour)	Yes	See **Section 5.5**
	Preservation and storage of samples upon collection and during transport to the laboratory	Yes	See **Section 5.5**
	Appropriate field rinsate and trip blanks taken	Yes	See **Appendix F**
	Completed field and analytical laboratory sample COC procedures and documentation	Yes	See **Appendix F**
Laboratory	Sample holding times within acceptable limits	Yes	See laboratory QA/QC, **Appendix H**
	Use of appropriate analytical procedures and NATA-accredited laboratories	Yes	See laboratory QA/QC, **Appendix H**
	LOR/PQL low enough to meet adopted criteria	Yes	See laboratory QA/QC, **Appendix H**
	Laboratory blanks	Yes	See laboratory QA/QC, **Appendix H**
	Laboratory duplicates	Yes	See laboratory QA/QC, **Appendix H**
	Matrix spike/matrix spike duplicates	Yes	See laboratory QA/QC, **Appendix H**
	Surrogates (or System Monitoring Compounds)	Yes	See laboratory QA/QC, **Appendix H**
	Analytical results for replicated samples, including field and laboratory duplicates and inter-laboratory duplicates, expressed as Relative Percentage Difference (RPD)	Yes	See laboratory QA/QC, **Appendix H**

	Checking for the occurrence of apparently unusual or anomalous results (e.g. laboratory results that appear to be inconsistent with field observations or measurements)	Yes	See **Appendix B, D, G**
Reporting	Report reviewed by senior staff to assess project meets desired quality, EPA guidelines and project outcomes.	Yes	See Document Control

7. GROUNDWATER INVESTIGATION RESULTS

7.1 Monitoring Well Construction

A total of three groundwater monitoring wells were installed in the vicinity of BH2M in the northern portion of the site. Well construction details for the installed groundwater monitoring wells, along with the BH1M, BH2M and BH3M installed during the previous DSI (EI, 2020a), are summarised in **Table 7-1**.

Table 7-1 Monitoring Well Construction Details

Well ID	Well Depth (mBGL)	RL (GL)	RL (TOC)	Screen Interval (mBGL)	Lithology Screened
BH201M	9.6	59.66	60.66	6.6-9.6	Shale
BH202M	9.3	58.01	59.01	6.3-9.3	Shale
BH203M	9.1	57.62	58.62	6.1-9.1	Shale
BH1M	7.1	58.75	59.75	4.1 – 7.1	Shale
BH2M	8.0	58.01	58.93	5.0 – 8.0	Shale
BH3M	10.0	57.71	58.41	7.0 – 10.0	Shale

Notes:
m BGL – metres below ground level.
RL (GL) – Reduced Level_surveyed elevation at ground level in metres relative to Australian Height Datum (m AHD).
TOC – top of well casing.
RL (GL) – Reduced Level_surveyed elevation at TOC in mAHD.

7.2 Field Observations

A groundwater monitoring event (GME) was conducted on 22 September 2020 for all the monitoring wells in the northern portion of the site. Field data was recorded before sampling, as presented in **Table 7-2**. Field data sheets are attached in **Appendix E**. Samples were then evaluated on the basis of odour and visual signs of contamination, with the following observations noted:

- Groundwater in monitoring wells BH1M, BH2M and BH201M was noted to be grey to dark grey, with high turbidity, while in BH3M, BH202M and BH203M, groundwater was noted to be with medium to high turbidity;
- No sufficient water in monitoring wells BH1M and BH3M, limited samples were collected;
- No olfactory or visual evidence of contamination was noted in the monitoring wells; and
- No sheens were noted within the groundwater of any monitoring well sampled.

Table 7-2 Groundwater Field Data

Well ID	SWL (mBTOC)	SWL (mBGL)	SWL (mAHD)	Purge Volume (L)	DO (mg/L)	Field pH	Field EC (µS/cm)	Temp (°C)	Redox (mV)
BH1M	7.96	6.96	52.70	-	-	-	-	-	-
BH2M	8.20	7.35	50.66	-	1.02	6.48	32,310	22.37	20.3
BH3M	9.57	8.87	48.75	-	-	-	-	-	-
BH201M	8.20	7.20	51.55	2.0	1.65	6.75	801	27.63	19.2
BH202M	7.50	6.50	51.51	2.5	1.02	7.12	17,038	22.36	12.1
BH203M	7.80	6.80	50.91	3.0	0.88	7.76	1,101	23.03	9.5

Notes:
SWL – Standing Water Levels as measured from TOC (top of well casing) prior to groundwater sampling.
SWL (mAHD) – Calculated groundwater level, in mAHD (note: these values were used for groundwater contouring analysis).

With reference to **Table 7-2**, the field pH data indicated that the groundwater was acidic to neutral (pH ranged from 6.48 to 7.76). Electrical Conductivity (EC) measurements were recorded in the range 801 to 32,310 µS/cm indicating that the groundwater was saline to extremely saline.

7.3 Laboratory Analytical Results

Laboratory analytical results for groundwater samples are summarised in **Table 7-3**, which also include the test sample quantities, minimum/maximum analyte concentrations for primary samples and samples found to exceed the GILs. More detailed tabulations of results, along with the analytical results from the previous DSI (EI, 2020a), are presented in **Table B.1** in **Appendix B**.

Selected samples were re-analysed with and without silica clean-up to determine the possible source of the TRH impact.

Completed documentation used to track groundwater sample movements and laboratory receipt (COC and SRA forms) are copied in **Appendix F**. Copies of the laboratory analytical reports are attached in **Appendix G**.

Table 7-3 Summary of Groundwater Analytical Results

No. of primary samples	Analyte	Min. Conc. (µg/L)	Max. Conc. (µg/L)	Sample(s) Exceeding GILs
Hydrocarbons				
5	F1	<50	<50	None
5	F2	<60	6400 $^{\#}$	PQL (60 µg/L) BH2M (6400 µg/L), BH201M (480 µg/L)
5	F3	<500	5600 $^{\#}$	PQL (500 µg/L) BH2M (5600 µg/L), BH3M (730 µg/L), BH201M (990 µg/L)
5	F4	<500	840 $^{\#}$	PQL (500 µg/L) BH2M (840 µg/L)
6	Benzene	<0.5	<0.5	None

No. of primary samples	Analyte	Min. Conc. (µg/L)	Max. Conc. (µg/L)	Sample(s) Exceeding GILs
6	Toluene	<0.5	2.1	None
6	Ethyl benzene	<0.5	<0.5	None
6	Total xylenes	<1.5	2.5	None
VOCs				
6	Chloroform (THM)	<0.5	18	None
6	Bromodichloromethane (THM)	<0.5	2.3	None
6	1,2,4-trimethylbenzene	<0.5	0.5	None
6	Total VOC	<10	25	None
Phenols				
5	Total Phenols	<10	10	None

Results after silica gel clean-up.

8. SITE CHARACTERISATION

8.1 Groundwater Impacts

During this investigation on 22 September and 23 September 2020, SWLs across the site ranged between 48.75m AHD and 53.18m AHD. Groundwater was interpreted to be flowing north-easterly and easterly towards Second Ponds Creek.

With reference to **Table 7-3** and **Table B.1**, the concentrations of BTEX, VOCs and Phenols were all reported below the adopted criteria.

The reported TRH concentrations were found to exceed the adopted environmental guidelines at groundwater wells BH2M, BH3M and BH201M as follows:

- At BH2M, the concentrations of F2, F3 and F4 TRH fractions exceeded the adopted criteria;
- At BH3M, the concentrations of F3 TRH fractions exceeded the adopted criteria; and
- At BH201M, the concentrations of F2, F3 TRH fractions exceeded the adopted criteria.

The source of the hydrocarbons have not been identified, however, the concentrations of F3 and F4 hydrocarbons were considered to be of low risk, as analysis showed these compounds consisted of long chain aliphatic organic compounds which have a low volatility. However, the concentrations of F2 hydrocarbons reported at BH2M (11,000µg/L / 6,400µg/L post silica gel clean-up) and BH201M (720µg/L / 480µg/L post silica gel clean-up) were considered to pose a potential vapour inhalation risk to future occupants.

Under the proposed development (**Appendix C**), bulk excavation would be required to construct the two to three-level of basement car park (covering the majority of the available area). This would result in the removal of the majority of the potential on-site contaminant sources in the vicinity of BH2M and BH201M, reducing the potential risks to the development.

However, given the lowest basement (B3) would potentially be in contact with the groundwater, the petroleum hydrocarbon results may require further investigation and assessment at the time of excavation to determine potential human health risk for the proposed development.

8.2 Groundwater Take Assessment

A Groundwater Take Assessment (GTA) has been completed concurrently with this report, which is presented in full in **Appendix J**.

Based on the findings of the GTA, EI concluded that:

- Construction and operational phase groundwater take will be approximately:
    - Stage 1: 1.23ML / 150 days during construction and 3.01ML / year during operation;
    - Stage 2: 2.48ML / 150 days during construction and 6.03ML / year during operation.
- The drawdown as a result of the dewatering will have negligible, if any, adverse impact on the neighbouring properties.

9. Conclusions

The property located at Tallawong Station Precinct South, Rouse Hill NSW (the site) was the subject of an Additional Groundwater Investigation, to address the potential hydrocarbon impacts in groundwater outlined in the RAP (EI, 2020b).

Three additional groundwater monitoring wells were installed in the vicinity of BH2M to investigate the extent of groundwater TRH contamination and the presence of any VOCs. In addition, a Groundwater Take Assessment (**Appendix J**) was undertaken to address concerns by Blacktown City Council regarding impacts from basement construction on groundwater.

The key findings were as follows:

- Standing water levels (SWLs) across the site ranged between 48.75m AHD and 53.18m AHD.
- Groundwater was interpreted to be flowing north-easterly and easterly towards Second Ponds Creek.
- Groundwater sampling and analysis were conducted at the six monitoring wells in the northern portion of the site, the concentrations of BTEX, VOCs and Phenols were all reported below the adopted criteria.
- TRHs were found at levels above the adopted guidelines at wells BH2M, BH3M and BH201M. The source of the TRH was not identified.
- The concentrations of TRH-F2 at BH2M and BH201M were considered to potentially pose a vapour inhalation risk to future occupants and may warrant further investigation.
- Bulk excavation would be required to construct the two to three-level of basement car park. This would result in the removal of the majority of on-site contaminant sources in the vicinity of BH2M and BH201M, reducing the potential risk to the development.
- However, given the proposed basement will potentially be in contact with the groundwater, the petroleum hydrocarbon results may warrant further investigation and assessment at the time of excavation to determine potential human health risk for the proposed development.
- The Groundwater Take Assessment (GTA) completed concurrently with this assessment has concluded that the estimated volume of groundwater removed beneath the basement during the operational phase of the development is expected to be approximately 3.01ML per year for Stage 1 and 6.03ML per year for Stage 2. The drawdown as a result of the dewatering will have negligible, if any, adverse impact on the neighbouring properties.

Based on the findings of this investigation, and consideration of EI's Statement of Limitations (**Section 11**), EI concluded that while localised TRH contamination in groundwater was identified in the vicinity of BH2M and BH201M, which may potentially pose a vapour inhalation risk to future occupants, the site can be made suitable for the proposed development, provided the recommendations detailed in **Section 10** are implemented.

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10.RECOMMENDATIONS

In view of the above findings, it is recommended that:

- Conduct visual inspections during bulk excavation works in the vicinity of BH2M and BH201M;
- Following excavation confirming that the potential on-site contaminant source has been removed by an additional round of groundwater sampling in the vicinity of BH2M and BH201M. If contaminated groundwater remains, a soil vapour assessment may be required to assess the potential vapour intrusion risks; and
- If confirmed, this may require updating of the existing RAP (EI, 2020b) to address any potential groundwater and/or vapour seepage into the lower basements.

11.STATEMENT OF LIMITATIONS

The findings presented in this report are the result of discrete and specific sampling methodologies used in accordance with best industry practices and standards. Due to the site-specific nature of soil sampling from point locations, it is considered likely that all variations in subsurface conditions across a site cannot be fully defined, no matter how comprehensive the field investigation program.

While normal assessments of data reliability have been made, EI assumes no responsibility or liability for errors in any data obtained from previous assessments conducted on site, regulatory agencies (e.g. Council, EPA), statements from sources outside of EI, or developments resulting from situations outside the scope of works of this project.

Despite all reasonable care and diligence, the ground conditions encountered and concentrations of contaminants measured may not be representative of conditions between the locations sampled and investigated. In addition, site characteristics may change at any time in response to variations in natural conditions, chemical reactions and other events, e.g. groundwater movement and or spillages of contaminating substances. These changes may occur subsequent to EI’s investigations and assessment.

EI’s assessment is necessarily based upon the result of the site investigation and the restricted program of surface and subsurface sampling, screening and chemical testing which was set out in the proposal. Neither EI, nor any other reputable consultant, can provide unqualified warranties nor does EI assume any liability for site conditions not observed or accessible during the time of the investigations.

This report was prepared for the above named client and no responsibility is accepted for use of any part of this report in any other context or for any other purpose or by other third parties. This report does not purport to provide legal advice.

This report and associated documents remain the property of EI subject to payment of all fees due for this assessment. The report shall not be reproduced except in full and with prior written permission by EI.

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ABBREVIATIONS

ASS	Acid sulfate soils
ANZECC	Australian and New Zealand Environment Conservation Council
ARMCANZ	Agriculture and Resource Management Council of Australia and New Zealand
BH	Borehole
BTEX	Benzene, Toluene, Ethylbenzene, Xylene
COC	Chain of Custody
DEC	Department of Environment and Conservation, NSW (see OEH)
DECC	Department of Environment and Climate Change, NSW (see OEH)
DECCW	Department of Environment, Climate Change and Water, NSW (see OEH)
DO	Dissolved Oxygen
DP	Deposited Plan
EC	Electrical Conductivity
EPA	Environment Protection Authority
F1	TRH C_6 – C_{10} less the sum of BTEX concentrations (Ref. NEPM 2013, Schedule B1)
F2	TRH $>C_{10}$ – C_{16} less the concentration of naphthalene (Ref. NEPM 2013, Schedule B1)
GIL	Groundwater Investigation Level
GME	Groundwater Monitoring Event
HSL	Health-based Screening Level
km	Kilometres
m	Metres
m AHD	Metres Australian Height Datum
m BGL	Metres Below Ground Level
mg/L	Milligrams per litre
µg/L	Micrograms per litre
mV	Millivolts
NATA	National Association of Testing Authorities, Australia
NEPC	National Environmental Protection Council
pH	Measure of the acidity or basicity of an aqueous solution
PSH	Phase-separated hydrocarbons (also referred to as LNAPL)
PQL	Practical Quantitation Limit (limit of detection for respective laboratory instruments)
QA/QC	Quality Assurance / Quality Control
RAP	Remediation Action Plan
SRA	Sample receipt advice (document confirming laboratory receipt of samples)
SWL	Standing Water Level
TRH	Total Recoverable Hydrocarbons (non-specific analysis of organic compounds)
USEPA	United States Environmental Protection Agency
VOCs	Volatile Organic Compounds (specific organic compounds which are volatile)

Appendix A– Figures

eiaustralia
Contamination | Remediation | Geotechnical

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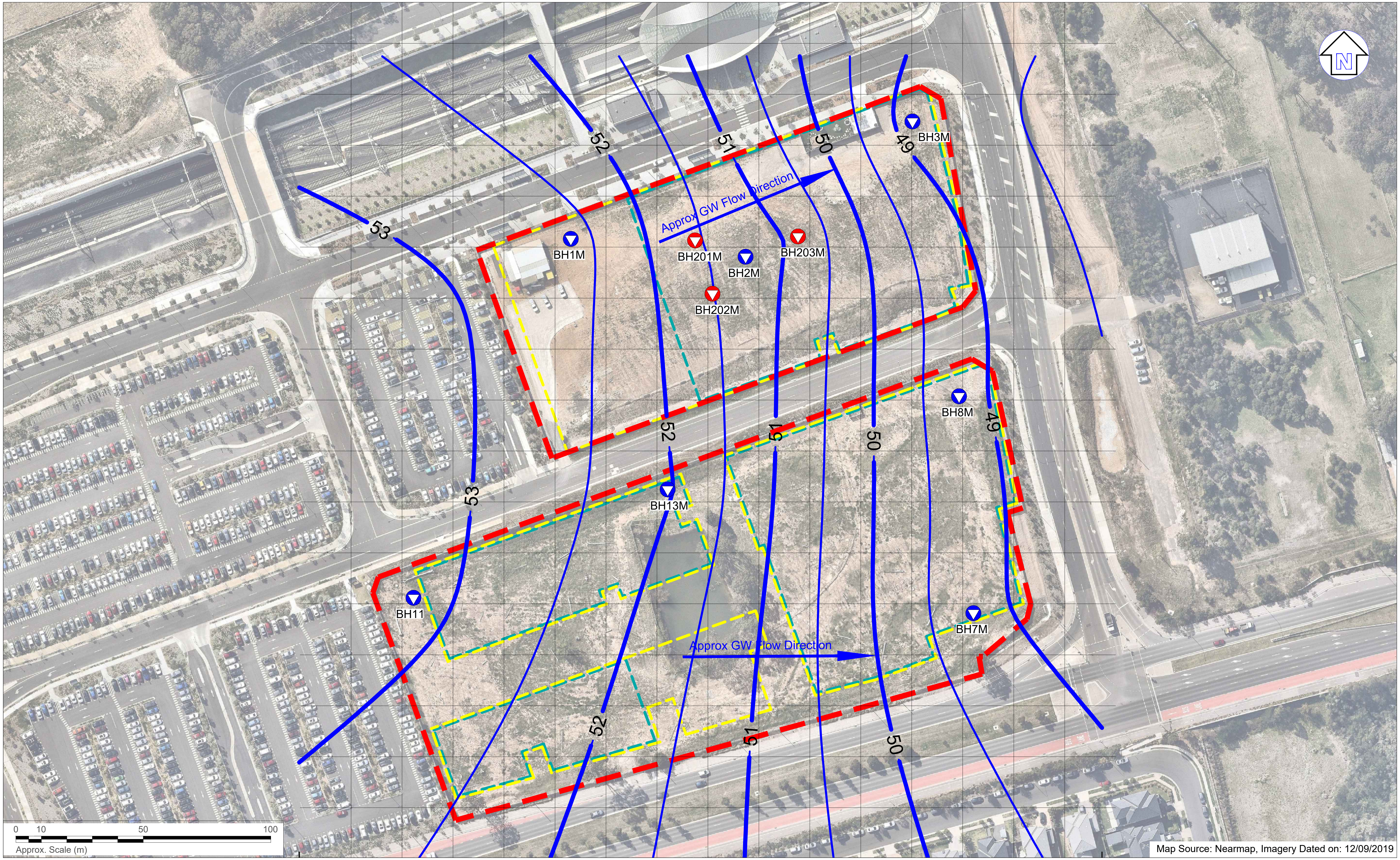
Drawn:	AM.H.
Approved:	N.G.
Date:	28-09-20
Scale:	Not To Scale

Deicorp Construction Pty Ltd

Additional Groundwater Investigation
Tallawong Station Precinct South, Rouse Hill NSW
Site Locality Plan

Figure:
A.1

Project: E24445.E17



Map Source: Nearmap, Imagery Dated on: 12/09/2019

LEGEND

- Approximate site boundary
- Approximate basement 1 and 2 boundary
- Approximate basement 2 and 3 boundary
- Approximate newly installed monitoring well location
- Approximate monitoring well location by EI (DSI, 2020)
- Approximate groundwater flow direction
- Approximate groundwater level (RL mAHD)
- Contour interval 0.5 m

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Additional Groundwater Investigation
Tallawong Station Precinct South, Rouse Hill NSW
Sampling Location Plan

Figure:
A.2

Project: E24445.E17

Appendix B– Tables

Table B.1 - Summary of Groundwater Analytical Results

Sample ID	Sampling Date	Metals									Cations				Anions		PAHs			BTEX					TRHs				VOCs			Total Phenols	pH
		As	Cd	Cr	Cu	Pb	Hg	Ni	Zn	Mn	Ca	Mg	Na	K	Cl	SO$_4$	Total PAHs	Benzo(a)pyrene	Naphthalene	Benzene	Toluene	Ethylbenzene	o-xylene	m/p-xylene	F1	F2	F3	F4	Chloroform (THM) *	Bromodichloromethane (THM) *	Total VOC		
Detailed Site Investigation (EI, 2020)																																	
BH1M	26/2/2020	6	<0.1	<1	<1	<1	<0.1	11	<5	1,700	80	94	640	34	750	89	<1	<0.1	<0.1	<0.5	<0.5	<0.5	<0.5	<1	<50	120	<500	<500	NA	NA	NA	NA	7.0
BH2M		3	<0.1	<1	<1	<1	<0.1	8	<5	1,200	46	39	310	26	660	150	820	6.1	87	<0.5	<0.5	<0.5	<0.5	<1	<50	7200$^{\#}$	3900$^{\#}$	810$^{\#}$	NA	NA	NA	NA	7.2
BH3M		4	<0.1	1	6	<1	<0.1	7	<5	410	110	290	1,500	38	3,200	400	<1	<0.1	<0.1	<0.5	<0.5	<0.5	<0.5	<1	<50	<60	<500	<500	NA	NA	NA	NA	7.8
BH7M	21/2/2020	3	<0.1	<1	5	<1	<0.1	19	<5	3,800	140	230	1,700	30	2,200	230	<1	<0.1	<0.1	<0.5	<0.5	<0.5	<0.5	<1	<50	190	<500	<500	NA	NA	NA	NA	6.7
BH8M		2	0.2	<1	41	1	<0.1	46	100	2,100	160	480	2,300	36	6,300	430	<1	<0.1	<0.1	<0.5	<0.5	<0.5	<0.5	<1	<50	<60	<500	<500	NA	NA	NA	NA	6.3
BH11M		4	<0.1	<1	13	<1	<0.1	23	42	1,500	110	260	1,100	30	3,400	280	<1	<0.1	<0.1	<0.5	<0.5	<0.5	<0.5	<1	<50	<60	<500	<500	NA	NA	NA	NA	6.7
BH13M		3	<0.1	<1	3	<1	<0.1	22	44	1,100	170	390	2,200	49	3,800	200	<1	<0.1	<0.1	<0.5	<0.5	<0.5	<0.5	<1	<50	73	<500	<500	NA	NA	NA	NA	6.9
Statistical Analysis																																	
Maximum Concentration		6	0.2	1	41	1	<0.1	46	100	3800	170	480	2300	49	6300	430	820	6.1	87	<0.5	<0.5	<0.5	<0.5	<1	<50	7200	3900	810	NA	NA	NA	NA	7.8
Additional Groundwater Investigation (EI, 2020)																																	
BH1M-2	22/09/2020	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.5	<0.5	<0.5	<0.5	<1	<50	NA	NA	NA	<0.5	<0.5	<10	NA	NA
BH2M-2		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.5	<0.5	<0.5	<0.5	<1	<50	6400$^{\#}$	5600$^{\#}$	840$^{\#}$	2.8	<0.5	<10	10	NA
BH3M-2		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.5	<0.5	<0.5	<0.5	<1	<50	<60	730$^{\#}$	<500	<0.5	<0.5	<10	<10	NA
BH201M-1		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.5	0.8	<0.5	<0.5	<1	<50	480$^{\#}$	990$^{\#}$	<500	12	1.2	15	<10	NA
BH202M-1		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.5	<0.5	<0.5	<0.5	<1	<50	<60	<500	<500	9.9	1.6	13	<10	NA
BH203M-1		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.5	2.1	<0.5	1.5	<1	<50	<60	<500	<500	18	2.3	25	<10	NA
Statistical Analysis																																	
Maximum Concentration		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.5	2.1	<0.5	1.5	<1	<50	6400	5600	840	18	2.3	25	10	NA
GILs																																	
HSL A&B - *Low - High Density Residential* [1]		2m to <4m																	NL	5,000	NL	NL	NL	NL	NL	NL							
		4m to <8m																	NL	5,000	NL	NL	NL	NL	NL	NL							
		8m+																	NL	5,000	NL	NL	NL	NL	NL	NL							
GILs	Fresh Water [2]	24 (AsIII) 13 (AsV)	0.2	1 (Cr VI)	1.4	3.4	0.06 [5]	11	8 [6]	1900 [6]									16	950	180 [7]	80 [7]	350 [7]	275 [7]	50 [8]	60 [8]	500 [8]	500 [8]				320	
	Recreational Water [9]	100	20		1,000 *	100	10	200	3,000*	100 *										10	25*	3*	20 *	20 *					2,500				

