TETRA TECH COFFEY

Level 19, Tower B, Citadel Tower, 799 Pacific Highway
Chatswood
NSW 2067 Australia

t: +61 2 9406 1000
f: +61 2 9415 1678
tetratechcoffey.com

17 October 2022

Our ref: SYDGE308795AB M1 Rev 1

Holdmark NSW Pty Ltd
Suite 2/2-4 Giffnock Avenue
Macquarie Park NSW 2113

Attention: Marvin Huang

Dear Marvin,

4-6 Bligh Street, Sydney – Response to SEARs for Issues 13 and 17 for SSD-48674209

Holdmark NSW Pty Ltd (Holdmark) commissioned Tetra Tech Coffey Pty Ltd (Coffey) to address Planning Secretary's Environmental Assessment Requirements (SEARs) for Issues 13 and 17, which are reproduced below. The proposed development site for a mixed-use hotel at 4-6 Bligh Street, Sydney (the site) is identified as Lot 1 in Deposited Plan 1244245. This site is within the City of Sydney local government area. Holdmark's development application is identified as SSD-48674209.

This letter presents Coffey's responses to issues regarding ground and water conditions (Issue 13) and contamination and remediation (Issue 17), which have been prepared by suitably qualified and experienced environmental professionals. Coffey's responses are based on results and reports from its previous environmental and geotechnical investigations at the site and observation of current groundwater levels.

ISSUE 13. GROUND AND WATER CONDITIONS

Assessment Requirements	Documentation
Assess potential impacts on soil resources and related infrastructure and riparian lands on and near the site, including soil erosion, salinity and acid sulfate soils. Provide a Surface and Groundwater Impact Assessment that assesses potential impacts on: • surface water resources (quality and quantity) including related infrastructure, hydrology, dependent ecosystems, drainage lines, downstream assets and watercourses • groundwater resources in accordance with the Groundwater Guidelines	• Surface and Groundwater Impact Assessment • Salinity Management Plan and/or Acid Sulfate Soils Management Plan

Soil resources

The site is at the northern end of the Sydney central business district and is currently occupied by a multi-storey building with two basement levels which extend over the entire site. Coffey's geotechnical investigation, reported in November 2018 (reference SYDGE205019-AD Rev0), found that the ground conditions below the lower basement concrete floor included no natural soil with quarried stone aggregate providing a levelling layer directly above sandstone bedrock.

Consequently, the potential for soil erosion from the site is eliminated as well as saline soil and/or acid sulfate soil not being present. Coffey concludes that the potential impacts on soil resources and related infrastructure and riparian lands on and near the site does not exist because the soil has not been retained on the site. The related management plans are therefore not applicable.

Surface water resources

The natural ground surface over the site has been excavated for the construction of the existing two-level basement. Existing development of the Sydney central business district (CBD) around the site has modified environmental conditions to the extent that surface water is present on the site and surrounds during rain events only. This water is managed through the Council's stormwater drainage system which, in the vicinity of the site, flows into the Tank Stream which ultimately discharges into Sydney Cove at Circular Quay.

The proposed development would not materially alter the quantity or quality of surface water generated from the site during rainfall events. Quality of discharged water may be improved by any first-flush retention device required under current Council management plans. Because the quality and quantity of water discharged from the site is reasonably expected to be the same as that from the existing premises during rainfall events, the potential for change in impact related to surface water is negligible.

Groundwater resources

Coffey's geotechnical investigation (report as cited earlier) included three investigation borings to depths of approximately 20 metres below the current street level. After recovery of cored rock (sandstone and shale), each borehole was used for installation of a piezometer, which is a slotted pipe allowing observation of groundwater level and collection of groundwater samples. Groundwater quality was assessed to be typical of that found in a Hawkesbury sandstone aquifer, with very low concentrations of petroleum hydrocarbons attributed to an off-site source. Hawkesbury sandstone of the rock quality observed beneath the site is associated with low yielding aquifers, which means that extraction of groundwater for beneficial use is not practicable. The land surrounding the site is intensively developed for high-rise buildings with basement levels and underground infrastructure including major tunnels for road and rail transport.

In general, groundwater prior to European settlement is expected to have flowed from the site to the north with seepage occurring into the Tank Stream and/or Sydney Cove. Development of the area around the site includes buildings with basement levels and underground infrastructure including major tunnels which have the potential to intersect groundwater and result in localised effects on groundwater flow and levels.

Site observations – observed groundwater levels

A Coffey engineer visited site on 13 October 2022 and measured groundwater levels at three existing piezometers, BH101, BH102 and BH103. The results are shown in Table 1 and the piezometer locations are shown in Figure 1.

Table 1: Groundwater levels observed on 13 October 2022

Piezometer location	Surface elevation (m AHD)	Casing stickup (m above ground)	Depth to water (m below top of casing)	Date and time	Groundwater level (m AHD)
BH101	17.9	-0.11	11.45	13 Oct 22 9:55am	6.3
BH102	17.9	-0.08	10.69	13 Oct 22 9:45am	7.1
BH103	12.8	-0.08	5.47	13 Oct 22 10:00am	7.3

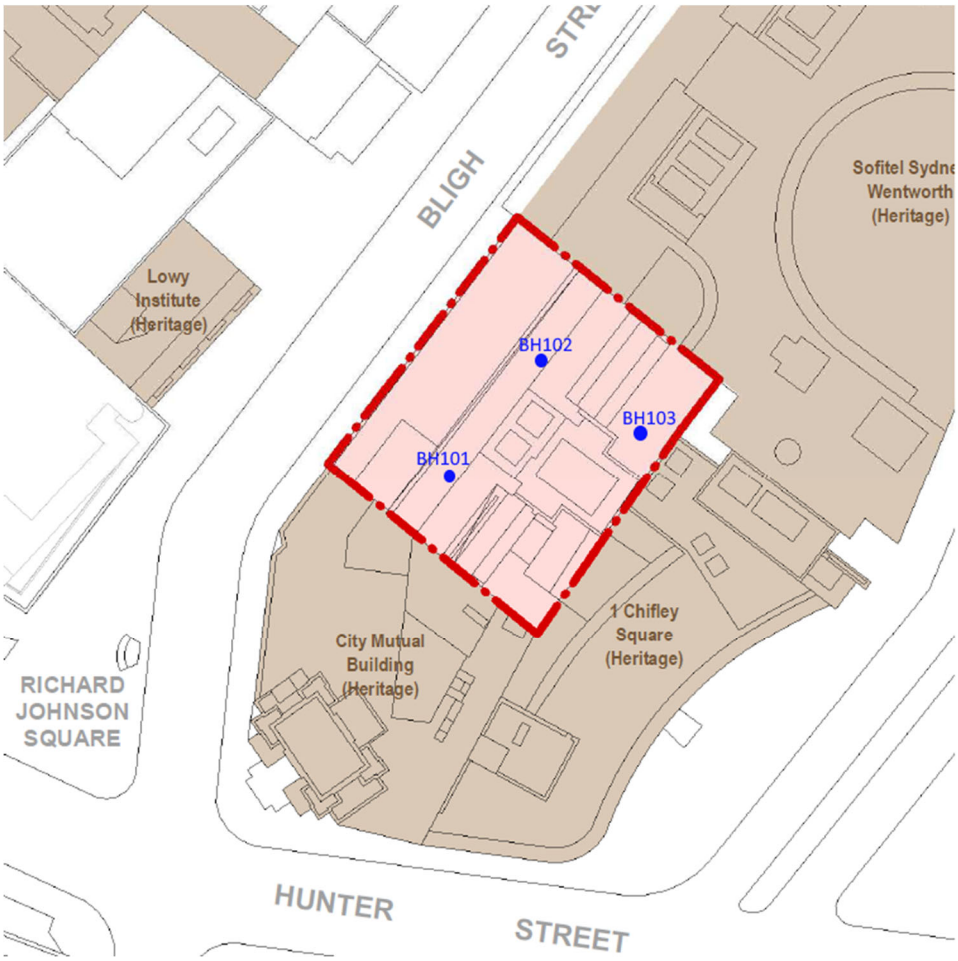


Figure 1: Piezometer locations

It is noteworthy that these levels were observed following nine months of “very much above average” rainfall in the Sydney region (source: Bureau of Meteorology), refer to Figure 2, and can therefore be assumed to represent groundwater levels higher than the long term average.

The current two-level basement does not penetrate the groundwater table. An extension of the basement at the site to provide four levels is expected to intersect approximately the top metre of the groundwater table.