Notes:

🟨	Highlighted indicates analytical results exceeded criteria
🟦	Highlighted indicates GIL criteria not met

All values are µg/L unless stated otherwise

NL	Not Limiting
NA	'Not Analysed' i.e. the sample was not analysed.
ND	Not Detected - i.e. concentration below the laboratory PQL
F1	To obtain F1 subtract the sum of BTEX concentrations from the C6-C10 fraction.
F2	To obtain F2 subtract naphthalene from the >C10-C16 fraction.
F3	(>C16-C34)
F4	(>C34-C40)
*	Only thoes VOC values above the laboratory PQL have been tabulated.
#	Results after silica gel clean up
1	NEPM (2013) Table 1A(4) Groundwater HSL A&B for vapour intrusion in clay.
2	NEPM (2013) Groundwater Investigation Levels for fresh and marine water quality, based on ANZECC & ARMCANZ (2000).
3	Value dervied from the National Environmental Management Plan for PFAS - 95% species protection for slightly to moderately disturbed systems
4	When pH>6.5
5	Chemical for which possible bioaccumulation and secondary poisoning effects should be considered, refer to ANZG (2018) for further guidance.
6	Figure may not protect key species from chronic toxicity, refer to ANZECC & ARMCANZ (2000) for further guidance
7	Low reliability toxicity data, refer to ANZECC & ARMCANZ (2000)
8	In lack of a criteria the laboratory PQL has been used (DEC, 2007).
9	Based on NHMRC (2011 - update August 2018 v.3.5) Drinking Water Guidelines. 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 *

Table B.2 Summary of QA/QC results for Investigation samples

Sample identification	Sampled Date	Description	TRH				BTEX			
			F1*	F2**	F3 (>C_{16} - C_{34})	F4 (>C_{34} - C_{40})	Benzene	Toluene	Ethylbenzene	Xylene (total)
Intra-laboratory Duplicate										
BH2M-2	22/9/2020	Groundwater	<50	11,000	12,000	3,500	<0.5	<0.5	<0.5	<1.5
GWQD2		Replicate of BH2M-2	<50	840	1,200	<500	<0.5	<0.5	<0.5	<1.5
RPD			***0.00***	**171.62**	**163.64**	**160.00**	***0.00***	***0.00***	***0.00***	***0.00***
Inter-laboratory Duplicate										
BH2M-2	22/9/2020	Groundwater	<50	11,000	12,000	3,500	<0.5	<0.5	<0.5	<1.5
GWQT2		Replicate of BH2M-2	<10	<50	<100	<100	<1	<1	<1	<3
RPD			***NA***	**198.64**	**197.51**	**191.55**	***NA***	***NA***	***NA***	***NA***
Intra-laboratory Duplicate (after retest)										
BH2M-2	22/9/2020	Groundwater	<50	8,100	9,100	2,700	<0.5	<0.5	<0.5	<1.5
GWQD2		Replicate of BH2M-2	<50	2,800	3,200	<500	<0.5	<0.5	<0.5	<1.5
RPD			***0.00***	**97.25**	**95.93**	**149.15**	***0.00***	***0.00***	***0.00***	***0.00***
Inter-laboratory Duplicate (after retest)										
BH2M-2	22/9/2020	Groundwater	<50	8,100	9,100	2,700	<0.5	<0.5	<0.5	<1.5
GWQT2		Replicate of BH2M-2	<10	<50	<100	<100	<1	<1	<1	<3
RPD			***NA***	**198.15**	**196.72**	**189.09**	***NA***	***NA***	***NA***	***NA***
GWTB2	22/9/2020	Trip blank	-	-	-	-	<0.5	<0.5	<0.5	<1.5
GWTS2		Trip spike	-	-	-	-	[104%]	[104%]	[102%]	[102%]
GWQR2		Rinsate	<50	<60	<500	<500	<0.5	<0.5	<0.5	<1.5

▒	Indicates values where a single result is found to be less than detection, with the duplicate sample found to be over the detect
■	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

DLCS Quality Endorsed Company ISO 9001:2015, Registration Number 20476
Nominated Architect: Nicholas Turner 6695, ABN 86 064 084 911

KEY PLAN

LEGEND

Rev	Date	Approved by	Issue Name
J	16.01.20	YO	PRELIMINARY
K	24/2/20	AH	PRELIMINARY
L	6/2/20	AH	PRELIMINARY
M	11/2/20	YO	PRELIMINARY
N	17/2/20	YO	PRELIMINARY
O	24/2/20	YO	For Coordination
P	6/3/20	YO	For Coordination
Q	13/3/20	YO	For Coordination
R	20/3/20	YO	For Coordination
S	22/3/20	YO	For Coordination
T	30/3/20	YO	For Coordination
U	31/3/20	YO	For Coordination
V	8/4/20	YO	For Coordination

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Project Title
Tallawong Station Precinct South
1-15 & 2-12 Conferta Avenue Rouse Hill NSW 2155

Drawing Title
GA Plans Overall
Basement 03 & 02

Scale
1:500 @A1, 50%@A3
Project No.
18095
Drawn by
TURNER
North
Status
For Co-ordination
Dwg No.
DA-110-006
Rev
V

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DLCS Quality Endorsed Company ISO 9001:2015, Registration Number 20476
Nominated Architect: Nicholas Turner 6695, ABN 86 064 084 911

KEY PLAN

LEGEND

Rev	Date	Approved by	Issue Name
J	16.01.20	YO	PRELIMINARY
K	24/2/20	AH	PRELIMINARY
L	6/2/20	AH	PRELIMINARY
M	11/2/20	YO	PRELIMINARY
N	17/2/20	YO	PRELIMINARY
O	24/2/20	YO	For Coordination
P	6/3/20	YO	For Coordination
Q	13/3/20	YO	For Coordination
R	20/3/20	YO	For Coordination
S	22/3/20	YO	For Coordination
T	30/3/20	YO	For Coordination
U	31/3/20	YO	For Coordination
V	8/4/20	YO	For Coordination

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Project Title
Tallawong Station Precinct South
1-15 & 2-12 Conferta Avenue Rouse Hill NSW 2155

Drawing Title
GA Plans Overall
Basement 02 & 01

Scale
1:500 @A1, 50%@A3
Project No.
18095
Drawn by
TURNER
North
Status
For Co-ordination
Dwg No.
DA-110-007
Rev
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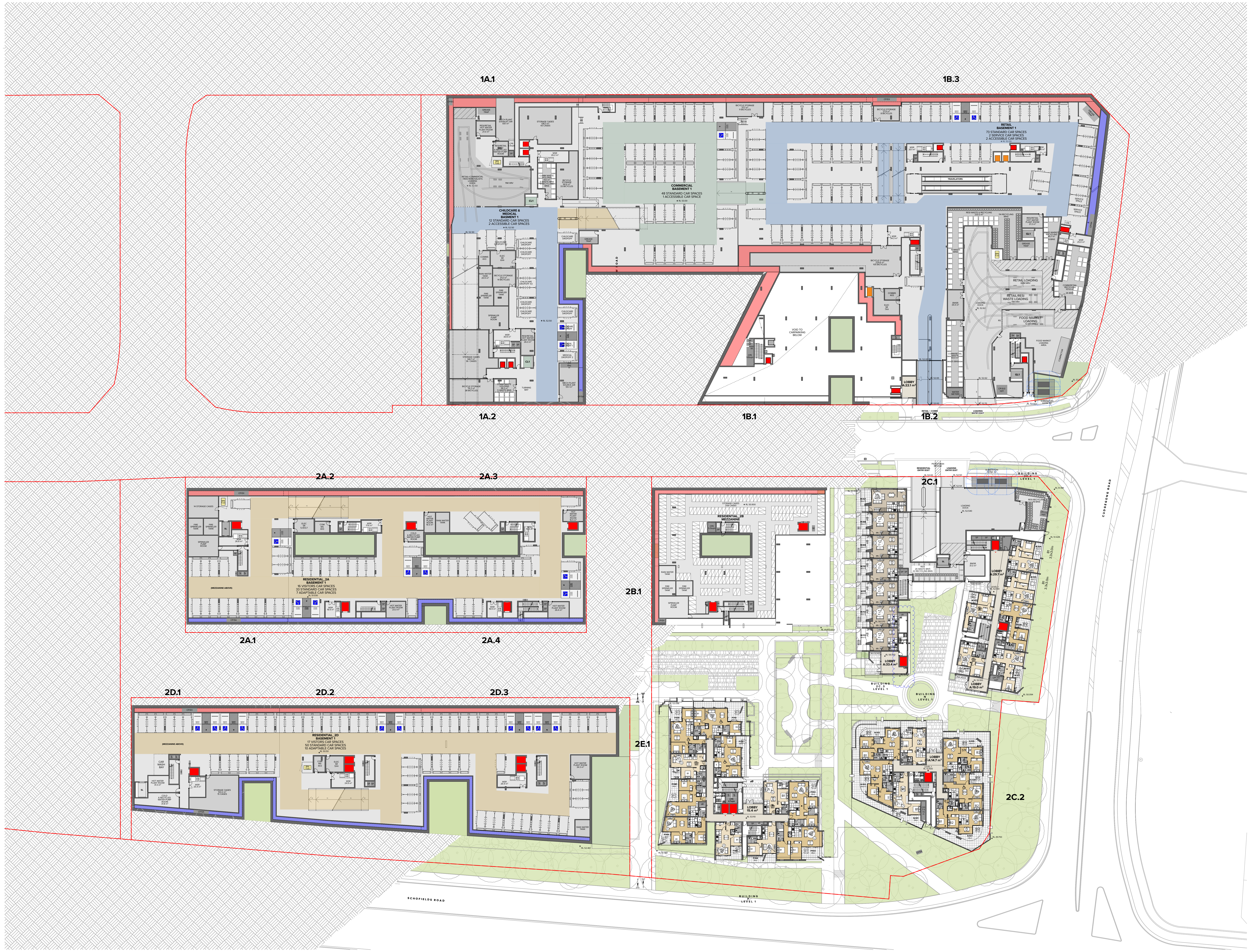

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KEY PLAN

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Rev	Date	Approved by	Issue Name
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K	24/2/20	AH	PRELIMINARY
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M	11/2/20	YO	PRELIMINARY
N	17/2/20	YO	PRELIMINARY
O	24/2/20	YO	For Coordination
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Q	13/3/20	YO	For Coordination
R	20/3/20	YO	For Coordination
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T	30/3/20	YO	For Coordination
U	31/3/20	YO	For Coordination
V	8/4/20	YO	For Coordination

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1-15 & 2-12 Conferta Avenue Rouse Hill NSW 2155

Drawing Title
GA Plans Overall
Basement 01, Mezz. & Level 1

Scale
1:500 @A1, 50%@A3
Project No.
18095
Drawn by
TURNER
North
Status
For Co-ordination
Dwg No.
DA-110-008
Rev
V

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DLCS Quality Endorsed Company ISO 9001:2015, Registration Number 20476
Nominated Architect: Nicholas Turner 6695, ABN 86 064 084 911

KEY PLAN

LEGEND

Rev	Date	Approved by	Issue Name
J	16.01.20	YO	PRELIMINARY
K	24/2/20	AH	PRELIMINARY
L	6/2/20	AH	PRELIMINARY
M	11/2/20	YO	PRELIMINARY
N	17/2/20	YO	PRELIMINARY
O	24/2/20	YO	For Coordination
P	6/3/20	YO	For Coordination
Q	13/3/20	YO	For Coordination
R	20/3/20	YO	For Coordination
S	22/3/20	YO	For Coordination
T	30/3/20	YO	For Coordination
U	31/3/20	YO	For Coordination
V	8/4/20	YO	For Coordination

WIP 06/04/20

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Project Title
Tallawong Station Precinct South
1-15 & 2-12 Conferta Avenue Rouse Hill NSW 2155

Drawing Title
GA Plans Overall
Mezzanines, Level 01 & 02

Scale	Project No.	Drawn by	North
1:500 @A1, 50%@A3	**18095**	**TURNER**	↗
Status	Dwg No.	Rev	
For Co-ordination	**DA-110-010**	**V**	

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NOTES

- TREE SPREADS SHOWN APPROXIMATELY ONLY
- VISIBLE SERVICES (AT TIME OF SURVEY) SHOWN ONLY
- NO SERVICE PITS ACCESSED/OPENED SHOWN AS LABELED
- BOUNDARIES BY THE TITLE DIAGRAM ONLY, (NOT SURVEYED)
- ALL PITS SHOULD BE ACCESSED, CONFIRMED AND HAVE SUBSURFACE EXTENTS MEASURED BY THE RELEVANT AUTHORITIES, PRIOR TO ADOPTION.
- ALL PIPES, CABLES □ DUCTS IN THE EXCAVATION AREA SHOULD BE ACCURATELY LOCATED BY A "PIPE LOCATOR" OR BY THE RELEVANT AUTHORITY, PRIOR TO ANY EXCAVATION IS UNDERTAKEN.
- THE SUBJECT TITLE IS NOT BURDENED BY EASEMENTS, RESTRICTIONS □ COVENANTS / BURDENED BY EASEMENTS (DP1213279)

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CONSULTING SURVEYORS
ABN 65 120 413 372

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Ph: (02) 8065 1156
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Email: survey@ daw-walton.com.au

DETAIL SURVEY □ CONFERTA AVENUE, ROUSE HILL NSW 2155	JOB No: 4900-20	SCALE: 1:600 (@ A1)/ 1:1200 (@ A3)
	REVISION.03, 03-04-20 SHEET 1 of 7 SHEETS	NORTH: MGA (by DP1213279)
CLIENT: DEICORP	SURVEYED: 21-02-20 (JT □ □□) DRAFTED: 10-03-20 (LJ)	DATUM: SSM206674 RL:57.720 (AHD)
		CONTOUR INT: 1.0 Maj□0.2 Min

Appendix D– Borehole Logs

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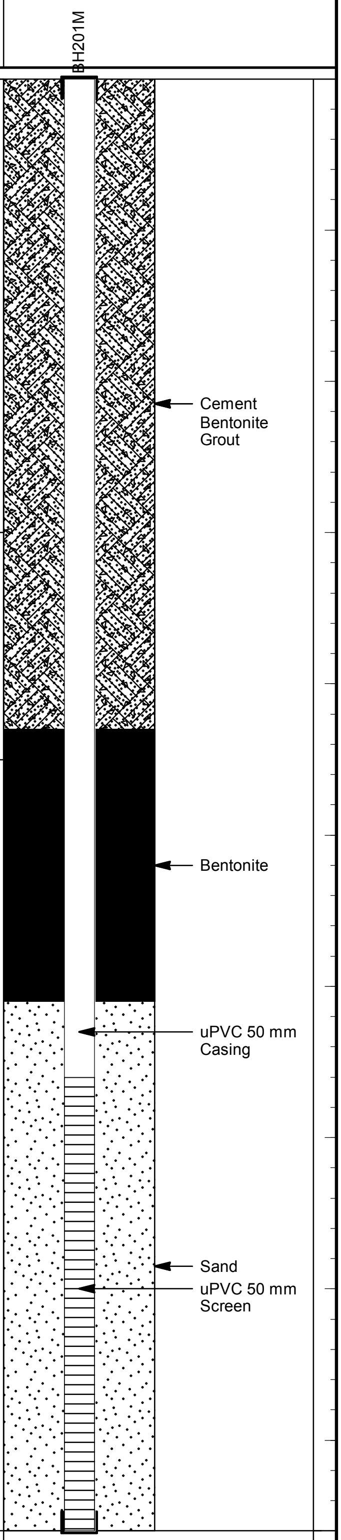
BOREHOLE: BH201M

Project	Additional Groundwater Investigation			Sheet	1 OF 1
Location	Tallawong Station Precinct South, Rouse Hill NSW			Date Started	16/9/20
Position	Refer to Figure 2			Date Completed	16/9/20
Job No.	E24445.E17	Contractor	Geosense Drilling Rig	Logged LW	Date:16/9/20
Client	Deicorp Pty Ltd	Drill Rig	Auger Drill	Checked NG	Date:28/09/20
		Inclination	-90°		

Drilling					Sampling		Field Material Description				
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY
AD/T	-	GWNE	0					-	FILL: Gravelly CLAY; low to medium plasticity, brown, with sub-angular to angular gravel, minor shale and sandstone fragments, no odour.	D	-
			3	3.00				-	FILL: Silty CLAY; low to medium plasticity, brown-light grey, with minor shale fragments, no odour.	D	-
			4	4.50				-	SHALE; very low strength, pale brown, extremely weathered, no odour.	D	-
			5	5.50					From 5.5 m, low strength, no odour.		
			7	7.20					From 7.2 m, medium strength, no odour.		
			9	9.60					Borehole Terminated at 9.60 mBGL; Target Depth Reached.		
			10								

PIEZOMETER DETAILS
ID Static Water Level
BH201M



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

EIA LIB 1.03.GLB Log IS AU BOREHOLE 3 E24445.E17 BOREHOLE LOGS.GPJ <<DrawingFile>> 28/09/2020 13:31 10.0.000 Datgel Lab and In Situ Tool - DGD | Lib: EIA 1.03 2014-07-05 Prj: EIA 1.03 2014-07-05

BOREHOLE: BH202M

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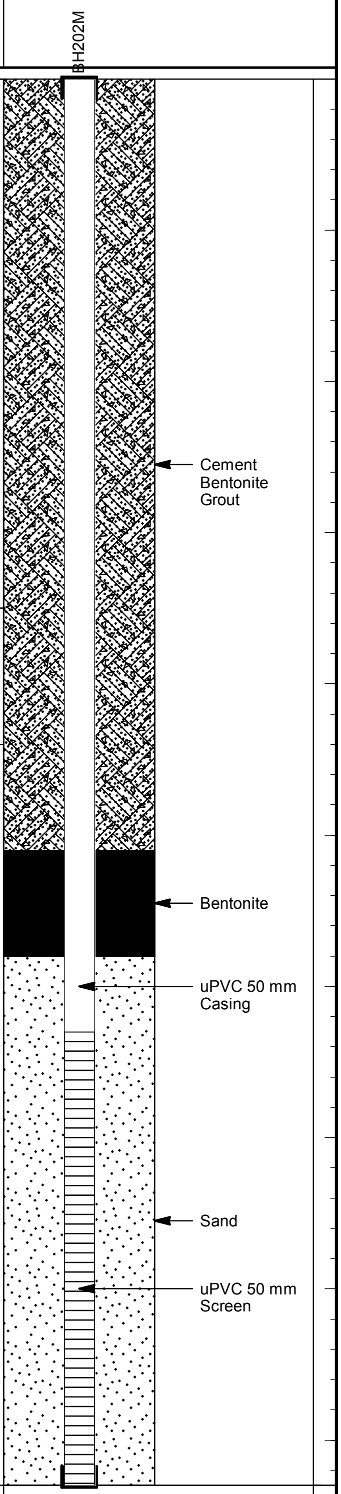
Project	Additional Groundwater Investigation			Sheet	1 OF 1
Location	Tallawong Station Precinct South, Rouse Hill NSW			Date Started	16/9/20
Position	Refer to Figure 2			Date Completed	16/9/20
Job No.	E24445.E17	Contractor	Geosense Drilling Rig	Logged LW	Date:16/9/20
Client	Deicorp Pty Ltd	Drill Rig	Auger Drill	Checked NG	Date:28/09/20
		Inclination	-90°		

Drilling					Sampling		Field Material Description				
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY
AD/T	-	GWNE	0					-	FILL: Gravelly CLAY; low to medium plasticity, brown, with sub-angular to angular gravel, minor shale and sandstone fragments, no odour.	D	-
				3.50				-	FILL: Silty CLAY; low to medium plasticity, brown-light grey, with minor shale fragments, no odour.	D	-
				4.40				-	SHALE; very low strength, pale brown, extremely weathered, no odour.	D	-
				5.40					From 5.4 m, low strength, no odour.		
				7.20					From 7.2 m, medium strength, no odour.		
				9.30					Borehole Terminated at 9.30 mBGL; Refusal on Shale.		
			10								

PIEZOMETER DETAILS
ID Static Water Level
BH202M



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

EIA LIB 1.03.GLB Log IS AU BOREHOLE 3 E24445.E17 BOREHOLE LOGS.GPJ <<DrawingFile>> 28/09/2020 13:31 10.0.000 Datgel Lab and In Situ Tool - DGD | Lib: EIA 1.03 2014-07-05 Prj: EIA 1.03 2014-07-05

BOREHOLE: BH203M

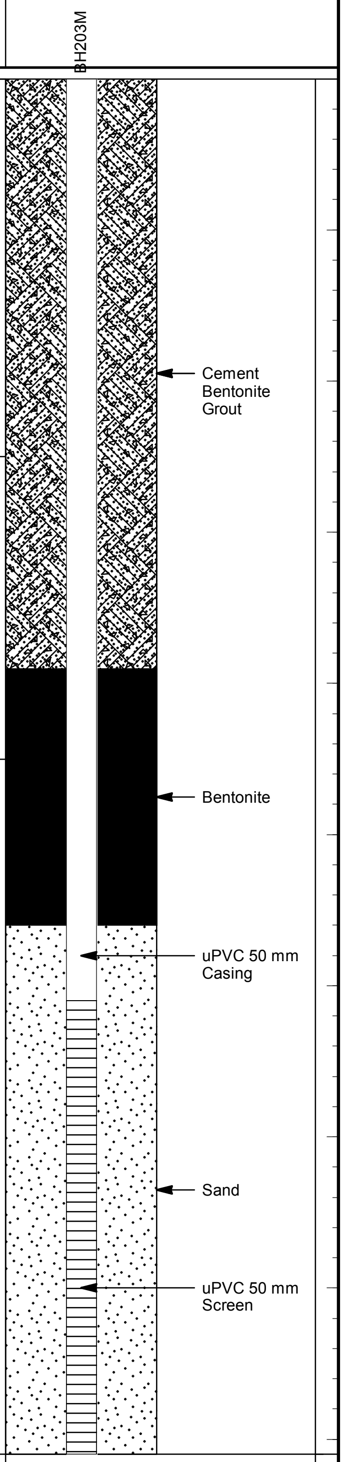
Project	Additional Groundwater Investigation			Sheet	1 OF 1
Location	Tallawong Station Precinct South, Rouse Hill NSW			Date Started	16/9/20
Position	Refer to Figure 2			Date Completed	16/9/20
Job No.	E24445.E17	Contractor	Geosense Drilling Rig	Logged LW	Date:16/9/20
Client	Deicorp Pty Ltd	Drill Rig	Auger Drill	Checked NG	Date:28/09/20
		Inclination	-90°		

Drilling					Sampling		Field Material Description				
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY
AD/T	-	GWNE	0				▨	-	FILL: Gravelly CLAY; low to medium plasticity, brown, with sub-angular to angular gravel, minor shale and sandstone fragments, no odour.	D	-
				2.50			▨	-	FILL: Silty CLAY; medium plasticity, orange-grey, with minor shale fragments, no odour.	D	-
				4.50			☰	-	SHALE; very low strength, pale brown, extremely weathered, no odour.	D	-
				5.60			☰		From 5.6 m, low strength, no odour.		
				7.10			☰		From 7.1 m, medium strength, no odour.		
				9.10					Borehole Terminated at 9.10 mBGL; Refusal on Shale.		
			10								

PIEZOMETER DETAILS

ID Static Water Level

BH203M



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

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

DRILLING/EXCAVATION METHOD

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 (%)

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

RQD = Rock Quality Designation (%)

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

MATERIAL BOUNDARIES

———— = inferred boundary

- - - - - - - - = probable boundary

— ?— ?— ?— ?— ? = possible boundary

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METHOD OF SOIL DESCRIPTION USED ON BOREHOLE AND TEST PIT LOGS

▩	FILL	ѱ	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		

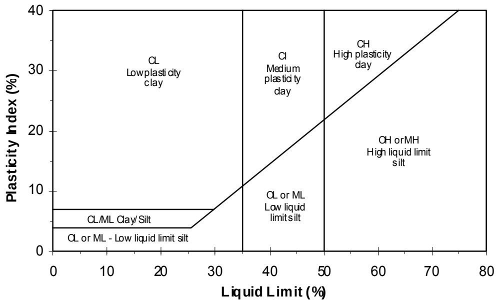
CLASSIFICATION AND INFERRED STRATIGRAPHY

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 >2.36mm	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 <2.36mm	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%

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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	J	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	B	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	X	Repetitive planar structure parallel to the shear direction or perpendicular to the direction of higher pressure, especially in metamorphic rock, e.g. Schistosity (S) and Gneissosity.
Contact	C	The surface between two types or ages of rock.
Cleavage	L	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 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/IZ	Seam of soil substance, usually clay or clayey, with very distinct roughly parallel boundaries, formed by soil migrating into joint or open cavity.
Schistocity	S	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	V	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	Po	Shiny smooth surface
Curved	Cu	Gradual change in orientation	Slickensided	Sl	Grooved or striated surface, usually polished
Undulating	Un	Wavy surface	Smooth	Sm	Smooth to touch. Few or no surface irregularities
Stepped	St	One or more well defined steps	Rough	Ro	Many small surface irregularities (amplitude generally <1mm). Feels like fine to coarse sandpaper
Irregular	Irr	Many sharp changes in orientation	Very Rough	VRo	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	Vr	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	
Open	O	Without Infill
Infilled	-	Soil or rock i.e. clay, talc, pyrite, quartz, etc.

Appendix E– Field Data Sheets

WATER SAMPLING FIELD SHEET

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Site Address:	Tallawong station precinct	Job Number:	E24445
Client:	Deicorp	Date:	22/9/20
Field Staff:	LW	Sampling Location ID	BH201M
Well Location:		Round No:	1

MEDIUM ☒Groundwater ☐Surface Water ☐Stormwater ☐Other:

SAMPLING POINT INFO

Well Installation Date:	16/9/20	[✓ Stick up] / down (m):	+1.0 (+ above ground - below ground)
Initial Well Depth (mBTOC):	10.6	Screen Interval (mBTOC):	7.6 – 10.6
Previous Sampling Date:		Previous SWL (mBTOC):	

PID READINGS

PID Headspace (ppm):		PID Background (ppm):	
PID Breathing Space (ppm):			

PRE PURGE

Total Well Depth (mBTOC):	10.6	Well Head Condition:	Good
SWL (mBTOC):	8.2	Water Column (m):	2.4

PHASE SEPARATED HYDROCARBONS (PSH)

Depth to PSH (mBTOC):		PSH Visually Confirmed (Bailer):	
PSH Thickness (mm):			

PURGE AND SAMPLE

Sampling Method ☒Bladder ☐Peristaltic ☐Submersible ☐Other:

Depth of Pump Inlet (mBTOC):	8.9	Fill Timer:	10
Pump Pressure Regulator (psi):	50	Discharge Timer:	5
Weather Conditions:	fine	Cycle:	cpm4
Pump on time:	9:40	Pump off time:	10:15

WATER QUALITY PARAMETERS

Probe Make and Model:		Bump Test Date and Time:	

Time	Volume (L)	SWL (mbtoc)	Temp (°C)	EC (µS/cm)	Redox (mV)	DO (mg/L)	pH (units)	Comments (colour, turbidity, odour, sheen etc.)
9:55	0.5	8.4	25.68	671	34.3	1.92	7.06	dark grey, high
9:57	1	8.6	26.27	629	22.7	1.82	6.91	no, no.
9:59	1.5	8.7	27.01	729	19.4	1.77	6.78	
10:01	2	8.8	27.63	801	19.2	1.65	6.75	
Stabilisation range: 3 consecutive readings			±0.2°C	±3%	±20mV	±10%	±0.2	

OTHER COMMENTS/OBSERVATIONS:

Silted at the bottom, adjusted pump inlet ~~twice~~.

SIGNATURE:

WATER SAMPLING FIELD SHEET

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Site Address: Tallawong Station Precinct	Job Number: E24445
Client: Devcorp	Date: 22/9/20
Field Staff: LW	Sampling Location ID BH202M
Well Location:	Round No: 1

MEDIUM ☒Groundwater ☐Surface Water ☐Stormwater ☐Other:

SAMPLING POINT INFO

Well Installation Date: 16/9/20	[✓ Stick up] / down (m): +1.0 (+ above ground - below ground)
Initial Well Depth (mBTOC): 10.3	Screen Interval (mBTOC): 7.3 – 10.3
Previous Sampling Date:	Previous SWL (mBTOC):

PID READINGS

PID Headspace (ppm):	PID Background (ppm):
PID Breathing Space (ppm):	

PRE PURGE

Total Well Depth (mBTOC): 10.3	Well Head Condition: Good
SWL (mBTOC): 7.5	Water Column (m): ~~[illegible]~~ 2.8

PHASE SEPARATED HYDROCARBONS (PSH)

Depth to PSH (mBTOC): Ø	PSH Visually Confirmed (Bailer):
PSH Thickness (mm): Ø	

PURGE AND SAMPLE

Sampling Method ☒Bladder ☐Peristaltic ☐Submersible ☐Other:

Depth of Pump Inlet (mBTOC): ~~8~~ 8.2	Fill Timer: 10
Pump Pressure Regulator (psi): 50	Discharge Timer: 5
Weather Conditions: fine	Cycle: CPM 4
Pump on time: 10:30	Pump off time: 10:55

WATER QUALITY PARAMETERS

Probe Make and Model:	Bump Test Date and Time:

Time	Volume (L)	SWL (mbtoc)	Temp (°C)	EC (µS/cm)	Redox (mV)	DO (mg/L)	pH (units)	Comments (colour, turbidity, odour, sheen etc.)
10:35	0.5	7.7	22.73	9977	4.8	1.52	7.96	~~dar~~ grey to dark grey,
10:37	1	7.9	22.06	10508	5.5	1.22	7.22	m-h turbidity,
10:39	1.5	8.2	22.07	13571	6.1	1.32	7.20	no, no
10:41	2	8.5	22.27	15682	7.2	1.05	7.19	
10:43	2.5	8.7	22.36	17038	12.1	1.02	7.12	
Stabilisation range: 3 consecutive readings			±0.2°C	±3%	±20mV	±10%	±0.2	

OTHER COMMENTS/OBSERVATIONS:

SIGNATURE: Lower

WATER SAMPLING FIELD SHEET

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Site Address:	Tallawong Station precinct	Job Number:	E24445
Client:	Deicorp	Date:	22/9/20
Field Staff:	LW	Sampling Location ID	BH203M
Well Location:		Round No:	1

MEDIUM ☒Groundwater ☐Surface Water ☐Stormwater ☐Other:

SAMPLING POINT INFO

Well Installation Date:	16/9/20	[✓ Stick up] / down (m):	+1.0 (+ above ground - below ground)
Initial Well Depth (mBTOC):	10.1	Screen Interval (mBTOC):	7.1 – 10.1
Previous Sampling Date:		Previous SWL (mBTOC):	

PID READINGS

PID Headspace (ppm):		PID Background (ppm):	
PID Breathing Space (ppm):			

PRE PURGE

Total Well Depth (mBTOC):	10.1	Well Head Condition:	Good
SWL (mBTOC):	7.8	Water Column (m):	2.3

PHASE SEPARATED HYDROCARBONS (PSH)

Depth to PSH (mBTOC):		PSH Visually Confirmed (Bailer):	
PSH Thickness (mm):			

PURGE AND SAMPLE

Sampling Method ☒Bladder ☐Peristaltic ☐Submersible ☐Other:

Depth of Pump Inlet (mBTOC):	9.0	Fill Timer:	10
Pump Pressure Regulator (psi):	50	Discharge Timer:	5
Weather Conditions:	fine	Cycle:	CPM 4
Pump on time:	11:10	Pump off time:	11:55

WATER QUALITY PARAMETERS

Probe Make and Model:

Bump Test Date and Time:

Time	Volume (L)	SWL (mbtoc)	Temp (°C)	EC (µS/cm)	Redox (mV)	DO (mg/L)	pH (units)	Comments (colour, turbidity, odour, sheen etc.)
11:25	0.5	7.9	22.65	6902	13.4	1.37	8.77	grey to dark grey,
11:27	1	8.1	22.75	7028	12.8	1.43	8.65	m-h turbidity,
11:29	1.5	8.2	22.95	8241	14.2	1.27	8.21	no, no.
11:31	2	8.4	22.90	9097	10.8	1.17	7.95	
11:33	2.5	8.5	23.01	1078	9.7	0.98	7.89	
11:35	3	8.6	23.03	1101	9.5	0.88	7.76	
Stabilisation range: 3 consecutive readings			±0.2°C	±3%	±20mV	±10%	±0.2	

OTHER COMMENTS/OBSERVATIONS:

slightly silted at the bottom.

SIGNATURE:

WATER SAMPLING FIELD SHEET

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Site Address: Tallawong station precinct	Job Number: E24495
Client: Dei corp	Date: 22/9/20.
Field Staff: W	Sampling Location ID BH1M
Well Location:	Round No: 2

MEDIUM ☒Groundwater ☐Surface Water ☐Stormwater ☐Other:

SAMPLING POINT INFO

Well Installation Date: 22/1/20	[✓ Stick up] / down (m): +1.0 (+ above ground - below ground)
Initial Well Depth (mBTOC): 8.1	Screen Interval (mBTOC): 5.1-8.1
Previous Sampling Date: 26/2/20	Previous SWL (mBTOC): 7.8

PID READINGS

PID Headspace (ppm):	PID Background (ppm):
PID Breathing Space (ppm):	

PRE PURGE

Total Well Depth (mBTOC): 8.1	Well Head Condition: good.
SWL (mBTOC): 7.96.	Water Column (m): 0.14

PHASE SEPARATED HYDROCARBONS (PSH)

Depth to PSH (mBTOC):	PSH Visually Confirmed (Bailer):
PSH Thickness (mm):	

PURGE AND SAMPLE

Sampling Method ☐Bladder ☐Peristaltic ☐Submersible ☒Other: bailer

Depth of Pump Inlet (mBTOC):	Fill Timer:
Pump Pressure Regulator (psi):	Discharge Timer:
Weather Conditions:	Cycle:
Pump on time:	Pump off time:

WATER QUALITY PARAMETERS

Probe Make and Model:	Bump Test Date and Time:

Time	Volume (L)	SWL (mbtoc)	Temp (°C)	EC (µS/cm)	Redox (mV)	DO (mg/L)	pH (units)	Comments (colour, turbidity, odour, sheen etc.)
								dark grey, high.
								no, no.
Stabilisation range: **3 consecutive readings**			±0.2°C	±3%	±20mV	±10%	±0.2	

OTHER COMMENTS/OBSERVATIONS:

Insufficient water, ~~took~~ one vial sample.

SIGNATURE:

WATER SAMPLING FIELD SHEET

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Site Address: Tallawong station precinct	Job Number: E24445
Client: Deicorp	Date: 22/9/20
Field Staff: IW.	Sampling Location ID BH2M
Well Location:	Round No: 2

MEDIUM ☒Groundwater ☐Surface Water ☐Stormwater ☐Other:

SAMPLING POINT INFO	
Well Installation Date: 22/1/20	[✓ Stick up] / down (m): +0.92 (+ above ground - below ground)
Initial Well Depth (mBTOC): 8.92	Screen Interval (mBTOC): 5.92-8.92
Previous Sampling Date: 26/2/20	Previous SWL (mBTOC): 7.5

PID READINGS	
PID Headspace (ppm):	PID Background (ppm):
PID Breathing Space (ppm):	

PRE PURGE	Stick up: +0.85
Total Well Depth (mBTOC): ~~[illegible]~~ 9.0	Well Head Condition: Good
SWL (mBTOC): 8.2	Water Column (m): 0.8

PHASE SEPARATED HYDROCARBONS (PSH)	
Depth to PSH (mBTOC):	PSH Visually Confirmed (Bailer):
PSH Thickness (mm):	

PURGE AND SAMPLE

Sampling Method ☒Bladder ☐Peristaltic ☐Submersible ☒Other: bailer.

Depth of Pump Inlet (mBTOC):	Fill Timer:
Pump Pressure Regulator (psi):	Discharge Timer:
Weather Conditions:	Cycle:
Pump on time:	Pump off time:

WATER QUALITY PARAMETERS

Probe Make and Model:	Bump Test Date and Time:

Time	Volume (L)	SWL (mbtoc)	Temp (°C)	EC (µS/cm)	Redox (mV)	DO (mg/L)	pH (units)	Comments (colour, turbidity, odour, sheen etc.)
			22.37	32310	203	1.02	6.48	grey to dark grey with
								no, no.
Stabilisation range: 3 consecutive readings			±0.2°C	±3%	±20mV	±10%	±0.2	

OTHER COMMENTS/OBSERVATIONS:

GWQD1 / GWQT1 taken

SIGNATURE:

WATER SAMPLING FIELD SHEET

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Site Address: Tallawong station precinct
Job Number: E24445
Client: Deicorp
Date: 22/9/20
Field Staff: W.
Sampling Location ID BH3M
Well Location:
Round No: 2

MEDIUM ☒Groundwater ☐Surface Water ☐Stormwater ☐Other:

SAMPLING POINT INFO

Well Installation Date: 23/1/20
[✓ Stick up]/ down (m): +0.7 (+ above ground - below ground)
Initial Well Depth (mBTOC): 10.7
Screen Interval (mBTOC): 7.7 - 10.7
Previous Sampling Date: 26/2/20
Previous SWL (mBTOC): 9.3

PID READINGS

PID Headspace (ppm):
PID Background (ppm):
PID Breathing Space (ppm):

PRE PURGE

Total Well Depth (mBTOC): 9.77
Well Head Condition: Good.
SWL (mBTOC): 9.57
Water Column (m): 0.2

PHASE SEPARATED HYDROCARBONS (PSH)

Depth to PSH (mBTOC):
PSH Visually Confirmed (Bailer):
PSH Thickness (mm):

PURGE AND SAMPLE

Sampling Method ☐Bladder ☐Peristaltic ☐Submersible ☒Other: bailer
Depth of Pump Inlet (mBTOC):
Fill Timer:
Pump Pressure Regulator (psi):
Discharge Timer:
Weather Conditions:
Cycle:
Pump on time:
Pump off time:

WATER QUALITY PARAMETERS

Probe Make and Model:
Bump Test Date and Time:

Time	Volume (L)	SWL (mbtoc)	Temp (°C)	EC (µS/cm)	Redox (mV)	DO (mg/L)	pH (units)	Comments (colour, turbidity, odour, sheen etc.)
								grey
								~~[illegible]~~ m-h turbidity
								no, no.
Stabilisation range: 3 consecutive readings			±0.2°C	±3%	±20mV	±10%	±0.2	

OTHER COMMENTS/OBSERVATIONS:

insufficient water, took one vial sample.

SIGNATURE:

Appendix F– Chain of Custody and Sample Receipt Forms

Sheet 1 of 1

Site: Tallawong Station, Rouse Hill

Project No: ~~E24446.E9~~ E24445.E17

Laboratory:

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

Sample Matrix | Analysis

Sample ID	Laboratory ID	Container Type	Sampling Date	Sampling Time	WATER	SOIL	OTHERS (i.e. Fibro, Paint, etc.)	HM Δ /TRH/BTEX/PAHs OCP/OP/PCB/Asbestos	HM Δ /TRH/BTEX/PAHs	[illegible]/TRH/BTEX	BTEX	VOCs	Asbestos	Asbestos Quantification	pH / CEC (cation exchange)	pH / EC (electrical conductivity)	Dewatering Suite	sPOCAS	PFAS	Total Phenols			TCLP HM B / PAH
BH1M-2	1	VC	22/9/20	AM/PM	✓					X		X								X			
BH2M-2	2	S, 2xVC								X		X								X			
BH3M-2	3	VC								X		X								X			
BH201M-1	4	S, 2xVC								X		X								X			
BH202M-1	5									X		X								X			
BH203M-1	6									X		X								X			
GWQD2	7									X													
GWQR2	8									X													
GWQRB2		↓	↓	↓																			
GWTB2	9	VC	LAB PREP								X												
GWTS2	10	VC			↓						X												

SGS EHS Sydney COC
SE211520

Comments

HM A
Arsenic
Cadmium
Chromium
Copper
Lead
Mercury
Nickel
Zinc

HM B
Arsenic
Cadmium
Chromium
Lead
Mercury
Nickel

Dewatering Suite
pH & EC
TDS / Turbidity NTU
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______

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

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): Li Wei
Print: Nicholas Grbich
Signature:
Date: 23-9-20

Received by (SGS):
Print: George Zhu
Signature:
Date: 23/9/20 @ 3:10pm

Sampler's Comments: For samples BH1M-2 and BH3M-2, there may be insufficient sample to complete all requested analytes, if so, please prioritise VOCs

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

eiaustralia
Contamination | Remediation | Geotechnical

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

COC March 2018 FORM v.4 - SGS

SAMPLE RECEIPT ADVICE

SE211520

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	**E24445.E17 Tallawong Station, Rouse Hill**
Order Number	**E24445.E17**
Samples	10

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 23/9/2020
Report Due	Mon 28/9/2020
SGS Reference	**SE211520**

SUBMISSION DETAILS

This is to confirm that 10 samples were received on Wednesday 23/9/2020. Results are expected to be ready by COB Monday 28/9/2020. Please quote SGS reference SE211520 when making enquiries. Refer below for details relating to sample integrity upon receipt.

Samples clearly labelled	Yes	Complete documentation received	Yes
Sample container provider	SGS	Sample cooling method	Ice Bricks
Samples received in correct containers	Yes	Sample counts by matrix	10 Water
Date documentation received	23/9/2020	Type of documentation received	COC
Samples received in good order	Yes	Samples received without headspace	Yes
Sample temperature upon receipt	15°C	Sufficient sample for analysis	Yes
Turnaround time requested	Three Days		

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

1 sample has been placed on hold as no tests have been assigned for it. This sample will not be processed.