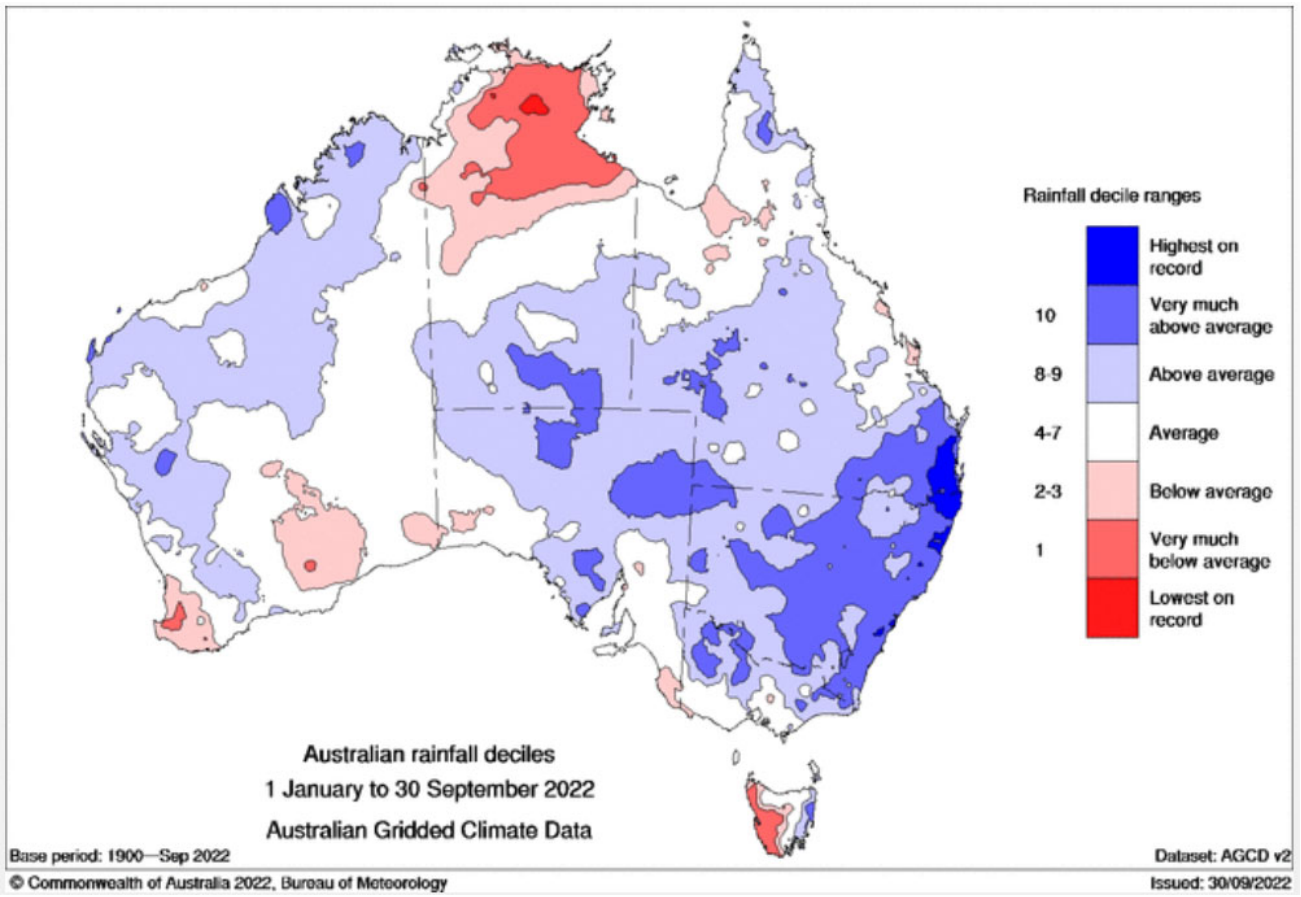


Figure 2: Australian rainfall deciles for 1 Jan 2022 to 30 September 2022

Groundwater inflow assessment

A steady state groundwater inflow assessment for the case of an extension of the basement at the site to provide four levels was carried out. The assessment assumed a design groundwater level of 7.5 m AHD, a bulk excavation level of 6.0 m AHD with excavation footprint dimensions of 37 m x 32 m, and a hydraulic conductivity of the bedrock of 5 x 10^{-7} m/s.

The assessed inflows to the excavation are less than 2.5 megalitres (ML) / year.

The adopted hydraulic conductivity for sandstone / shale bedrock of 5 x 10^{-7} m/s is considered conservative based on our experience with inflows to similar basements in the Sydney CBD. In particular, the observed core in the three investigation borings (report as cited earlier) does not indicate the presence of adverse fracturing in the sandstone / shale around and below the area of the proposed basement.

The details of the inflow assessment are included as an attachment, which also includes a second alternative case for inflows being captured by a lift core at an elevation of 3.8 m AHD, rather than being captured by the basement.

Water NSW provides for a water access licence exemption for aquifer interference activities taking 3ML or less of groundwater per year. Under the exemption, a person can take up to 3 ML of groundwater through an aquifer interference activity per authorised project per water year without needing to obtain a water access licence, provided:

a) the water is not taken primarily for consumption or supply; and

b) the person claiming the exemption keeps a record of the water taken under the exemption and provides this to the Minister within 28 days of the end of the water year; and

c) the records are kept for 5 years.

In relation to the potential for groundwater induced settlement impacts, an extension of the basement at the site to provide four levels would lead to around 1.5 m of groundwater drawdown in the bedrock at the excavation (assuming a design groundwater level of 7.5 m AHD, a bulk excavation level of 6.0 m AHD) and lesser drawdowns away from the excavation. A consideration of typical compressibility parameters for Sydney sandstone / shale indicates that this amount of drawdown in bedrock would result in negligible groundwater induced settlement.

The future basement is proposed for car parking and certain services which are considered to pose no unacceptable impact to groundwater quality.

Given the above discussion and considering groundwater resources in the context of the site's location in the northern part of the Sydney CBD, Coffey concludes that impact to groundwater resources for inclusion of a four-level basement would have negligible groundwater related impacts and that a water access licence would not be required.

Summary for Issue 13 Assessment Requirements

- the current premises on the site covers the entire site;
- the current premises includes a two-level basement which resulted in elimination of natural soil from the site;
- the proposed four-level basement development makes no material change to surface water management on or around the site;
- the site is located in an intensely developed area which includes major subsurface infrastructure, the proposed for basement for car parking and services is considered to pose no unacceptable impact to groundwater quality.

ISSUE 17. CONTAMINATION AND REMEDIATION

Assessment Requirements	Documentation
In accordance with Chapter 4 of SEPP (Resilience and Hazards) 2021, assess and quantify any soil and groundwater contamination and demonstrate that the site is suitable (or will be suitable, after remediation) for the development.	• Preliminary Site Investigation If required: • Detailed Site Investigation • Remedial Action Plan • Preliminary Long-term Environmental Management Plan

Coffey has completed and reported:

- Preliminary Site Investigation, 4-6 Bligh Street, Sydney (reference SYDEN205070-R01, dated 7 July 2017), and
- Detailed Site Investigation, 4-6 Bligh Street, Sydney (reference SYDEN205070-R02, dated 3 December 2018).

Based on the findings of these contamination investigations and interpretation of that information in the context of the proposed development, Coffey concluded that the site is suitable for the proposed commercial development. Given that no widespread contamination was identified across the site, and that petroleum hydrocarbon impact to groundwater appears to be low and not attributable to a release from the disused fuel storage tank in the existing basement, Coffey considers that remediation and/or long-term management is not warranted.

Summary for Issue 17 Assessment Requirements

Existing contamination assessment addressed Issue 17 and we confirm that current conditions on the site indicate that conditions as assessed in 2018 remain applicable.

Limitations

Coffey assessed the site and issued environmental assessment reports including a statement titled “Important information about your Coffey environmental report”. That statement also applies to information reported in this letter.

For and on behalf of Tetra Tech Coffey,

Dr Michael Dunbavan
Senior Principal Consultant, CEnvP-SC

Attachment A - Inflow assessment_details

Attachment B - Detailed Environmental Site Investigation - 4-6 Bligh Street, Sydney

Attachment A - Groundwater Inflow Assessment

PARAMETERS

no flow level	-20	m AHD
design gwl	7.5	m AHD
k	5.0E-07	m/s

Theim-Dupuit equation for steady-state inflow

$$Q = \frac{\pi k(H^2 - h^2)}{\ln(\frac{R}{r})}$$

Note:
Case 1 and Case 2 are separate inflow cases and are not to be added together

CASE 1 - inflow to basement level 4

BEL	6	m AHD
L	37	m
W	32	m
r (equiv)	19.4	m
R - Radius of influence	250	m
H	27.5	m
h	26	m
Inflow	4.9E-05	m3/s
	0.05	L/s
	4.26	m3/day
	1.6	ML/yr

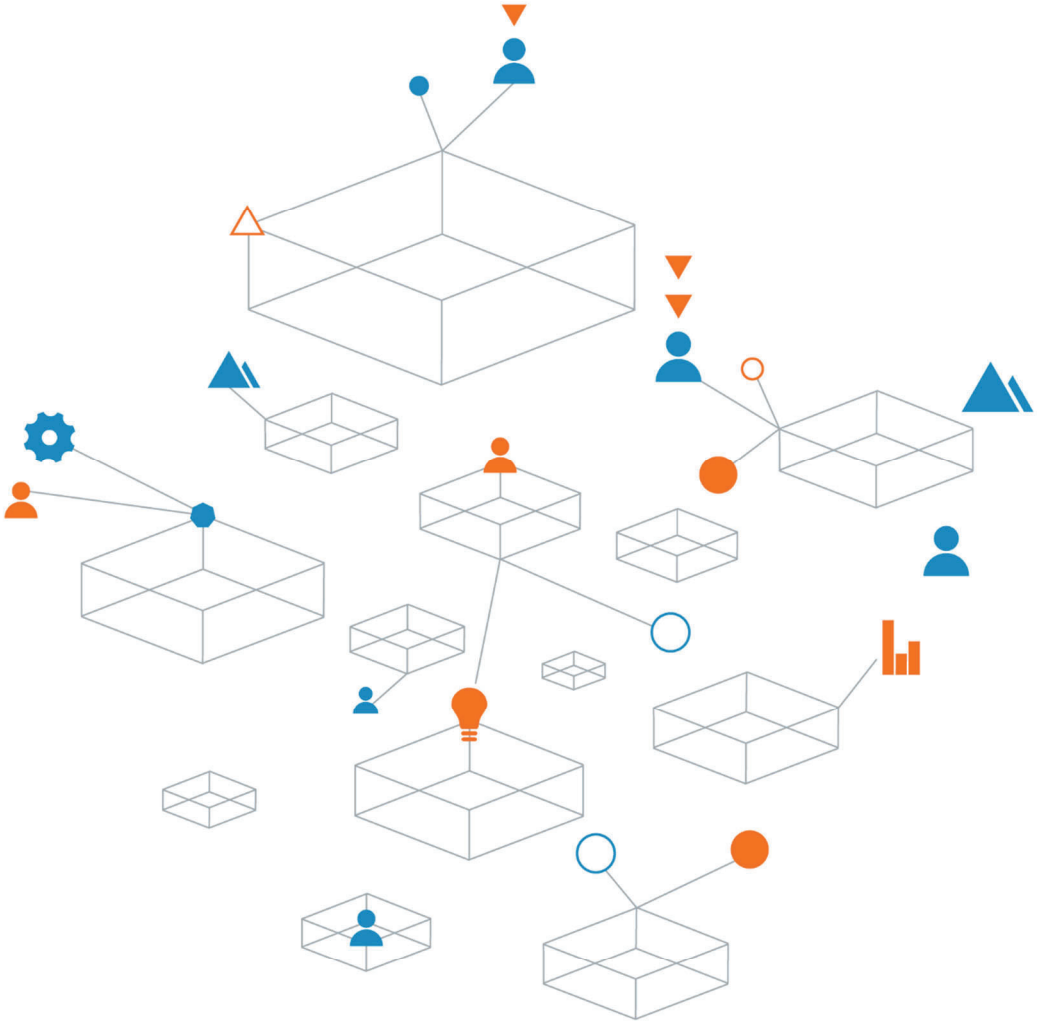
CASE 2 - inflow to lift core

BEL	3.8	m AHD
L	3.3	m
W	2.8	m
r (equiv)	1.7	m
R - Radius of influence	100	m
H	27.5	m
h	23.8	m
Inflow	7.3E-05	m3/s
	0.07	L/s
	6.34	m3/day
	2.3	ML/yr

Attachment B -
Detailed Environmental Site Investigation - 4-6 Bligh Street, Sydney

HOLDMARK

Detailed Environmental Site Investigation
4-6 Bligh Street, Sydney



Trust is the cornerstone of all our projects

This page has been left intentionally blank

Detailed Environmental Site Investigation 4-6 Bligh Street, Sydney

Prepared for
HOLDMARK

Prepared by
Coffey Services Australia Pty Ltd
Level 19, Tower B, Citadel Tower, 799 Pacific Highway
Chatswood
NSW 2067 Australia
t: +61 2 9406 1000 f: +61 2 9415 1678
ABN 55 139 460 521