SAMPLE RECEIPT ADVICE

CLIENT DETAILS

Client **EI AUSTRALIA**

Project E24445.E17 Tallawong Station, Rouse Hill

SUMMARY OF ANALYSIS

No.	Sample ID	Total Phenolics in Water	TRH (Total Recoverable Hydrocarbons) in Water	VOCs in Water	Volatile Petroleum Hydrocarbons in Water
001	BH1M-2	1	9	78	7
002	BH2M-2	1	9	78	7
003	BH3M-2	1	9	78	7
004	BH201M-1	1	9	78	7
005	BH202M-1	1	9	78	7
006	BH203M-1	1	9	78	7
007	GWQD2	-	9	11	7
008	GWQR2	-	9	11	7
009	GWTB2	-	-	11	-
010	GWTS2	-	-	11	-

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 .

TRH (Total Recoverable Hydrocarbons) in Water [AN403] Tested: 24/9/2020

			BH1M-2	BH2M-2	BH3M-2	BH201M-1	BH202M-1
			WATER	WATER	WATER	WATER	WATER
			-	-	-	-	-
			22/9/2020	22/9/2020	22/9/2020	22/9/2020	22/9/2020
PARAMETER	UOM	LOR	SE211520.001	SE211520.002	SE211520.003	SE211520.004	SE211520.005
TRH C10-C14	µg/L	50	IS	**11000**	<100↑	**540**	<50
TRH C15-C28	µg/L	200	IS	**7700**	**780**	**1800**	**200**
TRH C29-C36	µg/L	200	IS	**6600**	**410**	**550**	<200
TRH C37-C40	µg/L	200	IS	**1700**	<400↑	<200	<200
TRH >C10-C16	µg/L	60	IS	**11000**	<120↑	**720**	<60
TRH >C10-C16 - Naphthalene (F2)	µg/L	60	IS	**11000**	<120↑	**720**	<60
TRH >C16-C34 (F3)	µg/L	500	IS	**12000**	**1100**	**2100**	<500
TRH >C34-C40 (F4)	µg/L	500	IS	**3500**	<1000↑	<500	<500
TRH C10-C40	µg/L	320	IS	**27000**	**1200**	**2900**	<320

			BH203M-1	GWQD2	GWQR2
			WATER	WATER	WATER
			-	-	-
			22/9/2020	22/9/2020	22/9/2020
PARAMETER	UOM	LOR	SE211520.006	SE211520.007	SE211520.008
TRH C10-C14	µg/L	50	<50	**810**	<50
TRH C15-C28	µg/L	200	<200	**710**	**740**
TRH C29-C36	µg/L	200	<200	**680**	**1400**
TRH C37-C40	µg/L	200	<200	<200	<200
TRH >C10-C16	µg/L	60	<60	**840**	<60
TRH >C10-C16 - Naphthalene (F2)	µg/L	60	<60	**840**	<60
TRH >C16-C34 (F3)	µg/L	500	<500	**1200**	**1700**
TRH >C34-C40 (F4)	µg/L	500	<500	<500	**660**
TRH C10-C40	µg/L	320	<320	**2200**	**2200**

TRH repeat job, due 29/09
Email sent

Hi Emily -> Please book SE211520RE for TRH for
2, 4, 7, 8,

Thanks
He

SGS EHS Alexandria Laboratory
SE211520RE COC
Received: 28-Sep-2020

Yin, Emily (Sydney)

From:	AU.Environmental.Sydney (Sydney)
Sent:	Monday, 28 September 2020 6:35 PM
To:	Li Wei - EIAustralia
Cc:	Benjamin Aggar - EIAustralia; Nicholas Grbich - EIAustralia; AU.Environmental.Sydney (Sydney); AU.SampleReceipt.Sydney (Sydney)
Subject:	RE: [EXTERNAL] RE: Report Job SE211520, your reference E24445.E17 Tallawong Station, Rouse Hill, order number E24445.E17

Hi Li,

Please see below:

Kind Regards,

Huong Crawford
Environment, Health & Safety
Production Manager

SGS Australia Pty Ltd
Unit 16, 33 Maddox Street
Alexandria NSW 2015
Phone: +61 (0)2 8594 0403
Fax: + 61 (0)2 8594 0499
E-mail: Huong.Crawford@sgs.com
Web: www.au.sgs.com

View Your Results Online: engage.sgs.com

From: Li Wei - EIAustralia <li.wei@eiaustralia.com.au>
Sent: Monday, 28 September 2020 4:30 PM
To: AU.Environmental.Sydney (Sydney) <AU.Environmental.Sydney@sgs.com>; AU.SampleReceipt.Sydney (Sydney) <AU.SampleReceipt.Sydney@sgs.com>
Cc: Benjamin Aggar - EIAustralia <benjamin.aggar@eiaustralia.com.au>; Nicholas Grbich - EIAustralia <nicholas.grbich@eiaustralia.com.au>
Subject: [EXTERNAL] RE: Report Job SE211520, your reference E24445.E17 Tallawong Station, Rouse Hill, order number E24445.E17

Hi SGS,

For this job, can I schedule the following:

- Silica gel clean-up for samples BH2M-2, BH3M-2 and BH201M-1;- SE211520A has been book in for TPH silica gel due tomorrow.
- Filter samples BH2M-2, BH3M-2 and BH201M-1, then retest TRH-We can not filter the samples, against our procedure, has to be done as total but can repeat TRH for samples BH2M-2 and BH201M-1, not enough sample for BH3M-2 from the beginning- only 100 mL and 1 vial provided for TRH/BTEX/T-phenols (vial for BTEX, phenols needs 50 mL, TRH needs 80 mL as a minimum hence TRH LORs were raised as we only have ~50 mL)

SAMPLE RECEIPT ADVICE

SE211520RE

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	**E24445.E17 Tallawong Station, Rouse Hill**
Order Number	**E24445.E17**
Samples	10

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 28/9/2020
Report Due	Tue 29/9/2020
SGS Reference	**SE211520RE**

SUBMISSION DETAILS

This is to confirm that 10 samples were received on Monday 28/9/2020. Results are expected to be ready by COB Tuesday 29/9/2020. Please quote SGS reference SE211520RE when making enquiries. Refer below for details relating to sample integrity upon receipt.

Samples clearly labelled	Yes	Complete documentation received	Yes
Sample container provider	SGS	Sample cooling method	Ice Bricks
Samples received in correct containers	Yes	Sample counts by matrix	4 Water
Date documentation received	28/9/2020@4:30PM	Type of documentation received	Email
Samples received in good order	Yes	Samples received without headspace	Yes
Sample temperature upon receipt	15°C	Sufficient sample for analysis	Yes
Turnaround time requested	Standard		

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

1 sample has been placed on hold as no tests have been assigned for it. This sample will not be processed.

Yin, Emily (Sydney)

From:	Li Wei - EIAustralia <li.wei@eiaustralia.com.au>
Sent:	Monday, 28 September 2020 4:30 PM
To:	AU.Environmental.Sydney (Sydney); AU.SampleReceipt.Sydney (Sydney)
Cc:	Benjamin Aggar - EIAustralia; Nicholas Grbich - EIAustralia
Subject:	[EXTERNAL] RE: Report Job SE211520, your reference E24445.E17 Tallawong Station, Rouse Hill, order number E24445.E17
Attachments:	Report Job SE211520, your reference E24445.E17 Tallawong Station, Rouse Hill, order number E24445.E17; 251929.Excel.xlsx

*** WARNING: this message is from an EXTERNAL SENDER. Please be cautious, particularly with links and attachments. ***

SGS EHS Alexandria Laboratory
SE211520A COC
Received: 28-Sep-2020

Hi SGS,

For this job, can I schedule the following:

2✓ 3 4✓

- Silica gel clean-up for samples BH2M-2, BH3M-2 and BH201M-1;
- Filter samples BH2M-2, BH3M-2 and BH201M-1, then retest TRH.

In addition, can you please explain the following:
- confirm and valid the TRH results of GWQR2. It is the rinsate sample, using lab provided rinsate water and collected from clean and unused equipment;
- check the TRH results for GWQD2. This is the standard duplicate sample. I have attached the results from an inter-lab for the same duplicate sample we collected (results show TRH all below PQL);
- Can you also explain why the TRH PQL for sample BH3M is increased.

24 TAT and response ASAP please.

Best Regards

Li Wei
MEng. (Env), BSc.(Env)
Environmental Engineer
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

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Environmental | Geotechnical | Structural | Civil | Hazardous Materials

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

CLIENT DETAILS

Client	EI AUSTRALIA	Project	E24445.E17 Tallawong Station, Rouse Hill

SUMMARY OF ANALYSIS

No.	Sample ID	TRH (Total Recoverable Hydrocarbons) in Water
002	BH2M-2	9
004	BH201M-1	9
007	GWQD2	9
008	GWQR2	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 .

SAMPLE RECEIPT ADVICE

SE211520A

CLIENT DETAILS

Contact	Benjamin Aggar
Client	EI AUSTRALIA
Address	SUITE 6.01 55 MILLER STREET PYRMONT NSW 2009
Telephone	61 2 95160722
Facsimile	(Not specified)
Email	benjamin.aggar@eiaustralia.com.au
Project	**E24445.E17 Tallawong Station, Rouse Hill**
Order Number	**E24445.E17**
Samples	10

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 28/9/2020
Report Due	Tue 29/9/2020
SGS Reference	**SE211520A**

SUBMISSION DETAILS

This is to confirm that 10 samples were received on Monday 28/9/2020. Results are expected to be ready by COB Tuesday 29/9/2020. Please quote SGS reference SE211520A when making enquiries. Refer below for details relating to sample integrity upon receipt.

Samples clearly labelled	Yes	Complete documentation received	Yes
Sample container provider	SGS	Sample cooling method	Ice Bricks
Samples received in correct containers	Yes	Sample counts by matrix	3 Water
Date documentation received	28/9/2/020@4:30pm	Type of documentation received	Email
Samples received in good order	Yes	Samples received without headspace	Yes
Sample temperature upon receipt	15°C	Sufficient sample for analysis	Yes
Turnaround time requested	Next Day		

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

SE211520A

CLIENT DETAILS

Client	EI AUSTRALIA	Project	E24445.E17 Tallawong Station, Rouse Hill

SUMMARY OF ANALYSIS

No.	Sample ID	TRH Silica Gel (Total Recoverable
002	BH2M-2	9
003	BH3M-2	9
004	BH201M-1	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 .

Sheet 1 of 1

Site: Tallawong Station, Rouse Hill

Project No: E24445.E7

Laboratory:

Envirolab Services
12 Ashley Street,
CHATSWOOD NSW 2067
P: 02 9910 6200

Sample ID	Laboratory ID	Container Type	Sampling Date	Sampling Time	Sample Matrix: WATER	Sample Matrix: SOIL	Sample Matrix: OTHERS (i.e. Fibro, Paint, etc.)	Analysis: HM$^{\underline{A}}$ /TRH/BTEX/PAHs OCP/OP/PCB/Asbestos	HM$^{\underline{A}}$ /TRH/BTEX/PAHs	[redacted]/TRH/BTEX	BTEX	VOCs	Asbestos	Asbestos Quantification	pH / CEC (cation exchange)	pH / EC (electrical conductivity)	Dewatering Suite	sPOCAS	PFAS				TCLP HM$^{\underline{B}}$ / PAH
QT2	①	S, 2xVC	22-9-20	AM	✓					X													

ENVIROLAB GROUP
Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: (02) 9910 6200
Job No: 251929
Date Received: 23/09/2020.
Time Received: 16.35
Received By: RL
Temp: [✓ Cool]/Ambient
Cooling: Ice/[✓ Icepack]
Security: [✓ Intact]/Broken/None

Comments

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

HM$^{\underline{B}}$
Arsenic
Cadmium
Chromium
Lead
Mercury
Nickel

Dewatering Suite
pH & EC
TDS / Turbidity NTU
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______

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

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

Sampler's Name (EI): Li Wei.	Received by (Envirolab) Syd
Print Nicholas Wei	Print R Chazeen
Signature	Signature
Date 23-9-20	Date 23/09/2020. 16.35

Report with EI Waste Classification Table ☐

Sampler's Comments:

IMPORTANT: 11.4
Please e-mail laboratory results to: lab@eiaustralia.com.au

eiaustralia
Contamination | Remediation | Geotechnical

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

COC March 2018 FORM v.4 - SGS

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

SAMPLE RECEIPT ADVICE

Client Details

Client	EI Australia
Attention	Li Wei

Sample Login Details

Your reference	E24445.E17, Tullawong Station, Rouse Hill
Envirolab Reference	251929
Date Sample Received	23/09/2020
Date Instructions Received	23/09/2020
Date Results Expected to be Reported	28/09/2020

Sample Condition

Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	1 Water
Turnaround Time Requested	3 days
Temperature on Receipt (°C)	11.4
Cooling Method	Ice Pack
Sampling Date Provided	YES

Comments

Nil

Please direct any queries to:

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

Analysis Underway, details on the following page:

Sample ID	vTRH(C6-C10)/BTEXN in Water	svTRH (C10-C40) in Water
GWQT2	✓	✓

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

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

Appendix G– Laboratory Analytical Reports

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	**E24445.E17 Tallawong Station, Rouse Hill**
Order Number	**E24445.E17**
Samples	10

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	**SE211520 R1**
Date Received	23/9/2020
Date Reported	29/9/2020

COMMENTS

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

This report cancels and supersedes the report No.SE211520 R0 dated 28/09/20 issued by SGS Environment, Health and Safety due to amended TRH results for #8- rinsate sample following re -analysis.

Sample #1: Insufficient sample was provided for TRH/T-phenols analysis- only 1 vial was given.

TRH - sample # 3, The Limit of Reporting (LOR) has been raised due to limited sample used.

SIGNATORIES

Ly Kim HA
Organic Section Head

Shane MCDERMOTT
Inorganic/Metals Chemist

VOCs in Water [AN433] Tested: 24/9/2020

			BH1M-2	BH2M-2	BH3M-2	BH201M-1	BH202M-1
			WATER - 22/9/2020	WATER - 22/9/2020	WATER - 22/9/2020	WATER - 22/9/2020	WATER - 22/9/2020
PARAMETER	**UOM**	**LOR**	**SE211520.001**	**SE211520.002**	**SE211520.003**	**SE211520.004**	**SE211520.005**
Benzene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Toluene	µg/L	0.5	<0.5	<0.5	<0.5	**0.8**	<0.5
Ethylbenzene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
m/p-xylene	µg/L	1	<1	<1	<1	<1	<1
o-xylene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Total Xylenes	µg/L	1.5	<1.5	<1.5	<1.5	<1.5	<1.5
Total BTEX	µg/L	3	<3	<3	<3	<3	<3
Naphthalene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dichlorodifluoromethane (CFC-12)	µg/L	5	<5	<5	<5	<5	<5
Chloromethane	µg/L	5	<5	<5	<5	<5	<5
Vinyl chloride (Chloroethene)	µg/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Bromomethane	µg/L	10	<10	<10	<10	<10	<10
Chloroethane	µg/L	5	<5	<5	<5	<5	<5
Trichlorofluoromethane	µg/L	1	<1	<1	<1	<1	<1
Acetone (2-propanone)	µg/L	10	<10	<10	<10	<10	<10
Iodomethane	µg/L	5	<5	<5	<5	<5	<5
1,1-dichloroethene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Acrylonitrile	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dichloromethane (Methylene chloride)	µg/L	5	<5	<5	<5	<5	<5
Allyl chloride	µg/L	2	<2	<2	<2	<2	<2
Carbon disulfide	µg/L	2	<2	<2	<2	<2	<2
trans-1,2-dichloroethene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
MtBE (Methyl-tert-butyl ether)	µg/L	2	<2	<2	<2	<2	<2
1,1-dichloroethane	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Vinyl acetate	µg/L	10	<10	<10	<10	<10	<10
MEK (2-butanone)	µg/L	10	<10	<10	<10	<10	<10
cis-1,2-dichloroethene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Bromochloromethane	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chloroform (THM)	µg/L	0.5	<0.5	**2.8**	<0.5	**12**	**9.9**
2,2-dichloropropane	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,2-dichloroethane	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,1,1-trichloroethane	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,1-dichloropropene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Carbon tetrachloride	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dibromomethane	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,2-dichloropropane	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trichloroethene (Trichloroethylene,TCE)	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2-nitropropane	µg/L	100	<100	<100	<100	<100	<100
Bromodichloromethane (THM)	µg/L	0.5	<0.5	<0.5	<0.5	**1.2**	**1.6**
MIBK (4-methyl-2-pentanone)	µg/L	5	<5	<5	<5	<5	<5
cis-1,3-dichloropropene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
trans-1,3-dichloropropene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,1,2-trichloroethane	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,3-dichloropropane	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dibromochloromethane (THM)	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2-hexanone (MBK)	µg/L	5	<5	<5	<5	<5	<5
1,2-dibromoethane (EDB)	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Tetrachloroethene (Perchloroethylene,PCE)	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,1,1,2-tetrachloroethane	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chlorobenzene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Bromoform (THM)	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
cis-1,4-dichloro-2-butene	µg/L	1	<1	<1	<1	<1	<1
Styrene (Vinyl benzene)	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,1,2,2-tetrachloroethane	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,2,3-trichloropropane	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
trans-1,4-dichloro-2-butene	µg/L	1	<1	<1	<1	<1	<1

VOCs in Water [AN433] Tested: 24/9/2020 (continued)

PARAMETER	UOM	LOR	BH1M-2 WATER - 22/9/2020 SE211520.001	BH2M-2 WATER - 22/9/2020 SE211520.002	BH3M-2 WATER - 22/9/2020 SE211520.003	BH201M-1 WATER - 22/9/2020 SE211520.004	BH202M-1 WATER - 22/9/2020 SE211520.005
Isopropylbenzene (Cumene)	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Bromobenzene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
n-propylbenzene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2-chlorotoluene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
4-chlorotoluene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,3,5-trimethylbenzene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
tert-butylbenzene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,2,4-trimethylbenzene	µg/L	0.5	**0.5**	<0.5	<0.5	<0.5	<0.5
sec-butylbenzene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,3-dichlorobenzene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,4-dichlorobenzene	µg/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3
p-isopropyltoluene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,2-dichlorobenzene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
n-butylbenzene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,2-dibromo-3-chloropropane	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,2,4-trichlorobenzene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Hexachlorobutadiene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,2,3-trichlorobenzene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Total VOC	µg/L	10	<10	<10	<10	**15**	**13**

VOCs in Water [AN433] Tested: 24/9/2020 (continued)

PARAMETER	UOM	LOR	BH203M-1 WATER - 22/9/2020 SE211520.006	GWQD2 WATER - 22/9/2020 SE211520.007	GWQR2 WATER - 22/9/2020 SE211520.008	GWTB2 WATER - 22/9/2020 SE211520.009	GWTS2 WATER - 22/9/2020 SE211520.010
Benzene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	[104%]
Toluene	µg/L	0.5	**2.1**	<0.5	<0.5	<0.5	[104%]
Ethylbenzene	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	[102%]
m/p-xylene	µg/L	1	<1	<1	<1	<1	[101%]
o-xylene	µg/L	0.5	**1.5**	<0.5	<0.5	<0.5	[102%]
Total Xylenes	µg/L	1.5	<1.5	<1.5	<1.5	<1.5	-
Total BTEX	µg/L	3	**4**	<3	<3	<3	-
Naphthalene	µg/L	0.5	<0.5	<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	**18**	-	-	-	-
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	**2.3**	-	-	-	-
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	-	-	-	-
cis-1,4-dichloro-2-butene	µg/L	1	<1	-	-	-	-
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	-	-	-	-

VOCs in Water [AN433] Tested: 24/9/2020 (continued)

			BH203M-1	**GWQD2**	**GWQR2**	**GWTB2**	**GWTS2**
			WATER	WATER	WATER	WATER	WATER
			-	-	-	-	-
			22/9/2020	22/9/2020	22/9/2020	22/9/2020	22/9/2020
PARAMETER	**UOM**	**LOR**	**SE211520.006**	**SE211520.007**	**SE211520.008**	**SE211520.009**	**SE211520.010**
Isopropylbenzene (Cumene)	µg/L	0.5	<0.5	-	-	-	-
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	**25**	-	-	-	-

Volatile Petroleum Hydrocarbons in Water [AN433] Tested: 24/9/2020

PARAMETER	UOM	LOR	BH1M-2 WATER - 22/9/2020 SE211520.001	BH2M-2 WATER - 22/9/2020 SE211520.002	BH3M-2 WATER - 22/9/2020 SE211520.003	BH201M-1 WATER - 22/9/2020 SE211520.004	BH202M-1 WATER - 22/9/2020 SE211520.005
TRH C6-C9	µg/L	40	<40	<40	<40	<40	<40
Benzene (F0)	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
TRH C6-C10	µg/L	50	<50	<50	<50	<50	<50
TRH C6-C10 minus BTEX (F1)	µg/L	50	<50	<50	<50	<50	<50

PARAMETER	UOM	LOR	BH203M-1 WATER - 22/9/2020 SE211520.006	GWQD2 WATER - 22/9/2020 SE211520.007	GWQR2 WATER - 22/9/2020 SE211520.008
TRH C6-C9	µg/L	40	<40	<40	<40
Benzene (F0)	µg/L	0.5	<0.5	<0.5	<0.5
TRH C6-C10	µg/L	50	<50	<50	<50
TRH C6-C10 minus BTEX (F1)	µg/L	50	<50	<50	<50

TRH (Total Recoverable Hydrocarbons) in Water [AN403] Tested: 24/9/2020

			BH1M-2	BH2M-2	BH3M-2	BH201M-1	BH202M-1
			WATER	WATER	WATER	WATER	WATER
			-	-	-	-	-
			22/9/2020	22/9/2020	22/9/2020	22/9/2020	22/9/2020
PARAMETER	**UOM**	**LOR**	**SE211520.001**	**SE211520.002**	**SE211520.003**	**SE211520.004**	**SE211520.005**
TRH C10-C14	µg/L	50	IS	11000	<100↑	540	<50
TRH C15-C28	µg/L	200	IS	7700	780	1800	200
TRH C29-C36	µg/L	200	IS	6600	410	550	<200
TRH C37-C40	µg/L	200	IS	1700	<400↑	<200	<200
TRH >C10-C16	µg/L	60	IS	11000	<120↑	720	<60
TRH >C10-C16 - Naphthalene (F2)	µg/L	60	IS	11000	<120↑	720	<60
TRH >C16-C34 (F3)	µg/L	500	IS	12000	1100	2100	<500
TRH >C34-C40 (F4)	µg/L	500	IS	3500	<1000↑	<500	<500
TRH C10-C40	µg/L	320	IS	27000	1200	2900	<320

			BH203M-1	GWQD2	GWQR2
			WATER	WATER	WATER
			-	-	-
			22/9/2020	22/9/2020	22/9/2020
PARAMETER	**UOM**	**LOR**	**SE211520.006**	**SE211520.007**	**SE211520.008**
TRH C10-C14	µg/L	50	<50	810	<50
TRH C15-C28	µg/L	200	<200	710	<200
TRH C29-C36	µg/L	200	<200	680	<200
TRH C37-C40	µg/L	200	<200	<200	<200
TRH >C10-C16	µg/L	60	<60	840	<60
TRH >C10-C16 - Naphthalene (F2)	µg/L	60	<60	840	<60
TRH >C16-C34 (F3)	µg/L	500	<500	1200	<500
TRH >C34-C40 (F4)	µg/L	500	<500	<500	<500
TRH C10-C40	µg/L	320	<320	2200	<320

Total Phenolics in Water [AN289] Tested: 25/9/2020

			BH1M-2 WATER - 22/9/2020	BH2M-2 WATER - 22/9/2020	BH3M-2 WATER - 22/9/2020	BH201M-1 WATER - 22/9/2020	BH202M-1 WATER - 22/9/2020
PARAMETER	**UOM**	**LOR**	**SE211520.001**	**SE211520.002**	**SE211520.003**	**SE211520.004**	**SE211520.005**
Total Phenols	mg/L	0.01	IS	0.01	<0.01	<0.01	<0.01

			BH203M-1 WATER - 22/9/2020
PARAMETER	**UOM**	**LOR**	**SE211520.006**
Total Phenols	mg/L	0.01	<0.01

METHOD	METHODOLOGY SUMMARY
AN289	Analysis of Total Phenols in Soil Sediment and Water: Steam distillable phenols react with 4-aminoantipyrine at pH 7.9±0.1 in the presence of potassium ferricyanide to form a coloured antipyrine dye analysed by Discrete Analyser. Reference APHA 5530 B/D.
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.
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.
		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.

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ANALYTICAL REPORT

Accreditation No. 2562

CLIENT DETAILS

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Project	**E24445.E17 Tallawong Station, Rouse Hill**
Order Number	**E24445.E17**
Samples	10

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SGS Reference	**SE211520RE R0**
Date Received	28/9/2020
Date Reported	29/9/2020

COMMENTS

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

SIGNATORIES

Ly Kim HA
Organic Section Head

TRH (Total Recoverable Hydrocarbons) in Water [AN403] Tested: 29/9/2020

			BH2M-2	BH201M-1	GWQD2	GWQR2
			WATER	WATER	WATER	WATER
			-	-	-	-
			22/9/2020	22/9/2020	22/9/2020	22/9/2020
PARAMETER	UOM	LOR	SE211520RE.002	SE211520RE.004	SE211520RE.007	SE211520RE.008
TRH C10-C14	µg/L	50	**7800**	**480**	**2700**	<50
TRH C15-C28	µg/L	200	**6000**	**1500**	**2200**	<200
TRH C29-C36	µg/L	200	**5100**	**690**	**1600**	<200
TRH C37-C40	µg/L	200	**1400**	<200	<200	<200
TRH >C10-C16	µg/L	60	**8100**	**630**	**2800**	<60
TRH >C10-C16 - Naphthalene (F2)	µg/L	60	**8100**	**630**	**2800**	<60
TRH >C16-C34 (F3)	µg/L	500	**9100**	**1800**	**3200**	<500
TRH >C34-C40 (F4)	µg/L	500	**2700**	<500	<500	<500
TRH C10-C40	µg/L	320	**20000**	**2700**	**6500**	<320

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 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.

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.

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ANALYTICAL REPORT

Accreditation No. 2562

CLIENT DETAILS

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Email	benjamin.aggar@eiaustralia.com.au
Project	**E24445.E17 Tallawong Station, Rouse Hill**
Order Number	**E24445.E17**
Samples	10

LABORATORY DETAILS

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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	**SE211520A R0**
Date Received	28/9/2020
Date Reported	29/9/2020

COMMENTS

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

SIGNATORIES

Ly Kim HA
Organic Section Head

TRH Silica Gel (Total Recoverable Hydrocarbons - Silica Gel) in Water [AN403] Tested: 29/9/2020

PARAMETER	UOM	LOR	BH2M-2 WATER - 22/9/2020 SE211520A.002	BH3M-2 WATER - 22/9/2020 SE211520A.003	BH201M-1 WATER - 22/9/2020 SE211520A.004
TRH C10-C14-Silica	µg/L	50	**6000**	<50	**360**
TRH C15-C28-Silica	µg/L	200	**4300**	**610**	**870**
TRH C29-C36-Silica	µg/L	200	**2500**	<200	**400**
TRH C37-C40-Silica	µg/L	200	<200	<200	<200
TRH >C10-C16-Silica	µg/L	60	**6400**	<60	**480**
TRH >C16-C34-Silica	µg/L	500	**5600**	**730**	**990**
TRH >C34-C40-Silica	µg/L	500	**840**	<500	<500
TRH Sum C10-C36-Silica	µg/L	450	**13000**	**610**	**1600**
TRH Sum C10-C40-Silica	µg/L	650	**13000**	<650	**1600**

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 Petroleum Hydrocarbons (TPH) 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.
***	Indicates that both * and ** apply.	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.

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CERTIFICATE OF ANALYSIS 251929

Client Details

Client	EI Australia
Attention	Li Wei
Address	Suite 6.01, 55 Miller Street, Pyrmont, NSW, 2009

Sample Details

Your Reference	**E24445.E17, Tullawong Station, Rouse Hill**
Number of Samples	1 Water
Date samples received	23/09/2020
Date completed instructions received	23/09/2020

Analysis Details

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

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

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

Report Details

Date results requested by	28/09/2020
Date of Issue	28/09/2020
Reissue Details	This report replaces R00 due to an amendment to client sample ID.

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Results Approved By
Dragana Tomas, Senior Chemist

Authorised By

Nancy Zhang, Laboratory Manager

vTRH(C6-C10)/BTEXN in Water		
Our Reference		251929-1
Your Reference	UNITS	GWQT2
Date Sampled		22/09/2020
Type of sample		Water
Date extracted	-	24/09/2020
Date analysed	-	24/09/2020
TRH C_6 - C_9	µg/L	<10
TRH C_6 - C_{10}	µg/L	<10
TRH C_6 - C_{10} less BTEX (F1)	µg/L	<10
Benzene	µg/L	<1
Toluene	µg/L	<1
Ethylbenzene	µg/L	<1
m+p-xylene	µg/L	<2
o-xylene	µg/L	<1
Naphthalene	µg/L	<1
Surrogate Dibromofluoromethane	%	106
Surrogate toluene-d8	%	100
Surrogate 4-BFB	%	106

svTRH (C10-C40) in Water		
Our Reference		251929-1
Your Reference	UNITS	GWQT2
Date Sampled		22/09/2020
Type of sample		Water
Date extracted	-	24/09/2020
Date analysed	-	24/09/2020
TRH C_{10} - C_{14}	μg/L	<50
TRH C_{15} - C_{28}	μg/L	<100
TRH C_{29} - C_{36}	μg/L	<100
TRH >C_{10} - C_{16}	μg/L	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	μg/L	<50
TRH >C_{16} - C_{34}	μg/L	<100
TRH >C_{34} - C_{40}	μg/L	<100
Surrogate o-Terphenyl	%	98

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

Client Reference: E24445.E17, Tullawong Station, Rouse Hill

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Water					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	[NT]
Date extracted	-			24/09/2020	[NT]	[NT]	[NT]	[NT]	24/09/2020	[NT]
Date analysed	-			24/09/2020	[NT]	[NT]	[NT]	[NT]	24/09/2020	[NT]
TRH C_6 - C_9	µg/L	10	Org-023	<10	[NT]	[NT]	[NT]	[NT]	113	[NT]
TRH C_6 - C_{10}	µg/L	10	Org-023	<10	[NT]	[NT]	[NT]	[NT]	113	[NT]
Benzene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	111	[NT]
Toluene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	112	[NT]
Ethylbenzene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	114	[NT]
m+p-xylene	µg/L	2	Org-023	<2	[NT]	[NT]	[NT]	[NT]	115	[NT]
o-xylene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	112	[NT]
Naphthalene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate Dibromofluoromethane	%		Org-023	103	[NT]	[NT]	[NT]	[NT]	101	[NT]
Surrogate toluene-d8	%		Org-023	98	[NT]	[NT]	[NT]	[NT]	99	[NT]
Surrogate 4-BFB	%		Org-023	107	[NT]	[NT]	[NT]	[NT]	104	[NT]

QUALITY CONTROL: svTRH (C10-C40) in Water					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	[NT]
Date extracted	-			24/09/2020	[NT]	[NT]	[NT]	[NT]	24/09/2020	[NT]
Date analysed	-			24/09/2020	[NT]	[NT]	[NT]	[NT]	24/09/2020	[NT]
TRH C_{10} - C_{14}	µg/L	50	Org-020	<50	[NT]	[NT]	[NT]	[NT]	100	[NT]
TRH C_{15} - C_{28}	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	90	[NT]
TRH C_{29} - C_{36}	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	82	[NT]
TRH >C_{10} - C_{16}	µg/L	50	Org-020	<50	[NT]	[NT]	[NT]	[NT]	100	[NT]
TRH >C_{16} - C_{34}	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	90	[NT]
TRH >C_{34} - C_{40}	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	82	[NT]
Surrogate o-Terphenyl	%		Org-020	99	[NT]	[NT]	[NT]	[NT]	73	[NT]

Result Definitions

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

Quality Control Definitions

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

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

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

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

Laboratory Acceptance Criteria

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

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

Spikes for Physical and Aggregate Tests are not applicable.

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

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

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

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

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

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

Measurement Uncertainty estimates are available for most tests upon request.

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

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

Appendix H– Laboratory QA/QC Policies and DQOs

STATEMENT OF QA/QC PERFORMANCE

SE211520 R1

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	**E24445.E17 Tallawong Station, Rouse Hill**
Order Number	**E24445.E17**
Samples	10

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	**SE211520 R1**
Date Received	23 Sep 2020
Date Reported	29 Sep 2020

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 (within the SGS Alexandria Environmental laboratory).

SAMPLE SUMMARY

Samples clearly labelled	Yes	Complete documentation received	Yes
Sample container provider	SGS	Sample cooling method	Ice Bricks
Samples received in correct containers	Yes	Sample counts by matrix	10 Water
Date documentation received	23/9/2020	Type of documentation received	COC
Samples received in good order	Yes	Samples received without headspace	Yes
Sample temperature upon receipt	15°C	Sufficient sample for analysis	Yes
Turnaround time requested	Three Days		

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.

Total Phenolics in Water

Method: ME-(AU)-[ENV]AN289

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH1M-2	SE211520.001	LB209977	22 Sep 2020	23 Sep 2020	20 Oct 2020	25 Sep 2020	20 Oct 2020	25 Sep 2020
BH2M-2	SE211520.002	LB209977	22 Sep 2020	23 Sep 2020	20 Oct 2020	25 Sep 2020	20 Oct 2020	25 Sep 2020
BH3M-2	SE211520.003	LB209977	22 Sep 2020	23 Sep 2020	20 Oct 2020	25 Sep 2020	20 Oct 2020	25 Sep 2020
BH201M-1	SE211520.004	LB209977	22 Sep 2020	23 Sep 2020	20 Oct 2020	25 Sep 2020	20 Oct 2020	25 Sep 2020
BH202M-1	SE211520.005	LB209977	22 Sep 2020	23 Sep 2020	20 Oct 2020	25 Sep 2020	20 Oct 2020	25 Sep 2020
BH203M-1	SE211520.006	LB209977	22 Sep 2020	23 Sep 2020	20 Oct 2020	25 Sep 2020	20 Oct 2020	25 Sep 2020

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
BH1M-2	SE211520.001	LB209871	22 Sep 2020	23 Sep 2020	29 Sep 2020	24 Sep 2020	03 Nov 2020	28 Sep 2020
BH2M-2	SE211520.002	LB209871	22 Sep 2020	23 Sep 2020	29 Sep 2020	24 Sep 2020	03 Nov 2020	28 Sep 2020
BH3M-2	SE211520.003	LB209871	22 Sep 2020	23 Sep 2020	29 Sep 2020	24 Sep 2020	03 Nov 2020	28 Sep 2020
BH201M-1	SE211520.004	LB209871	22 Sep 2020	23 Sep 2020	29 Sep 2020	24 Sep 2020	03 Nov 2020	28 Sep 2020
BH202M-1	SE211520.005	LB209871	22 Sep 2020	23 Sep 2020	29 Sep 2020	24 Sep 2020	03 Nov 2020	28 Sep 2020
BH203M-1	SE211520.006	LB209871	22 Sep 2020	23 Sep 2020	29 Sep 2020	24 Sep 2020	03 Nov 2020	28 Sep 2020
GWQD2	SE211520.007	LB209871	22 Sep 2020	23 Sep 2020	29 Sep 2020	24 Sep 2020	03 Nov 2020	28 Sep 2020
GWQR2	SE211520.008	LB209871	22 Sep 2020	23 Sep 2020	29 Sep 2020	24 Sep 2020	03 Nov 2020	28 Sep 2020

VOCs in Water

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

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH1M-2	SE211520.001	LB209913	22 Sep 2020	23 Sep 2020	29 Sep 2020	24 Sep 2020	03 Nov 2020	25 Sep 2020
BH2M-2	SE211520.002	LB209913	22 Sep 2020	23 Sep 2020	29 Sep 2020	24 Sep 2020	03 Nov 2020	25 Sep 2020
BH3M-2	SE211520.003	LB209913	22 Sep 2020	23 Sep 2020	29 Sep 2020	24 Sep 2020	03 Nov 2020	25 Sep 2020
BH201M-1	SE211520.004	LB209913	22 Sep 2020	23 Sep 2020	29 Sep 2020	24 Sep 2020	03 Nov 2020	25 Sep 2020
BH202M-1	SE211520.005	LB209913	22 Sep 2020	23 Sep 2020	29 Sep 2020	24 Sep 2020	03 Nov 2020	25 Sep 2020
BH203M-1	SE211520.006	LB209913	22 Sep 2020	23 Sep 2020	29 Sep 2020	24 Sep 2020	03 Nov 2020	25 Sep 2020
GWQD2	SE211520.007	LB209913	22 Sep 2020	23 Sep 2020	29 Sep 2020	24 Sep 2020	03 Nov 2020	25 Sep 2020
GWQR2	SE211520.008	LB209913	22 Sep 2020	23 Sep 2020	29 Sep 2020	24 Sep 2020	03 Nov 2020	25 Sep 2020
GWTB2	SE211520.009	LB209913	22 Sep 2020	23 Sep 2020	29 Sep 2020	24 Sep 2020	03 Nov 2020	25 Sep 2020
GWTS2	SE211520.010	LB209913	22 Sep 2020	23 Sep 2020	29 Sep 2020	24 Sep 2020	03 Nov 2020	25 Sep 2020

Volatile Petroleum Hydrocarbons in Water

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

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH1M-2	SE211520.001	LB209913	22 Sep 2020	23 Sep 2020	29 Sep 2020	24 Sep 2020	03 Nov 2020	25 Sep 2020
BH2M-2	SE211520.002	LB209913	22 Sep 2020	23 Sep 2020	29 Sep 2020	24 Sep 2020	03 Nov 2020	25 Sep 2020
BH3M-2	SE211520.003	LB209913	22 Sep 2020	23 Sep 2020	29 Sep 2020	24 Sep 2020	03 Nov 2020	25 Sep 2020
BH201M-1	SE211520.004	LB209913	22 Sep 2020	23 Sep 2020	29 Sep 2020	24 Sep 2020	03 Nov 2020	25 Sep 2020
BH202M-1	SE211520.005	LB209913	22 Sep 2020	23 Sep 2020	29 Sep 2020	24 Sep 2020	03 Nov 2020	25 Sep 2020
BH203M-1	SE211520.006	LB209913	22 Sep 2020	23 Sep 2020	29 Sep 2020	24 Sep 2020	03 Nov 2020	25 Sep 2020
GWQD2	SE211520.007	LB209913	22 Sep 2020	23 Sep 2020	29 Sep 2020	24 Sep 2020	03 Nov 2020	25 Sep 2020
GWQR2	SE211520.008	LB209913	22 Sep 2020	23 Sep 2020	29 Sep 2020	24 Sep 2020	03 Nov 2020	25 Sep 2020
GWTB2	SE211520.009	LB209913	22 Sep 2020	23 Sep 2020	29 Sep 2020	24 Sep 2020	03 Nov 2020	25 Sep 2020
GWTS2	SE211520.010	LB209913	22 Sep 2020	23 Sep 2020	29 Sep 2020	24 Sep 2020	03 Nov 2020	25 Sep 2020

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.

VOCs in Water

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

Parameter	Sample Name	Sample Number	Units	Criteria	Recovery %
Bromofluorobenzene (Surrogate)	BH1M-2	SE211520.001	%	40 - 130%	101
	BH2M-2	SE211520.002	%	40 - 130%	102
	BH3M-2	SE211520.003	%	40 - 130%	101
	BH201M-1	SE211520.004	%	40 - 130%	101
	BH202M-1	SE211520.005	%	40 - 130%	104
	BH203M-1	SE211520.006	%	40 - 130%	106
	GWQD2	SE211520.007	%	40 - 130%	100
	GWQR2	SE211520.008	%	40 - 130%	105
	GWTB2	SE211520.009	%	40 - 130%	104
	GWTS2	SE211520.010	%	40 - 130%	99
d4-1,2-dichloroethane (Surrogate)	BH1M-2	SE211520.001	%	40 - 130%	100
	BH2M-2	SE211520.002	%	40 - 130%	101
	BH3M-2	SE211520.003	%	40 - 130%	102
	BH201M-1	SE211520.004	%	40 - 130%	99
	BH202M-1	SE211520.005	%	40 - 130%	100
	BH203M-1	SE211520.006	%	40 - 130%	99
	GWQD2	SE211520.007	%	40 - 130%	100
	GWQR2	SE211520.008	%	40 - 130%	99
	GWTB2	SE211520.009	%	40 - 130%	98
	GWTS2	SE211520.010	%	40 - 130%	102
d8-toluene (Surrogate)	BH1M-2	SE211520.001	%	40 - 130%	95
	BH2M-2	SE211520.002	%	40 - 130%	95
	BH3M-2	SE211520.003	%	40 - 130%	95
	BH201M-1	SE211520.004	%	40 - 130%	94
	BH202M-1	SE211520.005	%	40 - 130%	97
	BH203M-1	SE211520.006	%	40 - 130%	100
	GWQD2	SE211520.007	%	40 - 130%	94
	GWQR2	SE211520.008	%	40 - 130%	96
	GWTB2	SE211520.009	%	40 - 130%	96
	GWTS2	SE211520.010	%	40 - 130%	98

Volatile Petroleum Hydrocarbons in Water

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

Parameter	Sample Name	Sample Number	Units	Criteria	Recovery %
Bromofluorobenzene (Surrogate)	BH1M-2	SE211520.001	%	40 - 130%	101
	BH2M-2	SE211520.002	%	40 - 130%	102
	BH3M-2	SE211520.003	%	40 - 130%	101
	BH201M-1	SE211520.004	%	40 - 130%	101
	BH202M-1	SE211520.005	%	40 - 130%	104
	BH203M-1	SE211520.006	%	40 - 130%	106
	GWQD2	SE211520.007	%	40 - 130%	100
	GWQR2	SE211520.008	%	40 - 130%	105
d4-1,2-dichloroethane (Surrogate)	BH1M-2	SE211520.001	%	60 - 130%	100
	BH2M-2	SE211520.002	%	60 - 130%	101
	BH3M-2	SE211520.003	%	60 - 130%	102
	BH201M-1	SE211520.004	%	60 - 130%	99
	BH202M-1	SE211520.005	%	60 - 130%	100
	BH203M-1	SE211520.006	%	60 - 130%	99
	GWQD2	SE211520.007	%	60 - 130%	100
	GWQR2	SE211520.008	%	60 - 130%	99
d8-toluene (Surrogate)	BH1M-2	SE211520.001	%	40 - 130%	95
	BH2M-2	SE211520.002	%	40 - 130%	95
	BH3M-2	SE211520.003	%	40 - 130%	95
	BH201M-1	SE211520.004	%	40 - 130%	94
	BH202M-1	SE211520.005	%	40 - 130%	97
	BH203M-1	SE211520.006	%	40 - 130%	100
	GWQD2	SE211520.007	%	40 - 130%	94
	GWQR2	SE211520.008	%	40 - 130%	96

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.

Total Phenolics in Water

Method: ME-(AU)-[ENV]AN289

Sample Number	Parameter	Units	LOR	Result
LB209977.001	Total Phenols	mg/L	0.01	<0.01

TRH (Total Recoverable Hydrocarbons) in Water

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

Sample Number	Parameter	Units	LOR	Result
LB209871.001	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

VOCs in Water

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

Sample Number		Parameter	Units	LOR	Result
LB209913.001	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
		Iodomethane	µg/L	5	<5
		1,1-dichloroethene	µg/L	0.5	<0.5
		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
		cis-1,4-dichloro-2-butene	µg/L	1	<1
		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
	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
		o-xylene	µg/L	0.5	<0.5

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
LB209913.001	Monocyclic Aromatic Hydrocarbons	Styrene (Vinyl benzene)	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	µg/L	0.5	<0.5
	Sulphonated	Carbon disulfide	µg/L	2	<2
	Surrogates	d4-1,2-dichloroethane (Surrogate)	%	-	98
		d8-toluene (Surrogate)	%	-	94
		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
LB209913.001		TRH C6-C9	µg/L	40	<40
	Surrogates	d4-1,2-dichloroethane (Surrogate)	%	-	98
		d8-toluene (Surrogate)	%	-	94
		Bromofluorobenzene (Surrogate)	%	-	99

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.