17 Oct. 2022

SYDEN205070

R03

Quality information

Revision history

Revision	Description	Date	Originator	Approved
Draft	Initial Draft	30/11/2018	E. Hafsteinsdottir	M. Dunbavan
R02	Issued as final	03/12/2018	E. Hafsteinsdottir	M. Dunbavan
R03	Reviewed	17/10/2022	Matthew Locke	M. Dunbavan

Distribution

Report Status	No. of copies	Format	Distributed to	Date
Draft	1	PDF	Coffey – Rosanna Petteno	30/11/2018
Final	1	PDF	Coffey – Rosanna Petteno	03/12/2018
Reviewed	1	PDF	HOLDMARK	17/10/2022

Table of contents

Tables

Figures

Appendices

Abbreviations

AHD	Australian Height Datum
ASC NEPM	National Environmental Protection (Assessment of Site Contamination) Measure
ASS	Acid Sulfate Soil
bgl	below ground level
BTEX	Benzene, Toluene, Ethylbenzene and Xylenes
CoPC	Contaminant of Potential Concern
DBYD	Dial-Before-You-Dig
DP	Deposited Plan
DQO	Data Quality Objective
Eurofins	Eurofins Environment Testing Australia Pty Ltd, trading as Eurofins MGT
HSL	Health Screening Level
LOR	Limit of Reporting
mbgs	metres below ground surface
NATA	National Association of Testing Authorities
NEPC	National Environment Protection Council
NSW EPA	New South Wales Environment Protection Authority
NSW OEH	New South Wales Office of Environment & Heritage
PAH	Polycyclic Aromatic Hydrocarbon
PID	Photo-ionisation Detector
QA	Quality Assurance
QC	Quality Control
RL	Reduced Level
RPD	Relative Percent Difference
SOP	Standard Operating Procedures
SWL	Standing Water Level
TPH	Total Petroleum Hydrocarbon
TRH	Total Recoverable Hydrocarbon
VOC	Volatile Organic Compound

Executive Summary

One Investment Management Pty Ltd as trustee for Recap Management No. 4 Trust (Recap) is proposing to redevelop the existing property at 4-6 Bligh Street, Sydney (the site) into a modern hotel and commercial high-rise development. Coffey Services Australia Pty Ltd (Coffey), has been appointed by Recap to undertake a Detailed Environmental Site Investigation (DESI) for the site in response to a Preliminary Site Investigation (PSI) undertaken by Coffey in 2017, which identified potential contamination at the site, and City of Sydney Council's comments on the contamination.

The DESI works were carried out in conjunction with geotechnical investigations at the site. Following drilling of three boreholes at the site they were converted into groundwater wells; BH101, BH102 and BH103. Groundwater levels were measured and groundwater samples were collected from these three wells by a Coffey Environmental Consultant on 12 November 2018.

- Plan to manage any unexpected contamination encountered during excavation at the site.

Based on the review of available data, observations made during fieldwork and an assessment of laboratory analytical data, Coffey concludes that:

- No soil is present in a material quantity below the current basement levels;
- Petroleum hydrocarbon (TRH) impacted groundwater is present at the site, up-gradient of the disused fuel tank, but no volatile hydrocarbons (defined as TRH F1, BTEX and naphthalene) were reported and dissolved TRH F2 was reported at low concentrations (<0.05 to 0.27 mg/L);
- The source of the petroleum hydrocarbons is unknown and remains as a data gap. However, concentrations are unlikely to be derived from the disused fuel tank due to no detectable TRH reported in BH103, downgradient of the impacted locations (BH101 and BH102). However, we recommend removal of this tank prior to demolition, to avoid any potential residual fuel spillage;
- Groundwater is present within the sandstone bedrock, which is approximately 6m beneath the current basement level. The proposed development includes four basement levels, with the lowest basement level proposed at 6.01mAHD, approximately 1.5 m below the groundwater table;
- Associated potential human health and ecological risk (including potential vapour intrusion risk) is considered to be low due to the absence of TRH F1, BTEX and naphthalene, relatively low concentrations of TRH F2 and the air exchange rates required for use of the basement for car parking.

In summary, based on the findings of the investigation and in consideration of the key factors outlined above, Coffey concludes that the site is suitable for the proposed commercial development. Given that no widespread contamination was identified across the site, and that petroleum hydrocarbon impact to groundwater appears to be low and not attributable to a release from the disused UST in the sub-basement, Coffey considers that a RAP is not warranted. As a precaution against localised unidentified contamination, we recommend:

- Preparation and implementation of a Construction Environmental Monitoring Plan which includes an Unexpected Finds Protocol (UFP), to manage any unexpected contamination encountered during excavation at the site; and
- Confirmation of acceptable health risk related to petroleum impacted groundwater seepage into the lowest basement level when the structural detail for walls of that basement level and system for management of groundwater seepage is selected.

Any use of information in this report must consider the uncertainties outlined in *Important Information about your Coffey Environmental Report*, which follows Section 11.

1. Introduction

One Investment Management Pty Ltd as trustee for Recap Management No. 4 Trust (Recap) intends to redevelop the existing property at 4-6 Bligh Street, Sydney (the site) into a modern hotel and commercial high-rise development. Coffey Services Australia Pty Ltd (Coffey), was appointed by Recap to undertake a Detailed Environmental Site Investigation (DESI) for the site subsequent to a Preliminary Site Investigation (PSI) completed by Coffey in 2017, which identified potential contamination at the site, and to address City of Sydney Council's comments on that issue. Coffey understands that this DESI report is intended to form part of the responses to relevant authorities to support the Development Application (DA) for the redevelopment of the site.

This report has been carried out in general accordance with Coffey's proposal dated 23 October 2018 (ref: 754-SYDGE205019-AC Rev04), guidance made or endorsed by NSW Environment Protection Authority under section 105 of the *Contaminated Land Management Act 1997* (CLM Act) including the NSW Office of Environment and Heritage (NSW OEH, 2011) Guidelines for Consultants Reporting on Contaminated Sites.

1.1. Background and Development Description

At the time of investigation, the site was occupied by a multi-storey commercial building with a two-level basement that was used for car parking and building plant storage. Based on the Architectural Package (dated 2 June 2017) developed by Architectus (included in Appendix A), Coffey understands that the development will require demolition of the existing site structure, excavation of an additional basement level and the construction of a high-rise building.

The current building consists of a multi-storey commercial building with 19 floors office space above ground floor commercial and retail premises, overlying one level of basement car-parking and one level of building plant room. The proposed basement configuration will be four levels of basement including loading, car parking and plant room on basement level B1. Thus, excavation of another basement level is required to achieve the lowest basement design floor level of 6.01 m AHD. The development will include ground floor commercial and retail premises, two floors of function rooms and/or gyms, seven levels of commercial offices and meeting/conference rooms. Hotel levels will extend up to 46 floors (including two floors of plant rooms), with a business club, roof terrace and mezzanine level occupying the 45th - 47th floors. The 48th floor will be occupied by building plant.

Recap has lodged a planning proposal to redevelop the site. This proposal is subject to evaluation against extant planning policies including:

- State Environmental Planning Policy 55 – Remediation of Land (SEPP55) 1998; and
- City of Sydney Development Control Plan (DCP) 2012.

The planning policies above state that when determining a planning instrument, the determining authority should consider whether the land is suitable or can and will be made suitable for the proposed use.

Coffey (2017) previously prepared a PSI report for the site (ref. SYDEN205070-R01) that accompanied the planning proposal. The PSI report identified several potential sources of contamination at the site, including an underground storage tank (UST) for fuel and related fill points along the Bligh Street footpath. Subsequent information provided by the client and site reconnaissance confirmed the presence of a disused fuel storage tank within the sub-basement. Following these findings, Council has requested further investigation into these potential sources of contamination. Coffey understands that this DESI report is intended to form part of the responses to relevant authorities to support the DA, with a State Significant Development Application (SSDA) lodged in the future.

Concurrent to the DESI presented herein, Coffey has also undertaken geotechnical investigations at the site as part of the DA process and issued a separate Geotechnical Investigation Report (ref. SYDGE205019-AD Rev0).

1.2. Objectives

The objectives of the DESI were to:

- Carry out an environmental assessment in response to Council's concerns about potential contamination identified during the PSI;
- Refine the assessment of contamination risks associated with the identified fuel tank; and,
- Provide an opinion on the suitability for the site for the proposed development in accordance with SEPP55.

1.3. Scope of Investigation

The scope of investigation was based on the NSW EPA endorsed Australian framework for contaminated site assessment outlined in the National Environment Protection (Assessment of Site Contamination) Measure 1999 (the ASC NEPM, amended 2013) and the complimentary guidance published by the NSW EPA and the NSW Department of Planning for contamination assessment in NSW.

To meet the above objectives, Coffey undertook the following activities:

- Site visit to the sub-basement area where the disused fuel tank is located to observe the condition of the tank and presence/extent of staining observed on the floor (if any). During the visit, Coffey interviewed building maintenance representatives to obtain further information regarding the use of the tank and whether there are records detailing spillages, leaks etc.;
- Observation of soil and bedrock cuttings arising from geotechnical drilling for indicators of fuel impacts (e.g. staining or hydrocarbon odours). Cuttings from each borehole were screened using a calibrated photo-ionisation detector (PID) for the presence of ionisable volatile organic compounds such as petroleum hydrocarbons;
- Installation of groundwater monitoring wells, to enable collection of groundwater samples and assessment of groundwater flow direction;
- Development of monitoring wells in accordance with Coffey standard procedures, prior to sampling;
- Gauging, purging and collection of groundwater samples approximately one week after well installation. Samples analysed for TRH and PAH;
- Preparation of a DESI report (this document) based on information obtained from the site investigation and in general accordance with *Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites* (NSW OEH, 2011).

2. Site Information

2.1. Site Identification

Site identification details are summarised in Table 2-1. The location of the site is shown on Figure A1, and the current site plan on Figure A2 (both attached).

Table 2-1: Summary of site identification details.

Item	Description
Site Address	4-6 Bligh Street, Sydney, NSW 2000
Lot Number & Deposited Plan	Lots 1 and 2 in DP134866, Lot A in DP184770 and Lot 1 in DP919932
Site Area	Approximately 1,230 m^2
Present & Proposed Zoning	B8 – Metropolitan Centre. Sydney Local Environmental Plan (LEP) 2012
Local Government Authority	City of Sydney Council
Present Land Use	Commercial
Proposed Land Use	Commercial offices and hotel accommodation
Surrounding Land Use	North: Commercial buildings. East: Commercial buildings. South: Commercial buildings followed by Hunter Street. West: Bligh Street followed by commercial buildings and an active construction site.

2.2. Site History

Details of site history were provided in Coffey's PSI report (2017), including a review of historical aerial photographs, historical parish maps and a search of government registers.

A summary of the site history is provided in Table 2-2.

Table 2-2: Summary of site history.