Total Phenolics in Water

Method: ME-(AU)-[ENV]AN289

Original	Duplicate		Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE211502.008	LB209977.014		Total Phenols	mg/L	0.01	0.00292	0.00357	200	0
SE211579.003	LB209977.019		Total Phenols	mg/L	0.01	0.00612	0.0067	200	0

TRH (Total Recoverable Hydrocarbons) in Water

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

Original	Duplicate		Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE211454.007	LB209871.021		TRH C10-C14	µg/L	50	<50	0	200	0
			TRH C15-C28	µg/L	200	<200	0	200	0
			TRH C29-C36	µg/L	200	<200	0	200	0
			TRH C37-C40	µg/L	200	<200	0	200	0
			TRH C10-C40	µg/L	320	<320	0	200	0
		TRH F Bands	TRH >C10-C16	µg/L	60	<60	0	200	0
			TRH >C10-C16 - Naphthalene (F2)	µg/L	60	<60	0	200	0
			TRH >C16-C34 (F3)	µg/L	500	<500	0	200	0
			TRH >C34-C40 (F4)	µg/L	500	<500	0	200	0

VOCs in Water

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

Original	Duplicate		Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE210960B.001	LB209913.027	Fumigants	2,2-dichloropropane	µg/L	0.5	<0.5	0	200	0
			1,2-dichloropropane	µg/L	0.5	<0.5	0.0008524377	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	0.5767463680	200	0
			Vinyl chloride (Chloroethene)	µg/L	0.3	<0.3	0	200	0
			Bromomethane	µg/L	10	0.1092871558	0.1028443917	200	0
			Chloroethane	µg/L	5	<5	0.0084393852	200	0
			Trichlorofluoromethane	µg/L	1	<1	0.0016740993	200	0
			Iodomethane	µg/L	5	<5	0.4254348831	200	0
			1,1-dichloroethene	µg/L	0.5	<0.5	0.0060159217	200	0
			Dichloromethane (Methylene chloride)	µg/L	5	<5	1.0756424522	200	0
			Allyl chloride	µg/L	2	<2.0	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	0.0066222847	200	0
			Bromochloromethane	µg/L	0.5	<0.5	0.0044403942	200	0
			1,2-dichloroethane	µg/L	0.5	<0.5	0.0848978042	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	0.0193378988	200	0
			1,1,2-trichloroethane	µg/L	0.5	<0.5	0.0075974302	200	0
			1,3-dichloropropane	µg/L	0.5	<0.5	0	200	0
			Tetrachloroethene (Perchloroethylene,PCE)	µg/L	0.5	<0.5	0.0090208673	200	0
			1,1,1,2-tetrachloroethane	µg/L	0.5	<0.5	0	200	0
			cis-1,4-dichloro-2-butene	µg/L	1	<1	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	0.0045942772	200	0
		Halogenated Aromatics	Chlorobenzene	µg/L	0.5	<0.5	0.0133943339	200	0
			Bromobenzene	µg/L	0.5	<0.5	0.0027488416	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	200	0
			1,4-dichlorobenzene	µg/L	0.3	<0.3	0	200	0
			1,2-dichlorobenzene	µg/L	0.5	<0.5	0.0316521332	200	0
			1,2,4-trichlorobenzene	µg/L	0.5	<0.5	0.0102065480	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.

VOCs in Water (continued)

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

Original	Duplicate		Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE210960B.001	LB209913.027	Halogenated	1,2,3-trichlorobenzene	µg/L	0.5	<0.5	0.0070816862	200	0
		Surrogates	d4-1,2-dichloroethane (Surrogate)	µg/L	-	10.0	9.2050597167	30	8
			d8-toluene (Surrogate)	µg/L	-	9.7	9.4944041605	30	3
			Bromofluorobenzene (Surrogate)	µg/L	-	9.8	9.9993348706	30	2
		Trihalomethanes	Chloroform (THM)	µg/L	0.5	0.8	0.7388555402	96	6
			Bromodichloromethane (THM)	µg/L	0.5	<0.5	0.0679002326	200	0
			Dibromochloromethane (THM)	µg/L	0.5	<0.5	0.0024896532	200	0
			Bromoform (THM)	µg/L	0.5	<0.5	0	200	0
SE211520.006	LB209913.023	Fumigants	2,2-dichloropropane	µg/L	0.5	<0.5	<0.5	200	0
			1,2-dichloropropane	µg/L	0.5	<0.5	<0.5	200	0
			cis-1,3-dichloropropene	µg/L	0.5	<0.5	<0.5	200	0
			trans-1,3-dichloropropene	µg/L	0.5	<0.5	<0.5	200	0
			1,2-dibromoethane (EDB)	µg/L	0.5	<0.5	<0.5	200	0
		Halogenated Aliphatics	Dichlorodifluoromethane (CFC-12)	µg/L	5	<5	<5	200	0
			Chloromethane	µg/L	5	<5	<5	200	0
			Vinyl chloride (Chloroethene)	µg/L	0.3	<0.3	<0.3	200	0
			Bromomethane	µg/L	10	<10	<10	200	0
			Chloroethane	µg/L	5	<5	<5	200	0
			Trichlorofluoromethane	µg/L	1	<1	<1	200	0
			Iodomethane	µg/L	5	<5	<5	200	0
			1,1-dichloroethene	µg/L	0.5	<0.5	<0.5	200	0
			Dichloromethane (Methylene chloride)	µg/L	5	<5	<5	200	0
			Allyl chloride	µg/L	2	<2	<2	200	0
			trans-1,2-dichloroethene	µg/L	0.5	<0.5	<0.5	200	0
			1,1-dichloroethane	µg/L	0.5	<0.5	<0.5	200	0
			cis-1,2-dichloroethene	µg/L	0.5	<0.5	<0.5	200	0
			Bromochloromethane	µg/L	0.5	<0.5	<0.5	200	0
			1,2-dichloroethane	µg/L	0.5	<0.5	<0.5	200	0
			1,1,1-trichloroethane	µg/L	0.5	<0.5	<0.5	200	0
			1,1-dichloropropene	µg/L	0.5	<0.5	<0.5	200	0
			Carbon tetrachloride	µg/L	0.5	<0.5	<0.5	200	0
			Dibromomethane	µg/L	0.5	<0.5	<0.5	200	0
			Trichloroethene (Trichloroethylene,TCE)	µg/L	0.5	<0.5	<0.5	200	0
			1,1,2-trichloroethane	µg/L	0.5	<0.5	<0.5	200	0
			1,3-dichloropropane	µg/L	0.5	<0.5	<0.5	200	0
			Tetrachloroethene (Perchloroethylene,PCE)	µg/L	0.5	<0.5	<0.5	200	0
			1,1,1,2-tetrachloroethane	µg/L	0.5	<0.5	<0.5	200	0
			cis-1,4-dichloro-2-butene	µg/L	1	<1	<1	200	0
			1,1,2,2-tetrachloroethane	µg/L	0.5	<0.5	<0.5	200	0
			1,2,3-trichloropropane	µg/L	0.5	<0.5	<0.5	200	0
			trans-1,4-dichloro-2-butene	µg/L	1	<1	<1	200	0
			1,2-dibromo-3-chloropropane	µg/L	0.5	<0.5	<0.5	200	0
			Hexachlorobutadiene	µg/L	0.5	<0.5	<0.5	200	0
		Halogenated Aromatics	Chlorobenzene	µg/L	0.5	<0.5	<0.5	200	0
			Bromobenzene	µg/L	0.5	<0.5	<0.5	200	0
			2-chlorotoluene	µg/L	0.5	<0.5	<0.5	200	0
			4-chlorotoluene	µg/L	0.5	<0.5	<0.5	200	0
			1,3-dichlorobenzene	µg/L	0.5	<0.5	<0.5	200	0
			1,4-dichlorobenzene	µg/L	0.3	<0.3	<0.3	200	0
			1,2-dichlorobenzene	µg/L	0.5	<0.5	<0.5	200	0
			1,2,4-trichlorobenzene	µg/L	0.5	<0.5	<0.5	200	0
			1,2,3-trichlorobenzene	µg/L	0.5	<0.5	<0.5	200	0
		Monocyclic Aromatic	Benzene	µg/L	0.5	<0.5	<0.5	200	0
			Toluene	µg/L	0.5	2.1	2.7	51	23
			Ethylbenzene	µg/L	0.5	<0.5	<0.5	194	0
			m/p-xylene	µg/L	1	<1	1	117	34
			o-xylene	µg/L	0.5	1.5	1.9	60	22
			Styrene (Vinyl benzene)	µg/L	0.5	<0.5	<0.5	200	0
			Isopropylbenzene (Cumene)	µg/L	0.5	<0.5	<0.5	200	0
			n-propylbenzene	µg/L	0.5	<0.5	<0.5	200	0
			1,3,5-trimethylbenzene	µg/L	0.5	<0.5	<0.5	200	0

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.

VOCs in Water (continued)

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

Original	Duplicate		Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE211520.006	LB209913.023	Monocyclic Aromatic	tert-butylbenzene	µg/L	0.5	<0.5	<0.5	200	0
			1,2,4-trimethylbenzene	µg/L	0.5	<0.5	<0.5	200	0
			sec-butylbenzene	µg/L	0.5	<0.5	<0.5	200	0
			p-isopropyltoluene	µg/L	0.5	<0.5	<0.5	200	0
			n-butylbenzene	µg/L	0.5	<0.5	<0.5	200	0
		Nitrogenous	Acrylonitrile	µg/L	0.5	<0.5	<0.5	200	0
		Oxygenated Compounds	Acetone (2-propanone)	µg/L	10	<10	<10	200	0
			MtBE (Methyl-tert-butyl ether)	µg/L	2	<2	<2	200	0
			Vinyl acetate	µg/L	10	<10	<10	200	0
			MEK (2-butanone)	µg/L	10	<10	<10	200	0
			MIBK (4-methyl-2-pentanone)	µg/L	5	<5	<5	200	0
			2-hexanone (MBK)	µg/L	5	<5	<5	200	0
		Polycyclic	Naphthalene	µg/L	0.5	<0.5	<0.5	200	0
		Sulphonated	Carbon disulfide	µg/L	2	<2	<2	200	0
		Surrogates	d4-1,2-dichloroethane (Surrogate)	µg/L	-	9.9	9.8	30	1
			d8-toluene (Surrogate)	µg/L	-	10	9.6	30	5
			Bromofluorobenzene (Surrogate)	µg/L	-	11	10	30	2
		Trihalomethanes	Chloroform (THM)	µg/L	0.5	18	18	33	1
			Bromodichloromethane (THM)	µg/L	0.5	2.3	2.3	51	0
			Dibromochloromethane (THM)	µg/L	0.5	<0.5	<0.5	146	0
			Bromoform (THM)	µg/L	0.5	<0.5	<0.5	200	0

Volatile Petroleum Hydrocarbons in Water

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

Original	Duplicate		Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE211520.006	LB209913.023		TRH C6-C10	µg/L	50	<50	<50	137	0
			TRH C6-C9	µg/L	40	<40	46	124	14
		Surrogates	d4-1,2-dichloroethane (Surrogate)	µg/L	-	9.9	9.8	30	1
			d8-toluene (Surrogate)	µg/L	-	10	9.6	30	5
			Bromofluorobenzene (Surrogate)	µg/L	-	11	10	30	2
		VPH F Bands	Benzene (F0)	µg/L	0.5	<0.5	0.3576485243	200	0
			TRH C6-C10 minus BTEX (F1)	µg/L	50	<50	<50	149	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.

Total Phenolics in Water

Method: ME-(AU)-[ENV]AN289

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB209977.002	Total Phenols	mg/L	0.01	0.23	0.25	80 - 120	92

TRH (Total Recoverable Hydrocarbons) in Water

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

Sample Number		Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB209871.002		TRH C10-C14	µg/L	50	1100	1200	60 - 140	95
		TRH C15-C28	µg/L	200	1300	1200	60 - 140	110
		TRH C29-C36	µg/L	200	1400	1200	60 - 140	114
	TRH F Bands	TRH >C10-C16	µg/L	60	1200	1200	60 - 140	101
		TRH >C16-C34 (F3)	µg/L	500	1500	1200	60 - 140	123
		TRH >C34-C40 (F4)	µg/L	500	640	600	60 - 140	106

VOCs in Water

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

Sample Number		Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB209913.002	Halogenated Aliphatics	1,1-dichloroethene	µg/L	0.5	54	45.45	60 - 140	118
		1,2-dichloroethane	µg/L	0.5	61	45.45	60 - 140	134
		Trichloroethene (Trichloroethylene,TCE)	µg/L	0.5	60	45.45	60 - 140	131
	Halogenated Monocyclic Aromatic	Chlorobenzene	µg/L	0.5	41	45.45	60 - 140	90
		Benzene	µg/L	0.5	47	45.45	60 - 140	103
		Toluene	µg/L	0.5	46	45.45	60 - 140	102
		Ethylbenzene	µg/L	0.5	47	45.45	60 - 140	103
		m/p-xylene	µg/L	1	94	90.9	60 - 140	103
		o-xylene	µg/L	0.5	47	45.45	60 - 140	103
	Surrogates	d4-1,2-dichloroethane (Surrogate)	µg/L	-	10	10	60 - 140	103
		d8-toluene (Surrogate)	µg/L	-	10	10	70 - 130	101
		Bromofluorobenzene (Surrogate)	µg/L	-	10	10	70 - 130	100
	Trihalomethan	Chloroform (THM)	µg/L	0.5	44	45.45	60 - 140	97

Volatile Petroleum Hydrocarbons in Water

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

Sample Number		Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB209913.002		TRH C6-C10	µg/L	50	880	946.63	60 - 140	93
		TRH C6-C9	µg/L	40	740	818.71	60 - 140	90
	Surrogates	d4-1,2-dichloroethane (Surrogate)	µg/L	-	10	10	60 - 140	103
		d8-toluene (Surrogate)	µg/L	-	10	10	70 - 130	101
		Bromofluorobenzene (Surrogate)	µg/L	-	10	10	70 - 130	100
	VPH F Bands	TRH C6-C10 minus BTEX (F1)	µg/L	50	600	639.67	60 - 140	93

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.

Total Phenolics in Water

Method: ME-(AU)-[ENV]AN289

QC Sample	Sample Number	Parameter	Units	LOR	Result	Original	Spike	Recovery%
SE211520.002	LB209977.020	Total Phenols	mg/L	0.01	0.26	0.01	0.25	96

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.

STATEMENT OF QA/QC PERFORMANCE

SE211520RE R0

CLIENT DETAILS

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Project	**E24445.E17 Tallawong Station, Rouse Hill**
Order Number	**E24445.E17**
Samples	10

LABORATORY DETAILS

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SGS Reference	**SE211520RE R0**
Date Received	28 Sep 2020
Date Reported	29 Sep 2020

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 (within the SGS Alexandria Environmental laboratory).

SAMPLE SUMMARY

Samples clearly labelled	Yes	Complete documentation received	Yes
Sample container provider	SGS	Sample cooling method	Ice Bricks
Samples received in correct containers	Yes	Sample counts by matrix	4 Water
Date documentation received	28/9/2020@4:30PM	Type of documentation received	Email
Samples received in good order	Yes	Samples received without headspace	Yes
Sample temperature upon receipt	15°C	Sufficient sample for analysis	Yes
Turnaround time requested	Standard		

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 (Total Recoverable Hydrocarbons) in Water

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

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH2M-2	SE211520RE.002	LB210145	22 Sep 2020	28 Sep 2020	29 Sep 2020	29 Sep 2020	08 Nov 2020	29 Sep 2020
BH201M-1	SE211520RE.004	LB210145	22 Sep 2020	28 Sep 2020	29 Sep 2020	29 Sep 2020	08 Nov 2020	29 Sep 2020
GWQD2	SE211520RE.007	LB210145	22 Sep 2020	28 Sep 2020	29 Sep 2020	29 Sep 2020	08 Nov 2020	29 Sep 2020
GWQR2	SE211520RE.008	LB210145	22 Sep 2020	28 Sep 2020	29 Sep 2020	29 Sep 2020	08 Nov 2020	29 Sep 2020

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 (Total Recoverable Hydrocarbons) in Water

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

Sample Number	Parameter	Units	LOR	Result
LB210145.001	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

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.

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 (Total Recoverable Hydrocarbons) in Water

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

Sample Number		Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB210145.002		TRH C10-C14	µg/L	50	1300	1200	60 - 140	106
		TRH C15-C28	µg/L	200	1500	1200	60 - 140	122
		TRH C29-C36	µg/L	200	1600	1200	60 - 140	131
	TRH F Bands	TRH >C10-C16	µg/L	60	1300	1200	60 - 140	112
		TRH >C16-C34 (F3)	µg/L	500	1600	1200	60 - 140	135
		TRH >C34-C40 (F4)	µg/L	500	770	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.

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.

STATEMENT OF QA/QC PERFORMANCE

SE211520A R0

CLIENT DETAILS

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Project	**E24445.E17 Tallawong Station, Rouse Hill**
Order Number	**E24445.E17**
Samples	10

LABORATORY DETAILS

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SGS Reference	**SE211520A R0**
Date Received	28 Sep 2020
Date Reported	29 Sep 2020

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 (within the SGS Alexandria Environmental laboratory).

SAMPLE SUMMARY

Samples clearly labelled	Yes	Complete documentation received	Yes
Sample container provider	SGS	Sample cooling method	Ice Bricks
Samples received in correct containers	Yes	Sample counts by matrix	3 Water
Date documentation received	28/9/2/020@4:30pm	Type of documentation received	Email
Samples received in good order	Yes	Samples received without headspace	Yes
Sample temperature upon receipt	15°C	Sufficient sample for analysis	Yes
Turnaround time requested	Next Day		

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
BH2M-2	SE211520A.002	LB210145	22 Sep 2020	28 Sep 2020	29 Sep 2020	29 Sep 2020	08 Nov 2020	29 Sep 2020
BH3M-2	SE211520A.003	LB210145	22 Sep 2020	28 Sep 2020	29 Sep 2020	29 Sep 2020	08 Nov 2020	29 Sep 2020
BH201M-1	SE211520A.004	LB210145	22 Sep 2020	28 Sep 2020	29 Sep 2020	29 Sep 2020	08 Nov 2020	29 Sep 2020

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
LB210145.001	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.

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 %
LB210145.002	TRH C10-C14-Silica	µg/L	50	1300	1200	60 - 140	106
	TRH C15-C28-Silica	µg/L	200	1500	1200	60 - 140	122
	TRH C29-C36-Silica	µg/L	200	1600	1200	60 - 140	131
	TRH >C10-C16-Silica	µg/L	60	1300	1200	60 - 140	112
	TRH >C16-C34-Silica	µg/L	500	1600	1200	60 - 140	135
	TRH >C34-C40-Silica	µg/L	500	770	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.

SGS Environmental Services is accredited by NATA for Chemical Testing (Reg.No.2562) and Quality System compliance to ISO/IEC 17025. The QC parameters contained within are designed to meet NEPM 1999 requirements.

Quality Control samples included in any analytical run are listed below.

Reagent/Analysis Blank (BLK) **Method Blank (MB)**	Sample free reagents carried through the preparation/extraction/digestion procedure and analysed at the beginning of every sample batch analysis. A reagent blank is prepared and analysed with every batch of samples plus with each new batch of solvent prior to use.
Sample Matrix Spike (MS) & Matrix Spike Duplicate (MSD)	Sample replicates spiked with identical concentrations of target analyte(s). The spiking occurs during the sample preparation and prior to the extraction/digestion procedure. They are used to document the precision and bias of a method in a given sample matrix. Where there is not enough sample available to prepare a spiked sample, another known soil/sand or water may be used. A duplicate spiked sample is analysed at least every 20 samples.
Surrogate Spike (SS)	At least one but up to three surrogate compounds are added to all samples requiring analysis for organics prior to extraction. Used to determine the extraction efficiency. They are organic compounds which are similar to the target analyte(s) in chemical composition and behaviour in the analytical process, but which are not normally found in environmental samples. Where possible they are surrogate compounds recommended by the USEPA.
Control Matrix Spike (CMS)	To ensure spike recoveries can be determined for every batch of samples a control matrix is spiked with identical concentrations of target analyte(s) and then analysed. These results allow recoveries to be determined in the event that the matrix spikes are unusable (eg. matrix spikes performed on heavily contaminated samples). These are analysed at least every 20 samples.
Internal Standard (IS)	Added to all samples requiring analysis for organics (where relevant) after the extraction process; the compounds serve to give a standard of retention time and response, which is invariant from run-to-run with the instruments. Where possible they are standard compounds recommended by the USEPA.
Lab Duplicates (D)	A separate portion of a sample being analysed that is treated the same as the other samples in the batch. One duplicate is processed at least every 10 samples.
Lab Control Standards/Samples (LCS)	Prepared from a source independent of the calibration standards. At least one control standard is included in each run to confirm calibration validity. Thereafter they are analysed at least every one in 20 samples plus at the end of each analytical run. This data is not reported.
Continuous Calibration Verification (CCV) or **Calibration Check Standard & Blank**	A calibration check standard or CCV and blank are run after every 20 samples of an instrumental analysis run to assess analytical drift. Calibration Standards are checked old versus new with a criteria of ±10%

Quality Assurance Programs are listed below:

Statistical analysis of Quality Control data (SQC)	Quality control data is plotted on control charts using the APHA procedure with warning and control limits at 2 and 3 standard deviations respectively. See also QMS Procedure "Statistical Quality Control".
Certified Reference Materials (CRM/SRM)	Certified Reference Materials and Standards are regularly analysed. These materials/standards have certified reference values for various parameters.
Proficiency Testing	Regular proficiency test samples are analysed by our laboratories. SGS Environmental participates in a number of programs. Results and proficiency status are compiled and sent to participating laboratory post data interpretation. Failure to comply with acceptable values result in further investigations.
Inter-laboratory & Intra-laboratory Testing	SGS Environmental Services has schedules in the Quality Systems to participate in Inter/Intra laboratory testing conducted internally and by other parties.
Data Acceptance Criteria Unless otherwise specified in the method or method manual the following general criteria apply to all inorganic tests. All recoveries are to be reported to 3 significant figures.	Failure to meet the internal acceptance criteria will result in sample batch repeats dependent upon investigation outcomes. For data to be accepted: Inorganics (water samples) • For all inorganic analytes the Reagent & Method Blanks must be less than the LOR. • The Calibration Check Standards or Continuous Calibration Verification (CCV) must be within ±15%. • Control Standards must be 80-120% of the accepted value. • The Calibration Check Blanks must be less than the LOR. • Lab Duplicates RPD to be <15%*. Note: If client field duplicates do not meet this criteria it may indicate heterogeneity and shall be noted on the data reports for QC samples. • Sample (and if applicable Control) Matrix Spike♫ Duplicate recovery RPD to be <30%. • Where CRMs are used, results to be within ±2 standard deviations of the expected value. Inorganics (soil samples) • For all inorganic analytes the Reagent & Method Blanks must be less than the LOR. • The Calibration Check Standards or Continuous Calibration Verification (CCV) must be within ±15%. • Control Standards must be 80-120% of the accepted value. • The Calibration Check Blanks must be less than the LOR. • Lab duplicate RPD to be <30%* for sample results greater than 10 times LOR. • Sample Matrix Spike Duplicate (MS♫/MSD) recovery RPD to be <30%. In the event that the matrix spike has been applied to samples whose matrix or contamination is problematic to the method then these acceptance criteria apply to the Control Matrix Spike (CMS/D). • Where CRMs are used, results to be within ± 2 standard deviations of the expected value.