Item	Description
Aerial Photographs	Selected aerial photography between 1943 and 2017 was reviewed: • Site appears to have been occupied by commercial buildings prior to 1943. • Surrounding area has been dominated by commercial buildings since 1943, with some car parks and residential buildings.
Parish Maps	• The site is in Bourke Ward in the Parish of St James with the site occupied by a private building of brick or stone in 1854; • Residential and commercial buildings were present on the site in 1880, which included gardens, kitchens, lumber store, out houses and work sheds. The Union Club house was present north of the site, stables were present east / south east and an Iron Front workshop present on the corner of Hunter and Bligh Street. • The 1949 historical aerial photograph identified that the site was occupied by two large, multi-storey buildings, a lane north of the site. This building appeared the same as what was observed within the 1943 aerial photograph.
Government Registers	Coffey referred to the registers listed below but no information relevant to the site was identified: • NSW EPA contaminated land records • Protection of the Environment Operation Public Registers • NSW State Heritage search • Former gasworks • Waste management facilities • Mine areas and storage tanks • SafeWork NSW dangerous goods licence records

2.3. Site Condition and Surrounding Environment

Table 2-3 provides a summary for the site conditions and surrounding environment. Detailed information can be found in Coffey (2017) PSI report and Coffey (2018b) Geotechnical Investigation Report.

Table 2-3: Summary of site conditions and surrounding environment.

Item	Description
Topography and drainage	• Elevation from 21 m AHD within the north western corner, dropping to 19.5 m AHD within the south western corner; • Surface water anticipated to run offsite, and discharge into the municipal stormwater system; • Site is part of the extensive Sydney Harbour Catchment.
Surface waters and wetlands	• Sydney Cove (Circular Quay) is the closest identified surface water body, approximately 500 m north of the site; • No known wetlands at or within 500 m of the site.
Critical habitats	• No Critical habitat declarations at or within 500 m of the site under Sections 53-55 of the Threatened Species Conservation Act 1995.
Geology and soil landscapes	• Underlain by the Hawkesbury Sandstone: medium to coarse grained quartzose sandstone with very minor shale and laminite lenses. • Pittman LIV dyke: north of the site, runs east-west across the CBD; • GPO Fault Zone: west of the site, oriented in a NNE – SSW direction; • Martin Place Swarm Joint: east of the site, running in a NNE – SSW direction sub-parallel to the GPO Fault Zone; • Sandstone was overlain by the Gymea soil landscape: typically comprise undulating to rolling rises and low hills on Hawkesbury Sandstone. Where present, soils are shallow to moderately deep (30-100 cm), yellow earths and earthy sands on crests and inside benches; shallow (<20 cm) siliceous sands on leading edges of benches; localised podzolic soils and yellow podzolic soils on shale lenses; shallow to moderately deep (<100 cm) siliceous sands and leached sands along drainage lines. • Soil was not present in bore samples collected as part of the geotechnical investigations, which is attributed to historical development of the site including a basement.
Acid sulfate soils	• Site has no known occurrences of acid sulfate soils. • Area of 'Disturbed Terrain' (X4) is present north of the site, which includes filled areas, where reclamation of low lying areas has occurred for urban development.
Hydrogeology	• Coffey's PSI report assumed groundwater flow directions to be north toward Circular Quay. However, Coffey (2018b) geotechnical investigations interpreted the flow direction to be south, south-south east (based on 12 November 2018 groundwater observations), potentially due to drainage to existing drained basement and infrastructure such as the Eastern Suburbs Railway tunnels south of the site; • Coffey (2018b) did not report noticeable tidal fluctuation changes in groundwater levels; • No registered groundwater bores exist within a 500 m radius of the site.

2.4. Summary of Previous Investigations

Coffey referred to the following documents for the DESI:

- Coffey (2017). Preliminary Site Investigation, 4-6 Bligh Street, Sydney NSW, 7 July 2017 (ref. SYDEN202725-R01).
  - The following areas of environmental concern were identified:
    - Hazardous building materials in current site structures;
    - Isolated leaks/spills from mechanical plant within the basement; and
    - Suspected USTs.
  - Further work to address data gaps was recommended:
    - Undertake an inspection of the suspected USTs and/or fill points; and
    - Effectively characterise the site by carrying out a detailed site investigation, in tandem with geotechnical works.
- Coffey (2018b). Geotechnical Investigation Report for 4-6 Bligh Street, Sydney, dated 16 November 2018. Coffey Geotechnics Pty Ltd (ref. SYDGE205019-AD Rev0).
  - Soil was not present in borings into sandstone bedrock beneath the current basement; and
  - Groundwater flow direction was inferred to be south, south-south east (based on 12 November 2018 groundwater observations), attributed to drainage to existing drained basement and subsurface infrastructure such as the Eastern Suburbs Railway tunnels approximately 200m south of the site

3. Data Quality Objectives

With reference to Section 18 Appendix B of Schedule B2 – Guideline on Site Characterisation in the ASC NEPM, the data quality objectives (DQO) process is a seven-step iterative planning approach used to define the type, quantity and quality of data needed to support decisions relating to the environmental condition of a site. The seven-step DQO process used for this assessment is described in Table 3-1.

Table 3-1: Data Quality Objectives.

Step 1: State the problem	Coffey (2017) PSI report identified several potential sources of contamination at the site, including a disused fuel storage tank and related fill points along the Bligh Street footpath, which could adversely affect the suitability of the site through vapour intrusion into the basement of the proposed redevelopment. Council requested further investigation into these potential sources of contamination.
Step 2: Identify the decision/Goal of the study	• Is the site suitable for the proposed redevelopment considering potential presence of petroleum hydrocarbons in soil and groundwater? • Has fuel been released to the sub-surface, and if so, has contamination moved off-site? • Is there a complete pathway to potential receptors?
Step 3: Identify information inputs	The main inputs are: • How many boreholes should be drilled and where? • Are there access restrictions present that may affect the location of boreholes and the method(s) used for drilling? • To what depths should the boreholes be drilled? • At what depth should soil samples be collected? • Where should groundwater monitoring wells be installed?

	• What are the contaminants of potential concern for both soil and groundwater? The primary inputs to assessing the above include: • Information available from previous site investigations. • Observations made by Coffey during a site walkover. • Results of the proposed soil and groundwater sampling. • Relevant legislation and regulatory guidelines. • Proposed design levels for the additional basement level.
Step 4: Define the study boundaries	• Lateral study boundaries: defined by the boundaries of the site, for both soil and groundwater, as shown in Figure A2; • Vertical boundaries: target depth of the boreholes (30 m for BH101 and BH102, 15 m for BH103) and depth of groundwater wells, which screened lengths will be determined onsite based on subsurface conditions; • Temporal boundaries: the period of on-site activity; • Investigation constraints: significant access constraints.
Step 5: Develop the decision rule	The decision rule to assess the suitability of the site will be as follows: • QA/QC assessment indicates that the data is usable; • Where contaminant concentrations for each sample are above the limit of reporting (LOR) but below the adopted investigation levels, no further assessment/remediation is required with respect to that chemical/media/area; and • Where contaminant concentrations are reported to exceed the adopted investigation levels, then additional investigation and/or management (including remediation) may be required.

Step 6: Specify the performance or acceptance criteria	There are two sources of error for input to decisions:
	
	• Sampling errors, which occur when the samples collected are not representative of the conditions within the investigation area; and
	• Measurement errors, which occur during sample collection, handling, preparation, analysis and data reduction.
	• The null hypothesis for this study is:
	  ▪ Contaminant concentrations within the soil and groundwater beneath the site are above the adopted investigation levels.
	• These errors may lead to the following decision errors:
	  ▪ Type I - deciding that the soil and/or groundwater is not contaminated and, therefore, the site is suitable for the proposed development when the reverse is true; and
	  ▪ Type II - deciding that the soil and/or groundwater is contaminated and, therefore, the site is not suitable for the proposed development when the reverse is true.
	
	The acceptable limit on decision errors is a 5% probability of a false negative (i.e. assessing that the average concentrations of COPC are below the adopted soil and groundwater investigation levels when they are actually above the investigation levels).
	
	Where data sets are sufficiently populated, the 95% upper confidence limit (UCL) of the arithmetic mean will be used to calculate this probability. The 95% UCLs are to be less than the investigation level and standard deviation of the sample population shall be less than 50% of the investigation level.
	
	The assessment criteria for the investigation are nominated in Section 6 of this report.

Step 7: Optimise the design for obtaining data	Based on the previous Steps 1 to 6 of the DQO process, the optimal design for obtaining the required data is presented in the following sections (i.e. sampling and analysis plan).

4. Preliminary Conceptual Site Model

A generalised preliminary CSM was developed as part of the DQO process, defining the potential sources of contamination, potentially affected media, Contaminants of Potential Concern (CoPC), potential receptors and exposure scenarios for redevelopment of the site for the proposed hotel and commercial high-rise development.

A summary of the preliminary CSM in a graphic format is provided in Figure 1.

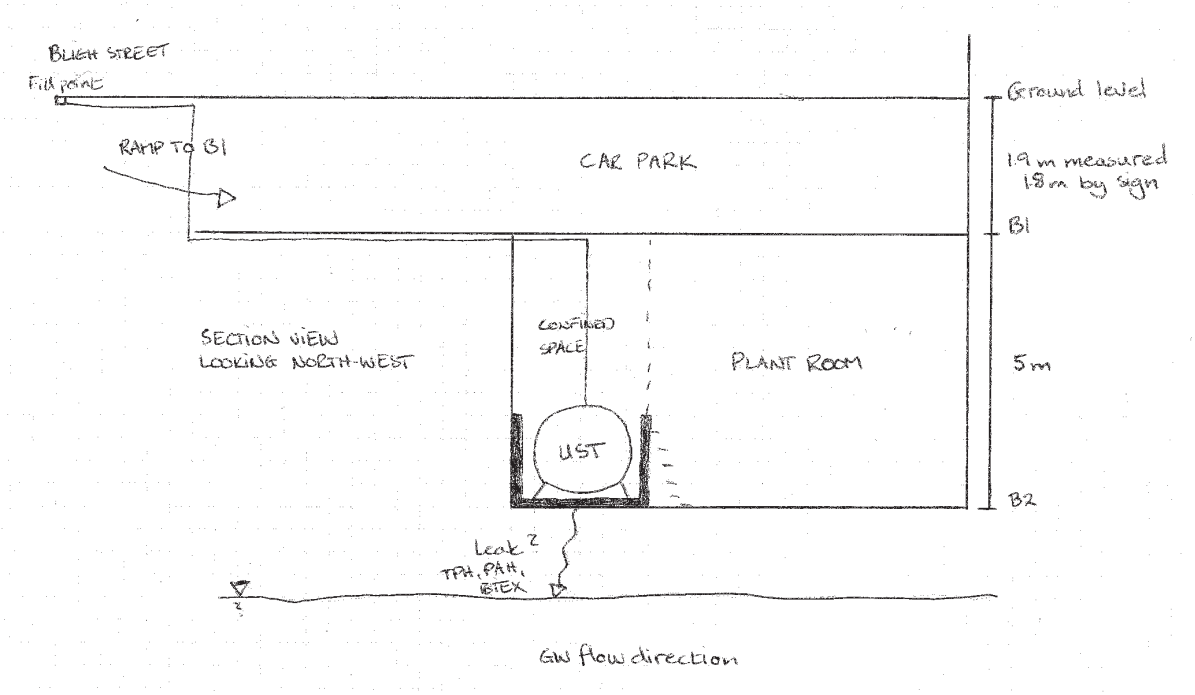


Figure 1: Preliminary CSM (schematic only, not to scale)

5. Sampling and Analysis Plan

5.1. Planning investigations

Investigation of potential contamination in soil and groundwater included the following:

- Fieldwork undertaken by Coffey environmental and geotechnical practitioners;
- Site walkover on 19 September 2018 to inspect the fuel tank and fill points;
- Subsequent selection of borehole locations which surrounded the tank location;
- Observation of cuttings from three (3) boreholes drilled during the geotechnical investigations between 29 October and 6 November 2018 (Coffey, 2018b);
- Installation and development of three (3) groundwater monitoring wells following the geotechnical drilling;
- Gauging and sampling of the three (3) groundwater wells on 12 November 2018.

5.2. Well Construction and Groundwater Sampling

During the geotechnical investigations, the boreholes were completed as groundwater monitoring wells for contamination assessment. Details of the well construction and groundwater sampling

procedures are summarised in Table 5-1. Details of well construction and bore logs are included in Appendix E, which is an extract from Coffey (2018b).

Table 5-1: Well construction and groundwater sampling procedures.

Activity	Detail / Comments
Below Ground Service Clearance	Prior to commencement of borehole drilling, Coffey carried out: • *Dial before you dig* search; • Engagement of an experienced services location subcontractor to locate the underground service and set out proposed borehole locations at cleared locations; • Review of plans showing locations of existing services.
Concrete Cutting	• Boreholes were drilled by specialist geotechnical drilling subcontractor BG Drilling; • Boreholes initially advanced through the concrete floor slabs and sub-base by diatube, and then cored through rock to final depth.
Well Construction and Development	Groundwater wells were constructed in accordance with the Coffey Standard Operating Procedures (SOPs), which are consistent with Schedule B2 of the ASC NEPM. Details of the groundwater well construction can be viewed in the well construction logs in Appendix E. The new monitoring wells were developed on 2 (BH102), 5 (BH101) and 6 November (BH103), using a bailer with three well volumes removed from each monitoring well. Well development records are presented in Coffey (2018b).
Well Location & Gauging	Well locations are shown in Figure A2 in Appendix A, being: • BH101 and BH102 – located in the upper level basement carpark at elevation 17.9 m AHD, drilled with a specialist small track-mounted rig; • BH103 – located in the pump room in the lower basement at elevation 12.8 m AHD, drilled with a portable rig. Each well was gauged 12 November 2018 using an oil/water Interface Probe (IP) to measure the depth to groundwater and the presence of Non-Aqueous Phase Liquid (NAPL) (if any). Data loggers were installed in these three wells on 6 November 2018 to record groundwater level for a planned monitoring period of four weeks (Coffey, 2018b).
Well Purging & Sampling Method	Groundwater was sampled in general accordance with the relevant Coffey SOP, which is consistent with Schedule B2 of the ASC NEPM. No purging was required due samples being collected using a Hydrasleeve (installed for a minimum of 30 minutes). Groundwater quality parameters were measured at each well, including pH, temperature, dissolved oxygen, electrical conductivity and redox potential. Groundwater sampling field sheets and water quality measurements are provided in Appendix B. The water quality meter calibration certificate is included in Appendix B.
QA/QC Samples	To measure the accuracy and precision of the data generated by the field and laboratory procedures for this assessment, Coffey collected and analysed the following quality assurance/quality control (QA/QC) samples: • One blind duplicate (QD01) groundwater sample was collected from BH102; • One rinsate blank (RB) to assess the adequacy of the decontamination process in the field; • One trip blank (TB) was included to assess whether any volatile organic contamination may have been introduced to the samples during sample handling;

Activity	Detail / Comments
	• One trip spike (TS) was included to assess if any loss of volatile organic compounds may have occurred during sample handling.
Sample Handling and Transportation	Sample collection, storage and transport were in general accordance with Coffey's SOPs, which are consistent with Schedule B2 of the ASC NEPM. Groundwater samples were immediately placed into laboratory supplied bottles with appropriate preservatives, with Teflon lined seals and placed into an ice chilled cooler. The samples were transported to a NATA accredited laboratory under chain of custody control.
Decontamination of sampling equipment	The interface probe was decontaminated with Decon 90 solution and rinsed with potable water prior to use and between each sample location.

5.3. Analytical Schedule

Groundwater samples were submitted for laboratory analysis of the chemicals of potential concern, to Eurofins | MGT at Lane Cove West (NATA accredited), as summarised in Table 5-2.

NATA endorsed laboratory reports for this investigation are included in Appendix C.

Table 5-2: Summary of analysis.

Chemical of Concern	No. Primary Groundwater Samples
TRH/TPH	3
PAH	3
BTEX	3

6. Groundwater Assessment Criteria

To assess groundwater quality, reference was made to environmental and/or human health threshold levels or acceptance criteria. Groundwater assessment criteria were selected based on published criteria for beneficial use of groundwater and potential environmental impact.

6.1.1. Assessment of environmental values

NSW DEC *Guidelines for Assessment and Management of Groundwater Contamination 2007* (NSW DEC, 2007) describes the process for identifying the likely environmental values that must be considered during groundwater investigations at potentially contaminated sites. Based on this, assessment of relevant environmental values follows the steps below:

- Determine whether the aquifer beneath the site is included in the NSW Office of Water list of major aquifers of drinking water quality;
- Assess the identified uses of groundwater from the aquifer; and
- Use groundwater indicators to assess whether the aquifer is suitable for use as a drinking water source (i.e., based on measured field groundwater quality).

Based on these steps, Coffey identified the following:

- The groundwater underlying the site is not considered to be part of the NSW Office of Water list of protected aquifers as an actual or potential drinking water supply;

- A review of WaterNSW, found no registered bores within 500 m radius of the site. Therefore, it is considered unlikely that groundwater beneath and migrating from the site would be used for the following environmental values or uses:
  - Drinking water – reticulated water is available in the area;
  - Homestead water supply;
  - Irrigation water supply; or
  - Livestock water supply.
- The closest identified potential ecological receptor to groundwater contamination is Sydney Cove (Circular Quay). However, the cove is approx. 500 m north of the site and is a highly urbanised area, experiencing high vehicle traffic (i.e. watercrafts, including the Sydney ferry network). Also, no known wetlands are at or within 500 m of the site.

Based on the above, Coffey considers that potential beneficial uses of groundwater include:

- Protecting marine aquatic ecosystems in a moderately disturbed habitat (Circular Quay); and
- Visual amenity of Sydney Cove as a major tourist attraction (no oily sheens, visible suspended solids or algal blooms)

The presence of a reticulated water supply to the area and the low yield of the water bearing zone are expected to preclude the use of local groundwater as a drinking water supply. Therefore, potable use was not considered when selecting GILs for comparison against the groundwater analytical results.

6.1.2. Groundwater Stressor Criteria

Chemical concentrations in groundwater are assessed against the ASC NEPM (NEPC, 2013):

- *Groundwater Investigation Levels (GILs) for Marine Waters listed in Table 1C, Schedule B1;*

Supplemented by the following guidelines:

- *ANZG (2018). Australian and New Zealand Guidelines for Fresh and Marine Water Quality.*

Assuming slightly to moderately disturbed ecosystems and the proximity to Circular Quay, marine criteria for protection of 95% of species are applied.

The lowest level of the proposed four level basement be approximately 1.5 m below the observed groundwater table. Potential health risk posed by intrusion of volatile organic compounds into indoor air is usually assessed by reference to published Health Screening Levels (HSLs), presence of impacted groundwater less than 2m below the base floor level precludes application of HSLs.

The adopted GILs are summarised in Table 6-1.

Table 6-1: Summary of the adopted GILs

Analyte	GIL (µg/L)
TRH C_6-C_{10}	20(1)
TRH >C_{10}-C_{16}	50(1)
TRH >C_{16}-C_{34}	100(1)
TRH >C_{34}-C_{40}	100(1)
Benzene	500
Naphthalene	50

(1) In the absence of a nominated guideline value, the laboratory LOR has been taken as the nominal trigger value for the presence of TRH compounds in groundwater and will be used as the GIL (NSW DEC, 2007).

7. Quality Assurance/Quality Control

This Quality Assurance/Quality Control (QA/QC) assessment addresses the predetermined data quality indicators (DQIs) that demonstrate data completeness, comparability, representativeness, precision and accuracy (bias) based on field and laboratory considerations and the processes for assessment of data quality provided in Section 19 (Appendix C) of Schedule B2 Guideline on Site Characterisation of the ASC NEPM.

7.1. DQIs for analytical results

The DQIs are based on the analysis of field and laboratory quality control sample results, and in accordance with AS 4482.1-2005. Specific DQIs for field and laboratory QA/QC samples are listed in Table 7-1.

Table 7-1: DQIs for analytical results.

Type of Quality Control Sample	Control Limit
Duplicate Samples	Relative Percentage Difference (RPD) within 50% for groundwater. Where the reported concentration was less than 10 times laboratory limit of reporting (LOR), no limit applies, and sample results are assessed subjectively.
Spikes	Recoveries within the following ranges: 60% - 140% for organics
Blanks	Analytes not detected above LOR.

7.2. DQIs for sampling and analysis

DQIs for the project are based on the field and laboratory considerations in Appendix C of Schedule B2 of the ASC NEPM. This comprises:

- Completeness – a qualitative measure of the amount of useable data from a data collection activity;
- Comparability – the confidence (expressed qualitatively) that data may be considered to be equivalent for each sampling and analytical event;
- Representativeness – the confidence (expressed qualitatively) that data are representative of each media present on the site;
- Precision – a quantitative measure of the variability (or reproducibility) of data; and
- Accuracy – a quantitative measure of the closeness of reported data to the true value.

7.3. Field QA/QC

QA/QC procedures implemented for this project included:

- Sampling performed by qualified Coffey environmental professionals in general accordance with Coffey's SOPs which are based on industry accepted protocols for environmental sampling and are consistent with Schedule B2 of the ASC NEPM;
- The PID was bump tested using isobutylene gas (100ppm in air) and fresh air calibration was performed in accordance with manufacturer's instructions, to ensure the equipment was holding calibration;
- The water quality meter was calibrated by the manufacturer before use;

- A blind duplicate groundwater sample was collected and submitted for laboratory analysis:
  - QD01 (primary sample BH102).
- Three groundwater primary samples were collected for analysis.

7.4. Laboratory QA/QC

In accordance with NATA endorsed quality plans, the project laboratory performed internal QA/QC assessments which include laboratory duplicates, method blanks, matrix spikes and surrogate spikes.