Data Acceptance Criteria Unless otherwise specified in the method or method manual the following general criteria apply to all organic tests. All recoveries are to be reported to 3 significant figures.	Organics • Volatile & extractable Reagent & Method Blanks must contain levels less than or equal to LOR. • The Calibration Check Standards or Continuous Calibration Verification (CCV) must be within ±25%. Some analytes may have specific criteria. • Control Standards (LCS/CMS) and Certified Reference Materials (CRM) recoveries are to be within established control limits or as a default 60-140% unless compound specific limits apply. • Retention times are to vary by no more than 0.2 min. • **At least two of three** routine level soil sample Surrogate Spike (SS) recoveries 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 acceptance criterion. Any recoveries outside these limits will have comment. • Water sample Surrogates Spike (SS) recoveries are to be within 40-130%. The presence of emulsions, surfactants and particulates may void this as an acceptance criterion. Any recoveries outside these limits will have comment. • Lab Duplicates (D) must have a RPD <30%*. • Sample Matrix Spike Duplicate (MS♬/MSD) recovery RPD to be <30%. In the event that the matrix spike has been applied to samples whose matrix or contamination is problematic to the method then these acceptance criteria apply to the Control Matrix Spike (CMS/D).

*Only if results are at least 10 times the LOR otherwise no acceptance criteria for RPD's apply. Application of more stringent criteria shall be applied for clean water sample from water boards and any other nominated client contracts. Nominal 10xLOR criteria are dropped to 5xLOR where specified.

♬Matrix do not readily equate to definitive recovery due to inherent matrix interferences and thus do not have recovery compliance values set. As a guide inorganic recoveries should be between 70-130% and for organics 60-130%

Batch Structure Summary

An analytical batch is nominally considered as 20 samples or smaller. As a standard template the following should be **used as a guide** according to the above Quality Control Types:

1	MB	16	UNK_DUP
2	STD1	17	MS
3	STD2	18	MS_DUP
4	STD3	19	UNK 11
5	LCS	20	UNK 12
6	BLK	21	UNK 13
7	UNK 1	22	UNK 14
8	UNK 2	23	UNK 15
9	UNK 3	24	UNK 16
10	UNK 4	25	UNK 17
11	UNK 5	26	UNK 18
12	UNK 6	27	UNK 19
13	UNK 7	28	UNK 20 (SS if applicable)
14	UNK 8	29	UNK_DUP
15	UNK 9	30	CCV
16	UNK 10 (SS if applicable)	31	CRM / SRM / CMS / LCS

Table QC1 - Containers, Preservation Requirements and Holding Times - Soil

Parameter	Container	Preservation	Maximum Holding Time
Acid digestible metals and metalloids - Total and TCLP (As,Cd.,Cu,Cr,Ni,Pb,Zn)	Glass with Teflon Lid	Nil	6 months
Mercury	Glass with Teflon Lid	Nil	28 days
TPH / BTEX / VOC / SVOC / CHC	Glass with Teflon Lid	4^{o}C, zero headspace	14 days
PAHs (total and TCLP)	Glass with Teflon Lid	4^{o}C [1]	14 days
Phenols	Glass with Teflon Lid	4^{o}C [1]	14 days
OCPs, OPPs and total PCBs	Glass with Teflon Lid	4^{o}C [1]	14 days
Asbestos	Sealed Plastic Bag	Nil	N/A

Table QC2 - Containers, Preservation Requirements and Holding Times - Water

Parameter	Container Volume (mL)	Preservation	Maximum Holding Time
Heavy Metals	125mL Plastic	Field filtration 0.45µm HNO_3 / 4^{o}C	6 months
Cyanide	125mL Amber Glass	pH > 12 NaOH / 4^{o}C	6 months
TPH (C6-C9) / BTEX / VOCs SVOCs / CHCs	4 x 43mL Glass	HCl / 4^{o}C [1]	14 days
TPH (C10-C36) / PAH / Phenolics OCP / OPP / TDS / pH	3 x 1L Amber Glass	None / 4^{o}C [1]	28 days

Notes: [1] = Extraction within 14 days, Analysis within 40 days.

Table QC3 - Analytical Parameters, PQLs and Methods - Soil

Parameter	Unit	PQL	Method Reference
Metals in Soil			
Arsenic - As[1]	mg / kg	1	USEPA 200.7
Cadmium - Cd[1]	mg / kg	0.5	USEPA 200.7
Chromium - Cr[1]	mg / kg	1	USEPA 200.7
Copper - Cu[1]	mg / kg	1	USEPA 200.7
Lead - Pb[1]	mg / kg	1	USEPA 200.7
Mercury - Hg[2]	mg / kg	0.1	USEPA 7471A
Nickel - Ni[1]	mg / kg	1	USEPA 200.7
Zinc - Zn[1]	mg / kg	1	USEPA 200.7
Total Petroleum Hydrocarbons (TPHs) in Soil			
C_6-C_9 fraction	mg / kg	25	USEPA 8260
C_{10}-C_{14} fraction	mg / kg	50	USEPA 8000
C_{15}-C_{28} fraction	mg / kg	100	USEPA 8000
C_{29}-C_{36} fraction	mg / kg	100	USEPA 8000
BTEX in Soil			
Benzene	mg / kg	1	USEPA 8260
Toluene	mg / kg	1	USEPA 8260
Ethylbenzene	mg / kg	1	USEPA 8260
m & p Xylene	mg / kg	2	USEPA 8260
o- Xylene	mg / kg	1	USEPA 8260
Other Organic Contaminants in Soil			
PAHs	mg / kg	0.05-0.2	USEPA 8270
CHCs	mg / kg	1	USEPA 8260
VOCs	mg / kg	1	USEPA 8260
SVOCs	mg / kg	1	USEPA 8260
OCPs	mg / kg	0.1	USEPA 8140, 8080
OPPs	mg / kg	0.1	USEPA 8140, 8080
PCBs	mg / kg	0.1	USEPA 8080
Phenolics	mg / kg	5	APHA 5530
Asbestos			
Asbestos	mg / kg	Presence / Absence	AS4964-2004

Notes:

1. Acid Soluble Metals by ICP-AES

2. Total Recoverable Mercury

Table QC4 - Analytical Parameters, PQLs and Methods - Groundwater

Parameter	Unit	PQL	Method	Parameter	Unit	PQL	Method
Heavy Metals				***Chlorinated Hydrocarbons (CHCs)***			
Antimony - Sb	µg/L	1	USEPA 200.8	1,2-dichlorobenzene	µg/L	1	USEPA 8260B
Arsenic - As	µg/L	1	USEPA 200.8	1,3-dichlorobenzene	µg/L	1	USEPA 8260B
Beryllium - Be	µg/L	0.5	USEPA 200.8	1,4-dichlorobenzene	µg/L	1	USEPA 8260B
Cadmium - Cd	µg/L	0.1	USEPA 200.8	1,2,3-trichlorobenzene	µg/L	1	USEPA 8260B
Chromium - Cr	µg/L	1	USEPA 200.8	1,2,4-trichlorobenzene	µg/L	1	USEPA 8260B
Cobalt - Co	µg/L	1	USEPA 200.8	Hexachlorobutadeine	µg/L	1	USEPA 8260B
Copper - Cu	µg/L	1	USEPA 200.8	1,1,2-trichloroethane	µg/L	1	USEPA 8260B
Lead - Pb	µg/L	1	USEPA 200.8	Hexachloroethane	µg/L	10	USEPA 8270D
Mercury - Hg	µg/L	0.5	USEPA 7471A	Other CHCs	µg/L	1	USEPA 8260B
Molybdenum - Mo	µg/L	1	USEPA 200.8	***Volatile Organic Compounds (VOCs)***			
Nickel - Ni	µg/L	1	USEPA 200.8	Aniline	µg/L	10	USEPA 8260B
Selenium - Se	µg/L	1	USEPA 200.8	2,4-dichloroaniline	µg/L	10	USEPA 8260B
Silver - Ag	µg/L	1	USEPA 200.8	3,4-dichloroaniline	µg/L	10	USEPA 8260B
Tin (inorg.) - Sn	µg/L	1	USEPA 200.8	Nitrobenzene	µg/L	50	USEPA 8260B
Nickel - Ni	µg/L	1	USEPA 200.8	2,4-dinitrotoluene	µg/L	50	USEPA 8260B
Zinc - Zn	µg/L	1	USEPA 200.8	2,4,6-trinitrotoluene	µg/L	50	USEPA 8260B
Total Petroleum Hydrocarbons (TPHs)				***Phenolic Compounds***			
C_6-C_9 fraction	µg/L	10	USEPA 8220A / 8000	Phenol	µg/L	10	USEPA 8041
C_{10}-C_{14} fraction	µg/L	50	USEPA 8000	2-chlorophenol	µg/L	10	USEPA 8041
C_{15}-C_{28} fraction	µg/L	100	USEPA 8000	4-chlorophenol	µg/L	10	USEPA 8041
C_{29}-C_{36} fraction	µg/L	100	USEPA 8000	2, 4-dichlorophenol	µg/L	10	USEPA 8041
BTEX				2,4,6-trichlorophenol	µg/L	10	USEPA 8041
Benzene	µg/L	1	USEPA 8220A	2,3,4,6-tetrachlorophenol	µg/L	10	USEPA 8041
Toluene	µg/L	1	USEPA 8220A	Pentachlorophenol	µg/L	10	USEPA 8041
Ethylbenzene	µg/L	1	USEPA 8220A	2,4-dinitrophenol	µg/L	10	USEPA 8041
m- & p-Xylene	µg/L	2	USEPA 8220A	***Miscellaneous Parameters***			
o-Xylene	µg/L	1	USEPA 8220A	Total Cyanide	µg/L	5	APHA 4500C&E-CN
Polyciclic Aromatic Hydrocarbons (PAHs)				Fluoride	µg/L	10	APHA 4500 F-C
PAHs	µg/L	0.1	USEPA 8270	Salinity (TDS)	mg/L	1	APHA 2510
Benzo(a)pyrene	µg/L	0.01	USEPA 8270	pH	units	0.1	APHA 4500H+
OrganoChlorine Pesticides (OCPs)				***OrganoPhosphate Pesticides (OPPs)***			
Aldrin	µg/L	0.001	USEPA 8081	Azinphos Methyl	µg/L	0.01	USEPA 8141
Chlordane	µg/L	0.001	USEPA 8081	Chloropyrifos	µg/L	0.01	USEPA 8141
DDT	µg/L	0.001	USEPA 8081	Diazinon	µg/L	0.01	USEPA 8141
Dieldrin	µg/L	0.001	USEPA 8081	Dimethoate	µg/L	0.01	USEPA 8141
Endosulfan	µg/L	0.001	USEPA 8081	Fenitrothion	µg/L	0.01	USEPA 8141
Endrin	µg/L	0.001	USEPA 8081	Malathion	µg/L	0.01	USEPA 8141
Heptachlor	µg/L	0.001	USEPA 8081	Parathion	µg/L	0.01	USEPA 8141
Lindane	µg/L	0.001	USEPA 8081	Temephos	µg/L	0.01	USEPA 8141
Toxaphene	µg/L	0.001	USEPA 8081	***Polychlorinated Biphenyls (PCBs)***			
				Individual PCBs	µg/L	0.01	USEPA 8081

Table QC5 - QC Sample Data Acceptance Criteria

QC Sample Type	Method of Assessment	Acceptable Range
Field QC		
Blind Duplicates and Split Samples	The assessment of split duplicate is undertaken by calculating the Relative Percent Difference (RPD) of the duplicate concentration compared with the primary sample concentration. The RPD is defined as: $\mathrm{RPD} = 100 \times \frac{\lvert X_1 - X_2 \rvert}{\mathrm{mean}\ (X1,\ X2)}$ Where: X_1 and X_2 are the concentrations of the primary and duplicate samples.	The acceptable range depends upon the levels detected: - 0-150% RPD (when the average concentration is <5 times the LOR/PQL) - 0-75% RPD (when the average concentration is 5 to 10 times the LOR/PQL) - 0-50% RPD (when the average concentration is >10 times the LOR/PQL)
Rinsate & Trip Blanks	Each blank is analysed as per the original samples.	Analytical Result <LOR/PQL
Laboratory prepared Trip Spike	The Trip Spike is analysed after returning from the field and the % recovery of the known spike is calculated.	70 - 130%
Laboratory QC		
Laboratory Duplicates	Assessment of Lab Duplicate RPD as per Blind Duplicates and Split Samples.	Lab Duplicate RPD < 15% (Inorganics) Lab Duplicate RPD < 30% (Organics) for sample results > 10 LOR
Surrogates Matrix Spikes Laboratory Control Samples	Assessment is undertaken by determining the percent recovery of the known surrogate spike (SS) or addition to the sample. $\%\ \mathrm{Recovery} = 100 \times \frac{C - A}{B}$ Where: A = Concentration of analyte determined in the original sample; B = Added Concentration; and C = Calculated Concentration.	at least 2 SS recoveries to be within 70-130% subject to matrix effects (Organics) 80-120% (Inorganics / Metals) 60-140% (Organics) 10-140% (SVOC and Speciated Phenols) If the result is outside the above ranges, the result must be <3x Standard Deviation of the Historical Mean (calculated over the past 12 months).
Sample Matrix Spike Duplicates	Recovery RPD	<30% (Inorganics & Organics)
Calibration Check Standars	Continuous Calibration Verification (CCV)	CCV must be within ±15% (inorganics) CCV must be within ±25% (inorganics)
Reagent, Method & Calibration Check Blanks	Each blank is analysed as per the original samples.	Analytical Result <LOR/PQL

Note: PQL - Laboratory Practical Quantitation Limit (PQL) or the minimum detection limit for a particular analyte.
LOR = Limit of Reporting

Appendix I– QA/QC Assessment

I1QUALITY CONTROL PROGRAM

I1.1PROJECT QA/QC PROTOCOLS

The overall quality assurance comprises an assessment of the reliability of the field procedures and the laboratory results against standard industry practices, documented sampling and analysis plans or remediation action plans. A summary of the project QA/QC protocols to be followed during the investigation works is presented in **Table I-1.**

Table I-1QA/QC Protocols

Task	Description	Project
Field QA/QC		
General	Work was undertaken following standard field procedures which are based on industry accepted standard practice.	Groundwater samples were obtained using sample jars/vials provided by the laboratory.
	All fieldwork was supervised by a suitably qualified and experienced scientist or engineer.	Yes
Equipment decontamination / Rinsate Samples	Sampling equipment to be decontaminated after the collection of each soil sample by washing with phosphate-free detergent (such as Decon 90 or Alconox) and potable water, followed by a final distilled water rinse. One rinsate blank would be collected and analysed for the primary contaminants. All results should be non-detect.	Yes
Transport	Samples were stored in a chilled (with ice) cooler box and transported to the laboratories. To ensure the integrity of the samples from collection to receipt by the analytical laboratory, samples were sent by courier to the laboratories under 'chain of custody' describing sample preservation and transport duration.	Yes
Trip Blank	Trip blank sample was prepared and analysed by the primary laboratory for BTEX. Analytical results for trip blank sample below the laboratory PQLs, indicate that ideal sample transport and handling conditions are achieved.	Yes
Trip Spike	Trip spike sample was prepared and analysed by the primary laboratory for BTEX. Acceptance criteria of BTEX spike recoveries are between 70% - 130%.	Yes

Task	Description	Project
QA samples	Field duplicate samples were analysed as follows: ▪ intra-laboratory duplicate samples at a rate of 1 in 20 primary samples (as per NEPM); and ▪ inter-laboratory duplicate samples at a rate of 1 in 20 primary samples (as per NEPM). Field and laboratory acceptable limits between 30-50% RPD as stated by AS4482.1–2005. RPDs that exceed this range may be considered acceptable where: ▪ Results are less than 10 times the limits of reporting (LOR); ▪ Results are less than 20 times the LOR and the RPD is less than 50%; or ▪ Heterogeneous materials or volatile compounds are encountered. Non-compliance is to be documented in the report and the sample re-analysed or a higher level conservatively adopted.	Part The required sampling density of 1 per 20 duplicated primary samples was achieved and sufficient for the investigation. The intra-laboratory duplicate (GWQD2) and inter-laboratory duplicate (GWQT2) samples were collected from the primary sample BH2M-2 on 22 September 2020. Field QC samples and calculated RPD values are presented in **Table B.2**. The RPD exceedances were noted as follows: ▪ GWQD2 F2 (171.62%), F3 (163.64%) and F4 (160.00%). ▪ GWQT2 F2 (198.64%), F3 (197.51%) and F4 (191.55%). After retested TRH concentrations for the primary sample and duplicate sample (GWQD2), the RPD exceedances were as follows: ▪ GWQD2 F2 (97.25%), F3 (95.93%) and F4 (149.15%). ▪ GWQT2 F2 (198.15%), F3 (196.72%) and F4 (189.09%).
Laboratory QA/QC		
Laboratory analysis	The laboratories selected are NATA accredited for the analytes selected and perform their own internal QA/QC programs	Yes SGS - primary laboratory Envirolab - secondary laboratory The laboratory QA/QC reports are included in **Appendix H**.
	Appropriate detection limits were used for the analyses to be undertaken.	Practical Quantitation Limits for all tested parameters during this investigation are presented in summary tables **Table QC3** in **Appendix H.**
	Methods followed are generally in accordance with the requirements of NEPM (2013).	Yes
Holding Times	Holding times are the maximum permissible elapsed time in days from the collection of the sample to its extraction and/or analysis. All extraction and analyses should be completed within standard guidelines.	Assessment of holding times has been undertaken by the laboratory.
Method Blanks	The method blank sample is laboratory prepared, containing the reagents used to prepare the sample for final analysis. The purpose of this procedure is to identify contamination in the reagent materials and assess potential bias in the sample analysis due to contaminated reagents. The QC criterion aims to find no detectable contamination in the reagents. Each analysis procedure should be subject to a method blank analysis. The results of each should indicate that contaminants were not detected.	Assessment of method blanks has been undertaken by the laboratory.

Task	Description	Project
Laboratory Duplicates	Laboratory duplicates are field samples that are split in the laboratory and subsequently analysed a number of times in the same batch. These sub-samples are selected by the laboratory to assess the accuracy and precision of the analytical method. The selected laboratories should undertake QA/QC procedures such as calibration standards, laboratory control samples, surrogates, reference materials, sample duplicates and matrix spikes. Intra-laboratory duplicates should be performed at a frequency of 1 per 10 samples.	Assessment of laboratory duplicates has been undertaken by the laboratory.
Laboratory Control Standard	A laboratory control standard is a standard reference material used in preparing primary standards. The concentration should be equivalent to a mid-range standard to confirm the primary calibration. Laboratory control samples should be performed on a frequency of 1 per 20 samples or at least one per analytical run.	Assessment of laboratory control standards has been undertaken by the laboratory.
Matrix Spikes / Matrix Spike Duplicates	Matric spikes are field samples to which a predetermined stock solution of known concentration has been added. The samples are then analysed for recovery of the known addition. Recoveries should be within the stated laboratory control limits of 70 to 130% and duplicates should have RPDs of less than 50%.	Assessment of matrix spikes has been undertaken by the laboratory.
Surrogate Spikes	Surrogate spikes provide a means of checking, for every analysis that no gross errors have occurred at any stage of the procedure leading to significant analyte loss. Recoveries should be within the stated laboratory control limits of 70 to 130%.	Assessment of surrogate spikes has been undertaken by the laboratory.
Conclusion	The QA/QC indicators should either all comply with the required standards or showed no variations that would have no significant effect on the quality of the data.	Questions remain regarding the source/type of TRH, therefore an additional round of sampling is considered appropriate to confirm the groundwater results and potential vapour risk.

I1.2CALCULATION OF RELATIVE PERCENTAGE DIFFERENCE (RPD)

The RPD values were calculated using the following equation:

$$RPD = \frac{|C_O - C_R|}{[(C_O + C_R)/2]} \times 100$$

Where:

C_O = Concentration obtained for the primary sample; and

C_R = Concentration obtained for the blind replicate or split duplicate sample.

I2FIELD QA/QC DATA PROGRAM

I2.1FIELD QA

The field (intra- / inter- laboratory) duplicate samples collected during the works are summarised in **Table I-2**. Inter-lab duplicates were analysed by the secondary laboratory, Envirolab.

Table I-2Field QA Sampling Program

Activity	Matrix	No. Primary Samples	Primary Sample ID	Intra-Lab Duplicate ID	Inter-Lab Duplicate ID	No. of Duplicates
Field QA Samples - Duplicates						
GME	Water	1	BH2M-2	GWQD2	GWQT2	2
Other Field QA Samples						
GME	Water	GWQR2 - Rinsate GWTB2 – Trip blank GWTS2 – Trip spike				

I2.2Field Data Quality Indicators

A discussion of the field data quality indicators is presented below.

Table I-3Field Data Quality Indicators

QA/QC Measures	Field Data Quality Indicators	Conformance / Comments
Precision – A quantitative measure of the variability (or reproducibility) of data	Standard operation procedures appropriate and complied with	Yes
Completeness – A measure of the amount of useable data from a data collection activity	Each critical location sampled	Yes
	Samples collected at targeted locations and depth	Yes
	SAQP appropriate and complied with	Yes
	Experienced sampler	Yes

QA/QC Measures	Field Data Quality Indicators	Conformance / Comments
	Field documentation correct	Yes
Comparability – The confidence (expressed qualitatively) that data may be considered to be equivalent for each sampling and analytical event	Same sampling method used on each occasion/location	Yes
	Experienced sampler	Yes
	Climatic conditions (temperature, rainfall, wind)	Climate conditions were recorded to be fine. These climatic conditions unlikely had significant influence on the results of the investigation.
	Same type of samples collected (filtered, size, fractions)	Yes
Representativeness – The confidence (expressed qualitatively) that data are representative of each medium present onsite	Appropriate media sampled according to SAQP	Yes
	Each media identified in SAQP sampled	Yes
	Appropriate sample collection methodologies, handling, storage and preservation techniques used	Yes
	Consistency between field observations and laboratory results.	Yes
Accuracy – A quantitative measure of the closeness of reported data to the "true" value	Standard operation procedures appropriate and complied with	Yes
	Calibration of instruments against known standards	Yes

I2.3CONCLUSION FOR THE FIELD QA/QC

Based on the above review of the field QA/QC data EI considered the field QA/QC programme carried out during the investigations to be appropriate and the results to be acceptable, with the exception that non-compliance of QA samples was noted in TRH. Questions remain regarding the source/type of TRH, therefore an additional round of sampling is considered appropriate to confirm the groundwater results and potential vapour risk.

I3LABORATORY QA/QC

I3.1LABORATORY ACCREDITATION

Primary and intra-laboratory duplicate samples were analysed by SGS Alexandria Environmental, NSW; inter-laboratory triplicate samples were analysed by Envirolab, Chatswood NSW; all laboratories are accredited by NATA for the analyses undertaken.

A discussion of the laboratory DQIs is presented below.

Table I-4Lab Data Quality Indicators

QA/QC Measures	Laboratory Data Quality Indicators	Conformance/Comments
Completeness – A measure of the amount of useable data from a data collection activity	All critical samples analysed according to SAQP and proposal	Yes
	All analytes analysed according to SAQP in proposal	Yes
	Appropriate methods and PQLs	Yes
	Sample documentation complete	Yes
	Sample holding times complied with	Yes
Comparability – The confidence (expressed qualitatively) that data may be considered to be equivalent for each sampling and analytical event	Same sample analytical methods used (including clean-up)	Yes
	Same Sample PQLs	Yes
	Same laboratories (NATA-accredited)	Yes
	Same units	Yes
Representativeness – The confidence (expressed qualitatively) that data are representative of each medium present onsite	All key samples analysed according to SAQP in the proposal.	Yes
	Analysis of laboratory-prepared volatile trip spikes and trip blanks	Yes
Precision – A quantitative measure of the variability (or reproducibility) of data	Analysis of laboratory and inter-laboratory duplicates	Yes
	Analysis of field duplicates	Yes
Accuracy – A quantitative measure of the closeness of reported data to the “true” value	Analysis of rinsate blanks	Yes
	Analysis of reagent blanks	Not applicable
	Analysis of method blanks	Yes
	Analysis of matrix spikes (MS)	Yes
	Analysis of matrix spike duplicates (MSD)	Yes

QA/QC Measures	Laboratory Data Quality Indicators	Conformance/Comments
	Analysis of surrogate spikes	Yes
	Analysis of reference materials	Not applicable
	Analysis of laboratory control samples	Yes
	Analysis of laboratory-prepared spikes	Yes

Overall, it is considered that the laboratory data quality objectives for this project have been attained.

I3.2CONCLUSIONS ON LAB QA/QC

Based on the laboratory QA/QC results, the data confirms that the analytical results for the various phases of laboratory testing were valid and useable for interpretation purposes.

I4Summary of Project QA/QC

The sampling methods (including sample preservation, transport and decontamination procedures) and laboratory methods followed during this investigation works were mostly consistent with EI protocols and meeting the DQOs for this project. Some discrepancies from the DQOs were reported, it is therefore considered that additional round of sampling is warranted to confirm the groundwater results.

Appendix J– Groundwater Take Assessment

30 September 2020
E24445.G12

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Groundwater Take Assessment
Tallawong Station Precinct South, Rouse Hill, NSW

1. INTRODUCTION

1.1. BACKGROUND

At the request of Mr. Greg Colbran of Deicorp Pty Ltd (the Client), EI Australia (EI) has prepared this Groundwater Take Assessment (GTA) for Tallawong Station Precinct South, Rouse Hill, NSW (the site).

EI had previously prepared a Geotechnical Investigation (GI) report for the site, referenced E24445.G03_Rev1, dated 15 April 2020. An Additional Groundwater Investigation (AGI), referenced E24445.E17, is being completed concurrently with this GTA report. This GTA report should be read in conjunction with the GI and AGI reports.

1.2. PROPOSED DEVELOPMENT

The following documents were used to assist in the preparation of this analysis:

- Architectural Drawings by TURNER, Project No.: 18095, Drawing Nos.: DA-110-06, DA-110-010, DA-110-008, DA-110-010 and DA-110-020, Revision V, dated 8 April 2020 and Drawing Nos DA-110-030, DA-110-040, DA-110-050, DA-110-060, DA-110-070, DA-110-080, DA-110-090 and DA-110-100, Revision J, dated 8 April 2020.
- Site Survey Plan, prepared by Daw & Walton Consulting Surveyors, Project No: 4900-20, Sheets 1-7, Revision 03, dated 3 April 2020. The datum in the survey plan is in Australian Height Datum (AHD), hence all Reduced Levels (RL) mentioned in this report are henceforth in AHD.

Based on the provided documents, EI understands that the proposed mixed use development involves the construction of up to 16 buildings of varying heights, to a maximum of eight storeys, with up to two to three basement levels and interconnected roadways and landscaped areas including a private park. Four separate basements are shared by the buildings.

The lowest basement levels are proposed to have finished floor levels (FFL) ranging between RL 44.500m and 49.500m. Bulk Excavation Levels (BEL) ranging between RL 44.20m and 49.20m have been assumed, which includes allowance for the construction of the basement slab. To achieve the BEL, excavation depths ranging from 5.10m Below Existing Ground Level (BEGL) to 13.3m (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 PERMEABILITY

For the purpose of the groundwater take assessment, the average subsurface conditions outlined our geotechnical investigation report (E24445.G03_Rev1, dated 5 June 2020) 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]	Model 1 (Site 1, North)		Model 2 (Site 2, South)		Adopted Permeability (m/s)
	Depth to Top of Unit (m BEGL) [2]	Approximate RL of Top of Unit (m AHD) [2]	Depth to Top of Unit (m BEGL) [2]	Approximate RL of Top of Unit (m AHD) [2]	
Fill [3]	0	56.9	0	54.4	1×10^{-6}
Residual Soil [3]	3.7	52.7	1.4	52.9	1×10^{-9}
Shale [4]	4.6	52.4	3.5	51.1	H: 2.4×10^{-7} V: 2.4×10^{-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 most conservative 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 Bedrock was calculated based on the average result of the pump out test carried out by EI.

The permeability the Shale/Laminite bedrock was 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

As part of the GI and AGI scope, EI had installed 10 monitoring wells (BH1M, BH2M, BH3M, BH7M, BH8M, BH11M, BH13M, BH201M, BH202M and BH203M) for groundwater monitoring. EI carried out a Pump out Test on 23 September 2020 within six of the monitoring wells installed by EI. Groundwater was observed to be at depths of between 1.6m and 8.6m BEGL (RL 48.9m and 54.6m) which were typically along the residual soil/rock interface.

Table 2 Monitoring Well Details and Pump Out Test Results

Monitoring Well/ Test 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)
BH7M	8.0	6	Shale/Laminite	23-Sept-2020	48.9	9.5×10^{-8}
BH8M	7.0	3	Shale	23-Sept-2020	49.4	1.4×10^{-7}
BH11M	11.6	6	Shale/Laminite	23-Sept-2020	52.8	8.3×10^{-9}
BH13M	7.0	3	Shale	23-Sept-2020	54.6	1.2×10^{-6}
BH201M	9.6	3	Shale	23-Sept-2020	50.6	8.1×10^{-9}
BH203M	9.1	3	Shale	23-Sept-2020	50.2	9.5×10^{-9}

To account for any groundwater level fluctuations due to seasonal variation, design groundwater should be considered 1m above the average recorded groundwater levels for each basement. We have conservatively assumed that design groundwater level for Model 1 and Model 2 to be at RL 51.4m and RL 52.4m AHD with the absence of long-term monitoring.

2.3. SHORING SYSTEM

At the time of this assessment, no detailed structural designs were available. Hence, the following shoring system was assumed for the model based on the recommendations of the GI:

- Solider pile wall: Piles will be socketed 1m into at least Class II/III bedrock.
- Vertical sandstone excavation below the soldier pile wall

Groundwater is assumed to be freely draining between the soldier piles and through the defects of the vertical sandstone excavation.

This assessment does not assess the overall stability and embedment depth of the shoring system. 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 and until the dewatering is turned off.

For the purpose of this modelling, it has been assumed that:

- Two models were undertaken to estimate the flows into the basements:
    - **Model 1**: The area for the two to three-level basement underneath Buildings 1A.1 and 1B.3 (Site 1), located in the northern half of the site, and
    - **Model 2**: The area for a three, two to three-level basement underneath Buildings 2A.2, 2A.3, 2B.1, 2C.1, 2C.2, 2D.1, 2D.2, 2D.3 and 2E.1 (Site 2), located in the southern half of the site. The three basements were modelled as one large basement for the purpose of this assessment.
- The subsurface conditions were horizontal along the site. The permeability values presented in **Table 1** above were adopted for each unit.
- The soldier pile shoring walls are assumed to be permeable and free to drain.
- The vertical sandstone excavations were modelled as freely draining.
- For the simplicity of this model, temporary dewatering will be undertaken within the basements retaining wall perimeter to BEL, or about RL 45.7m (Model 1) and RL 44.2m (Model 2).
- External design groundwater levels of RL 51.4m (Model 1) and RL 52.4m (Model 2) were assumed to be constant at 75m away from the shoring wall.
- A “No-Flow” boundary is defined along the symmetric line (the centre of the excavation), at 45m (Model 1) and 50m (Model 2) from the perimeter shoring wall.
- The shoring walls surrounding the basement excavation has a maximum length of about 510m (Model 1) and 680m (Model 2).
- The basement will be constructed in 150 days.

The SEEP/W model is presented in **Appendix A. Table 3** below provides the estimated groundwater inflow rate into the basement.

Table 3 Summary of Analysis Results

Model	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/150 days)
Site 1	1.87×10^{-7}	0.016	8.23	1.23
Site 2	2.81×10^{-7}	0.024	16.53	2.48

3.2. ASSESSMENT OF GROUNDWATER TAKE DURING OPERATIONAL PHASE

A drained basement using sub-soil drainage and a sump-and-pump system was assumed. 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 3.01ML per year for Stage 1 and 6.03ML per year for Stage 2.

4. CONCLUSIONS AND COMMENTS

Based on the findings of this report and within the limitations of available data, EI concludes that:

- Construction and operational phase groundwater take will be approximately:
  - Stage 1: 1.23ML / 150 days during construction and 3.01ML / year during operation
  - Stage 2: 2.48ML / 150 days during construction and 6.03ML / year during operation
- The above estimate is based on the following assumptions:
  - The soldier pile shoring walls are assumed to be permeable and free to drain, and the vertical sandstone excavation was modelled as freely draining
  - Temporary dewatering will be undertaken within the basement retaining wall perimeter to BEL, or about RL 45.7m (Model A1) and RL 44.2m (Model A2).
  - The basement walls and slab are designed as drained for the developments lifetime.
  - Construction of the basement will take 150 days.
  - 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.
- In our opinion, the drawdown as a result of the dewatering will have negligible, if any, adverse impact on the neighbouring properties.
- Based on our assessment, considering the size of the proposed basements the groundwater volumes expected per year appear to be manageable using a drained basement system for its lifetime. Hence in our opinion “tanking” of the basement is not warranted and a drained basement is possible for the development.
- Should any design or construction conditions differ from that adopted in this report; this GTA should be reviewed and updated as required.

5. LIMITATIONS

The advice and parameters presented in this Groundwater Take Assessment are for preliminary assessment of the expected groundwater take based upon the proposed development and encountered site conditions of the previous GA. This report is not a dewatering management plan. This assessment does not assess the overall stability of the assumed shoring system. The shoring system will need to be designed to satisfy stability, piping, founding and groundwater cut-off considerations by the structural engineer. A suitably qualified dewatering contractor should be engaged to confirm dewatering requirements.

Your attention is drawn to the document “Important Information”, attached as **Appendix B** at the end of this letter report. The statements presented in this document are intended to advise you of what your realistic expectations of this report should be. The document is not intended to reduce the level of responsibility accepted by EI, but rather to ensure that all parties who may rely on this report are aware of the responsibilities each assumes in so doing.

This letter report was prepared by EI for the sole use of Deicorp Pty Ltd for the particular project and purpose described. No responsibility is accepted for the use of any part of this letter report in any other content or for any other purpose.

EI has used a degree of care, skill and diligence normally exercised by consulting engineers in similar circumstances and locality and has relied on the accuracy of information provided by Deicorp Pty Ltd. No other warranty expressed or implied is made or intended.

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6. CLOSURE

Please do not hesitate to contact the undersigned should you have any questions.

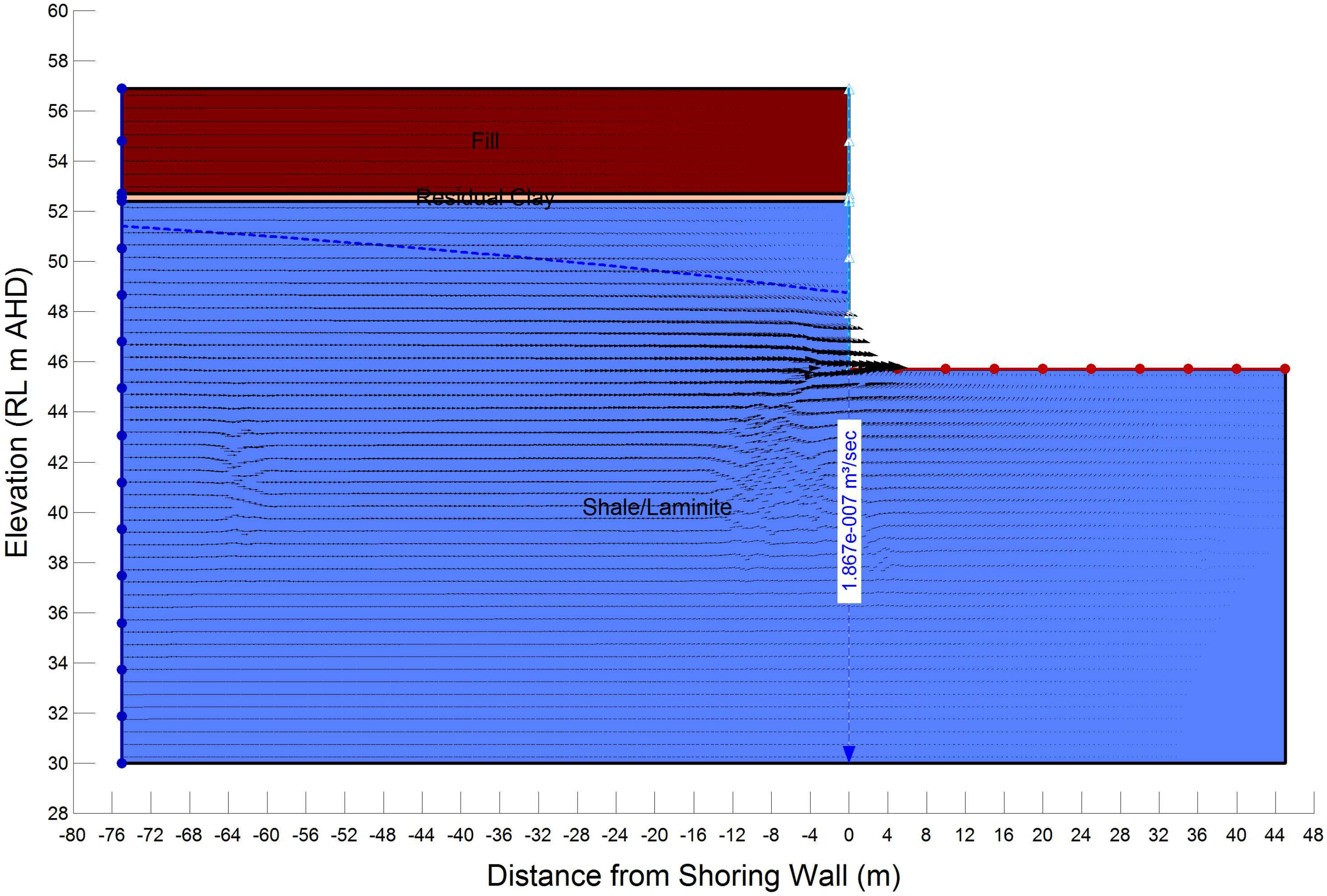
For and on behalf of:
EI AUSTRALIA

Authors	**Technical Reviewer**
Stephanie Liew Geotechnical Engineer	**Stephen Kim** Senior Geotechnical Engineer

Attachments: Appendix A – Seep/W Model Results
Appendix B – Important Information

APPENDIX A

Seep/W Model



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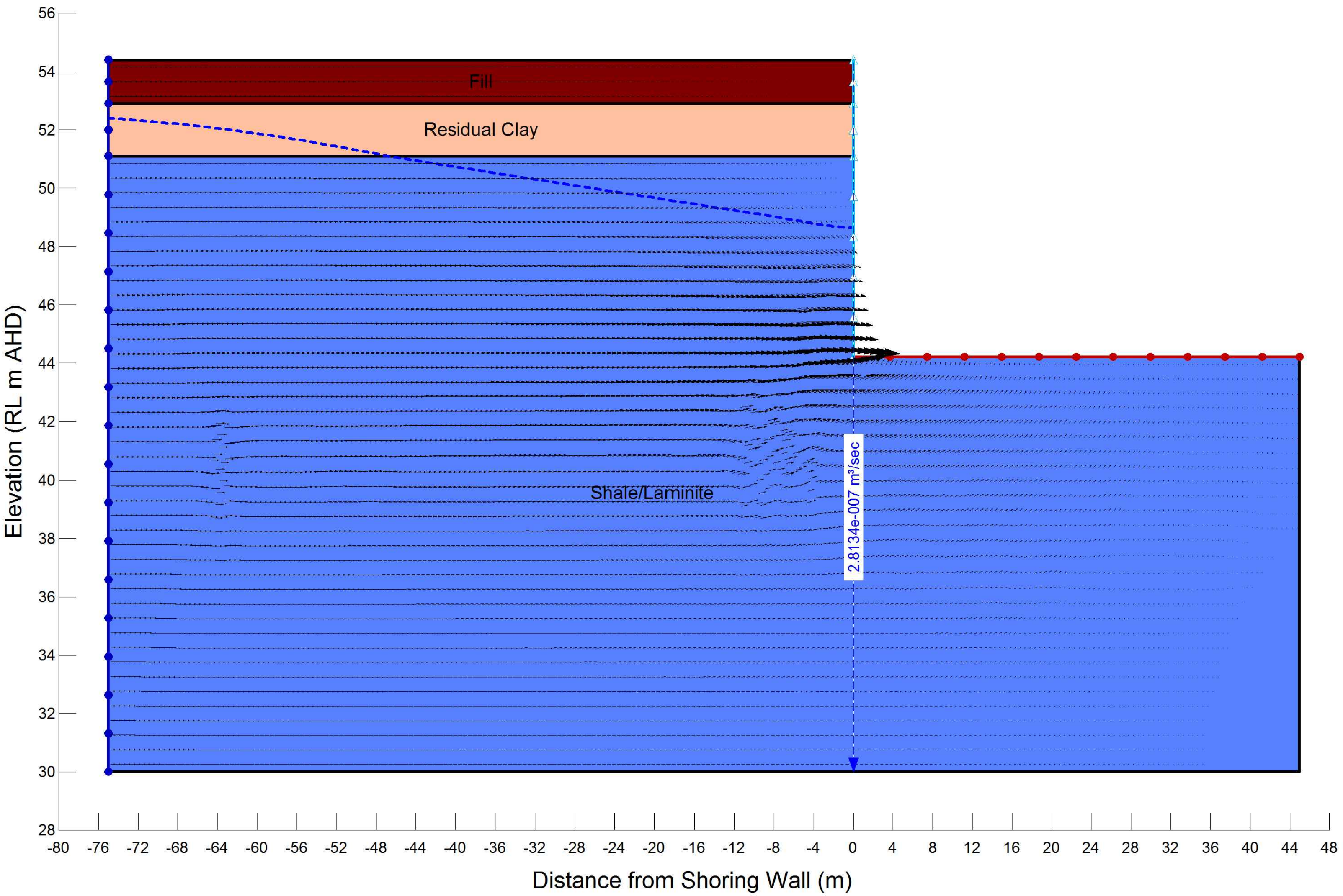
Approx Scale:	As Shown

Deicorp Pty Ltd
Groundwater Take Assessment
Tallawong Precinct South, Rouse Hill, NSW
SEEP/W Model and Results - Site 1

Appendix:
A1

Project: E24445.G12



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Date:	30/09/20
Approx Scale:	As Shown

Deicorp Pty Ltd
Groundwater Take Assessment
Tallawong Precinct South, Rouse Hill, NSW
SEEP/W Model and Results - Site 2

Appendix:
A2

Project: E24445.G12

APPENDIX B

Important Information

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.