Laboratory QC analytical results are summarised below:

- Laboratory analysis of samples was undertaken by NATA accredited environmental testing laboratories.
- All samples were extracted and analysed within acceptable holding times.
- No target analytes were detected in any of the method blanks.
- RPDs for the laboratory duplicate samples were within the acceptable range for all samples.
- Percentage recovery results for laboratory control samples were within the acceptable range for all samples.
- Percentage recovery results for surrogate samples were within the acceptable range for all samples.

Percentage recovery results for matrix spikes were within the acceptable range for all samples.

7.5. QA/QC Data Evaluation

QA/QC data evaluation was carried out as per Appendix D.

Based on an assessment of the field and laboratory QA/QC information, Coffey considers that the data obtained is representative of subsurface conditions at the sampling locations. Overall, it is assessed that the results are acceptable for the purposes of this investigation.

8. Results

8.1. Site Walkover Reconnaissance

A walkover of the site was carried out on 19 September 2018 by a Coffey environmental practitioner. Observations included:

- Tank fill point visible on footpath on Bligh Street;
- Basement (B1) headroom measured at 1.9 m (1.8 m by sign);
  - Low points are services and beams;
- Lower basement (B2):
  - Plant room headspace approx. 5 m;
  - Tank is located in lower basement plant room;
    - Not accessible by vehicle as there are three flights of stairs;
    - Situated in confined space in a concrete bund;
    - Some staining on enclosure floor but unsure whether diesel or a sealant;

- Tank bund accessible through 1.1 m high steps.

8.2. Field Observations and Measurements

Standing water level (SWL) and groundwater quality parameters were measured in the field prior to collection of groundwater samples, from all three monitoring well (BH101, BH102 and BH103). Table 8-1 presents the results from these field measurements. Water samples collected from BH101 and BH102 were observed slightly yellow but no odour or sheen. Water sample from BH103 was clear, with no odour or sheen.

Groundwater quality parameters from BH101, BH102 and BH103 indicated the following:

- Electrical conductivity (EC) ranged from 288.1 µS/cm in BH102 to 404.1 µS/cm in BH101 which is indicative of fresh conditions.
- pH ranged from 5.58 in BH103 to 7.06 in BH101, which represents slightly acidic to neutral conditions.
- Redox potential was recorded at -45.4 mV in BH101 to 48.1 mV in BH103 which is indicative of moderately oxidising conditions after correction to the Standard Hydrogen Electrode (add 199 mV); and
- Dissolved oxygen concentrations were indicative of low levels of oxygen in groundwater based on the temperature range reported between 21.2 and 21.7 degrees Celsius.

Groundwater levels ranged from 7.21 mAHD in BH103 to 7.49 mAHD in BH102. Groundwater flow direction was inferred to be to the south east, supporting the findings of the Geotechnical Investigation Report (Coffey, 2018b). Coffey (2018b) did not report material tidal fluctuation induced in groundwater levels.

Field notes and equipment calibration sheets are provided in Appendix B.

Table 8-1: Field Measured Groundwater Level and Quality.

Monitoring Well	Date	Depth to Water (mbgs)	Water Level (mAHD)	DO (mg/L)	EC (µS/cm)	pH	Redox reading (mV)[1]	Temp. (ºC)
BH101	12/11/2018	10.66	7.27	2.10	404.1	7.06	-45.4	21.7
BH102	12/11/2018	10.44	7.49	0.51	288.1	6.39	-39.4	21.5
BH103	12/11/2018	5.58	7.21	1.17	385.5	5.58	48.1	21.2

Notes: 1. Add 199 mV to these readings to provide standard Redox potential.

8.3. Site Specific Geology

Based on the Geotechnical Investigation Report (Coffey, 2018b), the general subsurface conditions below current basement levels are summarised in Table 8-2.

Table 8-2: Site Specific Geology (Coffey, 2018b).

Unit		Material Description	Base of Unit (mAHD)	Thickness of Unit (m)
1:	Rock above proposed lower basement level of 6 mAHD	Moderately weathered to fresh, medium and high strength sandstone	BH101: 5.1 BH102: 6.2 BH103: 5.0	5.3 to 7.8

Unit		Material Description	Base of Unit (mAHD)	Thickness of Unit (m)
2:	Rock near proposed lower basement level of 6 mAHD	Interbedded sandstone, shale and shale breccia, varies from highly to slightly weathered, and from low to high strength, fractured	BH101: 2.7 BH102: 2.3 BH103: 3.2	2.4 to 2.6
3:	Rock below proposed basement level	Fresh medium and high strength sandstone	BH101: below -11.4 BH102: below -4.5 BH103: below -2.5	5.7 to 14.1

8.4. Groundwater Analytical Results

Groundwater analytical results for samples collected on 12 November 2018 are presented in Table A1 at the end of this report. In summary, the concentrations of all CoPC were reported below the assessment criteria, except for the following summarised in Table 8-3. We note that the sample from BH103 reported no detectable TRH.

Table 8-3: Summary of CoPCs Exceeding the Adopted Assessment Criteria.

Chemical	Unit	GIL	BH101	BH102
F2-NAPHTHALENE	mg/L	0.05*	0.09	0.27
C10 - C40 (Sum of total)	mg/L	0.10*	0.49	0.57
C10-C16	mg/L	0.05*	0.09	0.27
C16-C34	mg/L	0.1*	0.4	0.3

* In the absence of a reliable guideline value, the laboratory LOR has been taken as the nominal trigger value for the presence of TRH compounds in groundwater and will be used as the GIL (NSW DEC, 2007).

9. Conceptual Site Model

A CSM is a representation of site related information regarding contamination sources, receptors and exposure pathways between those sources and receptors.

Three groundwater wells were installed at the site; BH101, BH102 and BH103. Collection of groundwater samples from these three wells on 12 November 2018, provided the foundation for the following updated CSM, provided in Table 9-1.

Table 9-1: Updated CSM.

Source	**Petroleum Hydrocarbon impacted groundwater identified within BH101 and BH102.** The source is unknown. However, it does not appear to be derived from the disused fuel tank located in the lower basement of the site due the identified south-easterly groundwater flow direction.

Contaminants of Potential Concern and Affected Media	TRH impacted groundwater.
Likelihood of Impact	Low due to known concentrations, depth to groundwater, and groundwater flow direction.
Plausible Exposure Pathways	Inhalation of vapours Incidental ingestion of groundwater Dermal contact
Receptors	Construction workers Future maintenance workers Current and future site users (vapour inhalation only) Adjoining sensitive land uses (direct contact with aquatic species)
Comments	Workers involved in excavation and construction of the basement are unlikely to be exposed to low concentrations of petroleum hydrocarbon impacted groundwater because the excavation will be open to the air. There is potential for impacted groundwater to be migrating through the site. However, the concentrations in BH103, downgradient of the impacted locations (BH101 and BH102), reported no dissolved hydrocarbons.

10. Conclusions and Recommendations

Based on the review of available data, observations made during fieldwork and an assessment of laboratory analytical data, Coffey concludes that:

- No soil is present in a material quantity below the current basement levels;
- Petroleum hydrocarbon (TRH) impacted groundwater is present at the site, up-gradient of the disused fuel tank, but no volatile hydrocarbons (defined as TRH F1, BTEX and naphthalene) were reported and dissolved TRH F2 was reported at low concentrations (<0.05 to 0.27 mg/L);
- The source of the petroleum hydrocarbons is unknown and remains as a data gap. However, concentrations are unlikely to be derived from the disused fuel tank due to no detectable TRH reported in BH103, downgradient of the impacted locations (BH101 and BH102). However, we recommend removal of this tank prior to demolition, to avoid any potential residual fuel spillage;
- Groundwater is present within the sandstone bedrock, which is approximately 6m beneath the current basement level. The proposed development includes four basement levels, with the lowest basement level proposed at 6.01mAHD, approximately 1.5 m below the groundwater table;
- Associated potential human health and ecological risk (including potential vapour intrusion risk) is considered to be low due to the absence of TRH F1, BTEX and naphthalene, relatively low concentrations of TRH F2 and the air exchange rates required for use of the basement for car parking.

In summary, based on the findings of the investigation and in consideration of the key factors outlined above, Coffey concludes that the site is suitable for the proposed commercial development. Given that no widespread contamination was identified across the site, and that petroleum hydrocarbon impact to groundwater appears to be low and not attributable to a release from the disused UST in the sub-basement, Coffey considers that a Remedial Action Plan is not warranted. As a precaution against localised unidentified contamination, we recommend:

- Preparation and implementation of a Construction Environmental Monitoring Plan which includes an Unexpected Finds Protocol (UFP), to manage any unexpected contamination encountered during excavation at the site; and
- Confirmation of acceptable health risk related to petroleum impacted groundwater seepage into the lowest basement level when the structural detail for walls of that basement level and system for management of groundwater seepage is selected.

11. Limitations

It is the nature of contaminated site investigations that the degree of variability in site conditions cannot be known completely and no sampling and analysis program can eliminate all uncertainty concerning the condition of the site. Professional judgement must be exercised in the collection and interpretation of the data.

In preparing this report, current guidelines for assessment and management of contaminated land were followed. This work has been conducted in good faith in accordance with Coffey understanding of the client's brief and general accepted practice for environmental consulting.

This report was prepared for One Investment Management Pty Ltd as trustee for Recap Management No. 4 Trust to provide a detailed assessment of land contamination at the subject site. No warranty, expressed or implied, is made as to the information and professional advice included in this report. Anyone relying on this document with reference to a particular development concept does so at their own risk and should satisfy themselves concerning its applicability and, where necessary, should seek expert advice in relation to the particular situation. Any use of information in this report must consider the uncertainties outlined in *Important Information about your Coffey Environmental Report*, which follows this text.

References

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

ANZG (2018). Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Australian and New Zealand Governments and Australian state and territory governments, Canberra ACT, Australia. Available at www.waterquality.gov.au/anz-guidelines

Coffey (2017). Preliminary Site Investigation, 4-6 Bligh Street, Sydney NSW, 7 July 2017 (ref. 754-SYDENV202725-R01).

Coffey (2018a). Proposal for site investigation, environmental assessment, and Sydney Metro infrastructure impact assessment for 4-6 Bligh Street, Sydney to assist DA for Early Works – Rev04 (ref: 754-SYDGE205019-AC).

Coffey (2018b). Geotechnical Investigation Report for 4-6 Bligh Street, Sydney, dated 16 November 2018. Coffey Geotechnics Pty Ltd (ref. SYDGE205019-AD Rev0).

NEPC (2013). National Environmental Protection (Assessment of Site Contamination) Measure 1999 (the ASC NEPM, amended 2013). National Environment Protection Council.

NSW DEC (2007). *Guidelines for Assessment and Management of Groundwater Contamination 2007*. Department of Environment and Conservation NSW.

NSW OEH (2011). Guidelines for Consultants Reporting on Contaminated Sites. Office of Environment and Heritage, Sydney.

Important information about your **Coffey** Environmental Report

Introduction

This report has been prepared by Coffey for you, as Coffey's client, in accordance with our agreed purpose, scope, schedule and budget.

The report has been prepared using accepted procedures and practices of the consulting profession at the time it was prepared, and the opinions, recommendations and conclusions set out in the report are made in accordance with generally accepted principles and practices of that profession.

The report is based on information gained from environmental conditions (including assessment of some or all of soil, groundwater, vapour and surface water) and supplemented by reported data of the local area and professional experience. Assessment has been scoped with consideration to industry standards, regulations, guidelines and your specific requirements, including budget and timing. The characterisation of site conditions is an interpretation of information collected during assessment, in accordance with industry practice,

This interpretation is not a complete description of all material on or in the vicinity of the site, due to the inherent variation in spatial and temporal patterns of contaminant presence and impact in the natural environment. Coffey may have also relied on data and other information provided by you and other qualified individuals in preparing this report. Coffey has not verified the accuracy or completeness of such data or information except as otherwise stated in the report. For these reasons the report must be regarded as interpretative, in accordance with industry standards and practice, rather than being a definitive record.

Your report has been written for a specific purpose

Your report has been developed for a specific purpose as agreed by us and applies only to the site or area investigated. Unless otherwise stated in the report, this report cannot be applied to an adjacent site or area, nor can it be used when the nature of the specific purpose changes from that which we agreed.

For each purpose, a tailored approach to the assessment of potential soil and groundwater contamination is required. In most cases, a key objective is to identify, and if possible quantify, risks that both recognised and potential contamination pose in the context of the agreed purpose. Such risks may be financial (for example, clean up costs or constraints on site use) and/or physical (for example, potential health risks to users of the site or the general public).

Limitations of the Report

The work was conducted, and the report has been prepared, in response to an agreed purpose and scope, within time and budgetary constraints, and in reliance on certain data and information made available to Coffey.

The analyses, evaluations, opinions and conclusions presented in this report are based on that purpose and scope, requirements, data or information, and they could change if such requirements or data are inaccurate or incomplete.

This report is valid as of the date of preparation. The condition of the site (including subsurface conditions) and extent or nature of contamination or other environmental hazards can change over time, as a result of either natural processes or human influence. Coffey should be kept appraised of any such events and should be consulted for further investigations if any changes are noted, particularly during construction activities where excavations often reveal subsurface conditions.

In addition, advancements in professional practice regarding contaminated land and changes in applicable statues and/or guidelines may affect the validity of this report. Consequently, the currency of conclusions and recommendations in this report should be verified if you propose to use this report more than 6 months after its date of issue.

The report does not include the evaluation or assessment of potential geotechnical engineering constraints of the site.

Interpretation of factual data

Environmental site assessments identify actual conditions only at those points where samples are taken and on the date collected. Data derived from indirect field measurements, and sometimes other reports on the site, are interpreted by geologists, engineers or scientists to provide an opinion about overall site conditions, their likely impact with respect to the report purpose and recommended actions.

Variations in soil and groundwater conditions may occur between test or sample locations and actual conditions may differ from those inferred to exist. No environmental assessment program, no matter how comprehensive, can reveal all subsurface details and anomalies. Similarly, no professional, no matter how well qualified, can reveal what is hidden by earth, rock or changed through time.

The actual interface between different materials may be far more gradual or abrupt than assumed based on the facts obtained. Nothing can be done to change the actual site conditions which exist, but

steps can be taken to reduce the impact of unexpected conditions.

For this reason, parties involved with land acquisition, management and/or redevelopment should retain the services of a suitably qualified and experienced environmental consultant through the development and use of the site to identify variances, conduct additional tests if required, and recommend solutions to unexpected conditions or other unrecognised features encountered on site. Coffey would be pleased to assist with any investigation or advice in such circumstances.

Recommendations in this report

This report assumes, in accordance with industry practice, that the site conditions recognised through discrete sampling are representative of actual conditions throughout the investigation area. Recommendations are based on the resulting interpretation.

Should further data be obtained that differs from the data on which the report recommendations are based (such as through excavation or other additional assessment), then the recommendations would need to be reviewed and may need to be revised.

Report for benefit of client

Unless otherwise agreed between us, the report has been prepared for your benefit and no other party. Other parties should not rely upon the report or the accuracy or completeness of any recommendation and should make their own enquiries and obtain independent advice in relation to such matters.

Coffey 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.

To avoid misuse of the information presented in your report, we recommend that Coffey be consulted before the report is provided to another party who may not be familiar with the background and the purpose of the report. In particular, an environmental disclosure report for a property vendor may not be suitable for satisfying the needs of that property's purchaser. This report should not be applied for any purpose other than that stated in the report.

Interpretation by other professionals

Costly problems can occur when other professionals develop their plans based on misinterpretations of a report. To help avoid misinterpretations, a suitably qualified and experienced environmental consultant should be retained to explain the implications of the report to other professionals referring to the report and then review plans and specifications produced to see how other professionals have incorporated the report findings.

Given Coffey prepared the report and has familiarity with the site, Coffey is well placed to provide such assistance. If another party is engaged to interpret the recommendations of the report, there is a risk that the contents of the report may be misinterpreted and Coffey disowns any responsibility for such misinterpretation.

Data should not be separated from the report

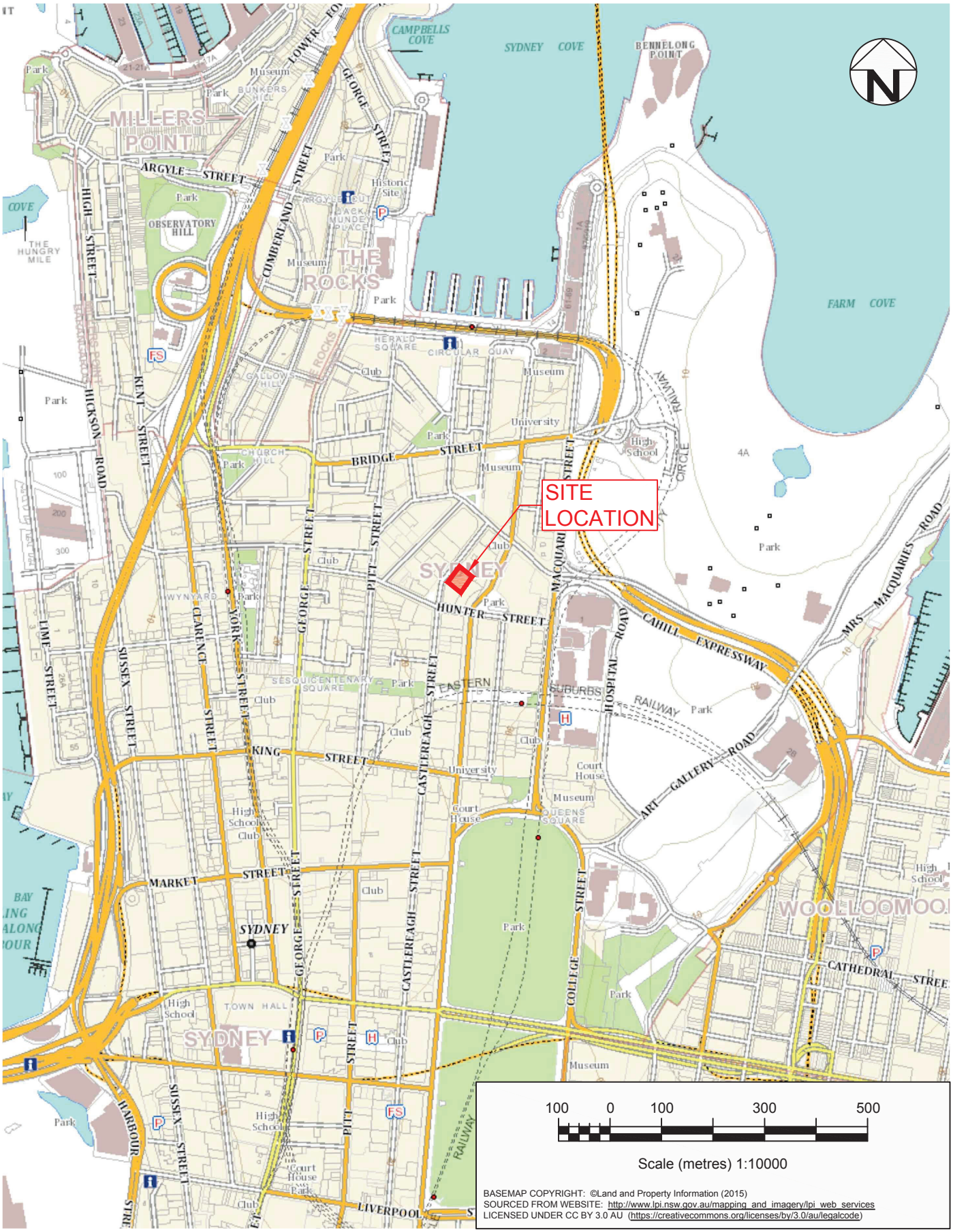
The report as a whole presents the findings of the site assessment and the report should not be copied in part or altered in any way. Logs, figures, laboratory data, drawings, etc. are customarily included in our reports and are developed by scientists or engineers based on their interpretation of field logs, field testing and laboratory evaluation of samples. This information should not under any circumstances be redrawn for inclusion in other documents or separated from the report in any way.

This report should be reproduced in full. No responsibility is accepted for use of any part of this report in any other context or for any other purpose or by third parties.

Responsibility

Environmental reporting relies on interpretation of factual information using professional judgement and opinion and has a level of uncertainty attached to it, which is much less exact than other design disciplines. This has often resulted in claims being lodged against consultants, which are unfounded. As noted earlier, the recommendations and findings set out in this report should only be regarded as interpretive and should not be taken as accurate and complete information about all environmental media at all depths and locations across the site.

Figures



drawn	EH / AW
approved	-
date	28 / 11 / 18
scale	AS SHOWN
original size	A4

coffey
A TETRA TECH COMPANY

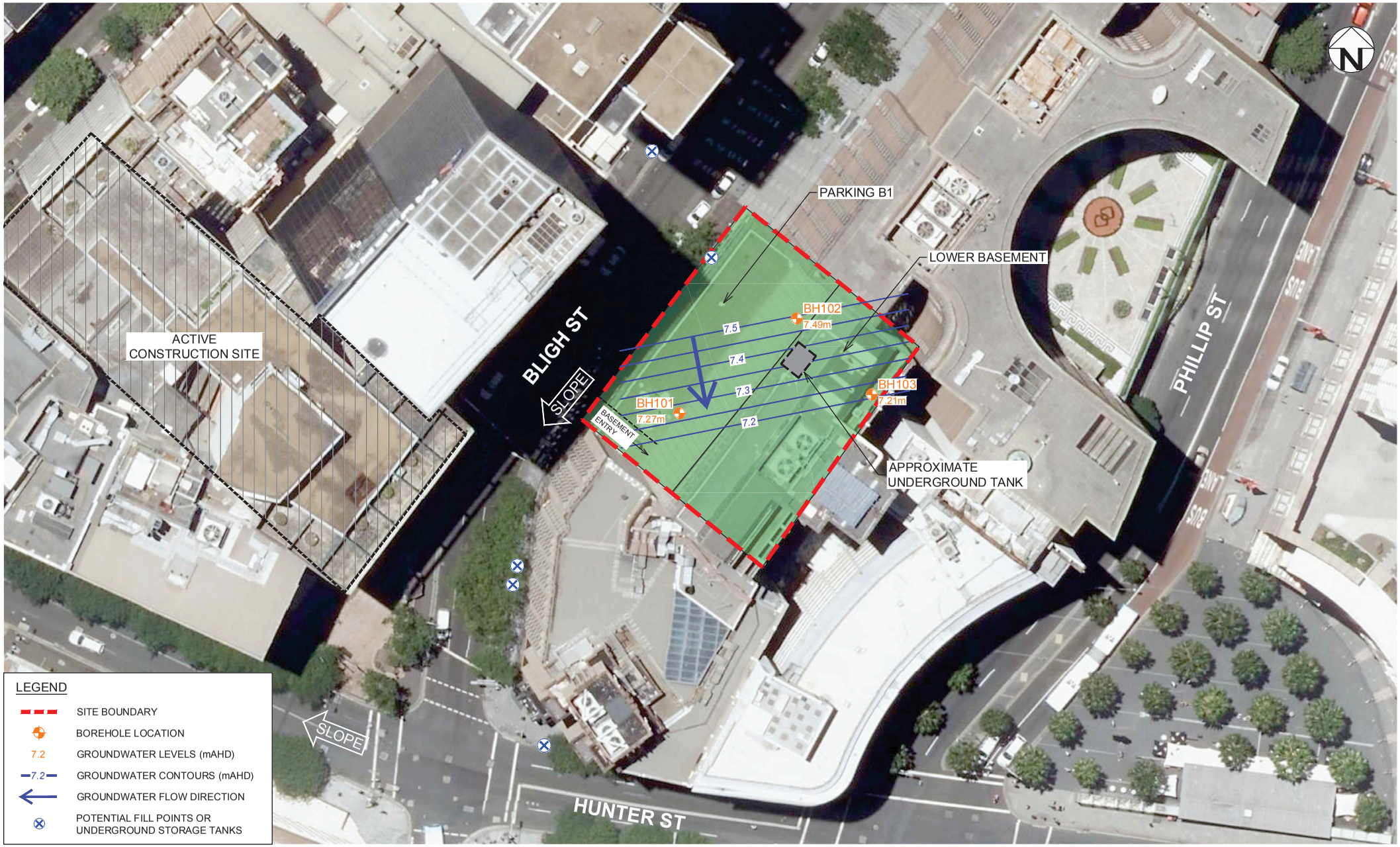
client: ONE INVESTMENT MANAGEMENT PTY LTD
ATF THE RECAP IV MANAGEMENT NO.4 TRUST

project: DETAILED ENVIRONMENTAL SITE INVESTIGATION
4 - 6 BLIGH STREET, SYDNEY NSW

title: SITE LOCATION

project no: 754-SYDEN205070-R02 | figure no: FIGURE A1 | rev: A

PLOT DATE: 28/11/2018 10:48:51 AM DWG FILE: F:\1. PROJECTS\1. SYDENENV\2017\SYDEN205070 - 4-6 BLIGH STREET\CAD\754-SYDEN205070-R02.DWG



revision	no.	description	drawn	approved	date
	A	ORIGINAL ISSUE			

5 0 5 15 25

Scale (metres) 1:500

drawn	EH / AW
approved	-
date	28 / 11 / 18
scale	AS SHOWN
original size	A3

coffey
A TETRA TECH COMPANY

client: ONE INVESTMENT MANAGEMENT PTY LTD ATF THE RECAP IV MANAGEMENT NO.4 TRUST

project: DETAILED ENVIRONMENTAL SITE INVESTIGATION 4 - 6 BLIGH STREET, SYDNEY NSW

title: SITE LAYOUT FEATURES AND SAMPLING LOCATIONS

project no: 754-SYDEN205070-R02 | figure no: FIGURE A2 | rev: A

PLOT DATE: 29/11/2018 12:18:30 PM DWG FILE: F:\1. PROJECTS\1. SYDNEY\ENV\2017\SYDEN205070 - 4-6 BLIGH STREET\CAD\754-SYDEN205070-R02.DWG

Table

					Field_ID	BH101	BH102	BH103	QD01	RB01	TB	TS
					LocCode	BH101	BH102	BH103	QD01	RB01	TB	TS
					WellCode							
					Sampled_Date-Time	12-Nov-18	12-Nov-18	12-Nov-18	12-Nov-18	12-Nov-18	12-Nov-18	12-Nov-18
				NEPM 2013 GIL Marine Waters(A)	NEPM 2013 GW HSL D Commercial/Industrial Vapour Intrusion 2m to <4m, Clay							
Method_Type	**ChemName**	**Units**	**EQL**									
Organic	Naphthalene	µg/L	10	50		<10	<10	<10	<10	<10	<10	81,000
	F2-NAPHTHALENE	mg/L	0.05	0.05*		0.09	0.27	<0.05	0.21	<0.05	-	-
	C6 - C9	µg/L	20	20*		<20	<20	<20	<20	<20	<20	86,000
	C10 - C40 (Sum of total)	µg/L	100	100*		490	570	<100	610	<100	-	-
	C6-C10 less BTEX (F1)	mg/L	0.02	0.02*		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	-
	C10-C16	mg/L	0.05	0.05*		0.09	0.27	<0.05	0.21	<0.05	-	-
	C16-C34	mg/L	0.1	0.1*		0.4	0.3	<0.1	0.4	<0.1	-	-
	C34-C40	mg/L	0.1	0.1*		<0.1	<0.1	<0.1	<0.1	<0.1	-	-
	C6 - C10	mg/L	0.02	0.02*		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	87
PAH	Acenaphthene	µg/L	1			<1	<1	<1	<1	<1	-	-
	Acenaphthylene	µg/L	1			<1	<1	<1	<1	<1	-	-
	Anthracene	µg/L	1			<1	<1	<1	<1	<1	-	-
	Benzo(a)anthracene	µg/L	1			<1	<1	<1	<1	<1	-	-
	Benzo(a)pyrene	µg/L	1			<1	<1	<1	<1	<1	-	-
	Benzo(g,h,i)perylene	µg/L	1			<1	<1	<1	<1	<1	-	-
	Benzo(k)fluoranthene	µg/L	1			<1	<1	<1	<1	<1	-	-
	Chrysene	µg/L	1			<1	<1	<1	<1	<1	-	-
	Benzo[b+j]fluoranthene	µg/L	1			<1	<1	<1	<1	<1	-	-
	Dibenz(a,h)anthracene	µg/L	1			<1	<1	<1	<1	<1	-	-
	Fluoranthene	µg/L	1			<1	<1	<1	<1	<1	-	-
	Fluorene	µg/L	1			<1	<1	<1	<1	<1	-	-
	Indeno(1,2,3-c,d)pyrene	µg/L	1			<1	<1	<1	<1	<1	-	-
	Naphthalene	µg/L	1	50		<1	<1	<1	<1	<1	-	-
	Phenanthrene	µg/L	1			<1	<1	<1	<1	<1	-	-
	Pyrene	µg/L	1			<1	<1	<1	<1	<1	-	-
	Total PAHs	µg/L	1			<1	<1	<1	<1	<1	-	-
TPH	C10 - C14	µg/L	50	50*		<50	70	<50	<50	<50	-	-
	C15 - C28	µg/L	100	100*		400	500	<100	500	<100	-	-
	C29 - C36	µg/L	100	100*		<100	<100	<100	100	<100	-	-
	C10 - C36 (Sum of total)	µg/L	100	100*		400	570	<100	600	<100	-	-
Volatile	Benzene	µg/L	1	500	30,000	<1	<1	<1	<1	<1	<1	95,000
	Ethylbenzene	µg/L	1			<1	<1	<1	<1	<1	<1	120,000
	Toluene	µg/L	1			<1	<1	<1	<1	<1	<1	100,000
	Xylene (m & p)	µg/L	2			<2	<2	<2	<2	<2	<2	110,000
	Xylene (o)	µg/L	1			<1	<1	<1	<1	<1	<1	110,000
	Xylene Total	µg/L	3			<3	<3	<3	<3	<3	<3	110,000

(A) Investigaiton levels apply to typical slightly-moderately disturbed systems.

* In the absense of a nominated guideline value, the laboratory LOR has been taken as the nominal trigger value for the presence of TRH compounds in groundwater and will be used as the GIL (NSW DEC, 2007)

Appendix A – Proposed Development Drawings

4-6 Bligh Street, Sydney
Reference Design

Sheet Number	Sheet Name	Current Revision Date
RD0000	Cover Sheet	20/07/17
RD1001	Basement Level 04 Plan	20/07/17
RD1002	Basement Level 03 Plan	20/07/17
RD1003	Basement Level 02 Plan	20/07/17
RD1004	Basement Level 01 Plan	20/07/17
RD1005	Ground Level Plan	20/07/17
RD1006	Level 01 Plan (Commercial)	20/07/17
RD1007	Level 02 Plan (Podium Plant)	20/07/17
RD1008	Level 03-07 Plan (Typical Commercial)	20/07/17
RD1009	Level 8 Plan (Podium Gym)	20/07/17
RD1010	Level 9 Plan (Podium Gym/Pool)	20/07/17
RD1011	Level 10 Plan (Podium Roof/Hotel Lobby)	20/07/17
RD1012	Level 11 Plan (Podium Transfer/Plant)	20/07/17
RD1013	Typical Hotel Plan	20/07/17
RD1014	Level 30 Plan (Mid Plant Level)	20/07/17
RD1015	Level 50 Plan (Hotel Club Lounge)	20/07/17
RD1016	Level 51 Plan (Function)	20/07/17
RD1017	Level 52 Plan (Hotel Roof Terrace)	20/07/17
RD1018	Level 53 Plan (Hotel Roof Mezzanine)	20/07/17
RD1019	Level 54 Plan (Tower Roof Plant)	20/07/17
RD2001	Section	20/07/17
RD3001	Area Schedule	20/07/17
RD4000	3D Perspectives (Indicative Only) - 01	20/07/17
RD4001	3D Perspectives (Indicative Only) - 02	20/07/17
RD4002	3D Perspectives (Indicative Only) - 03	20/07/17

Architectus Sydney
Level 18 MLC Centre
19 Martin Place
Sydney NSW 2000
sydney@architectus.com.au

architectus™

GA - Basement Level 04 Plan

4-6 Bligh Street, Sydney

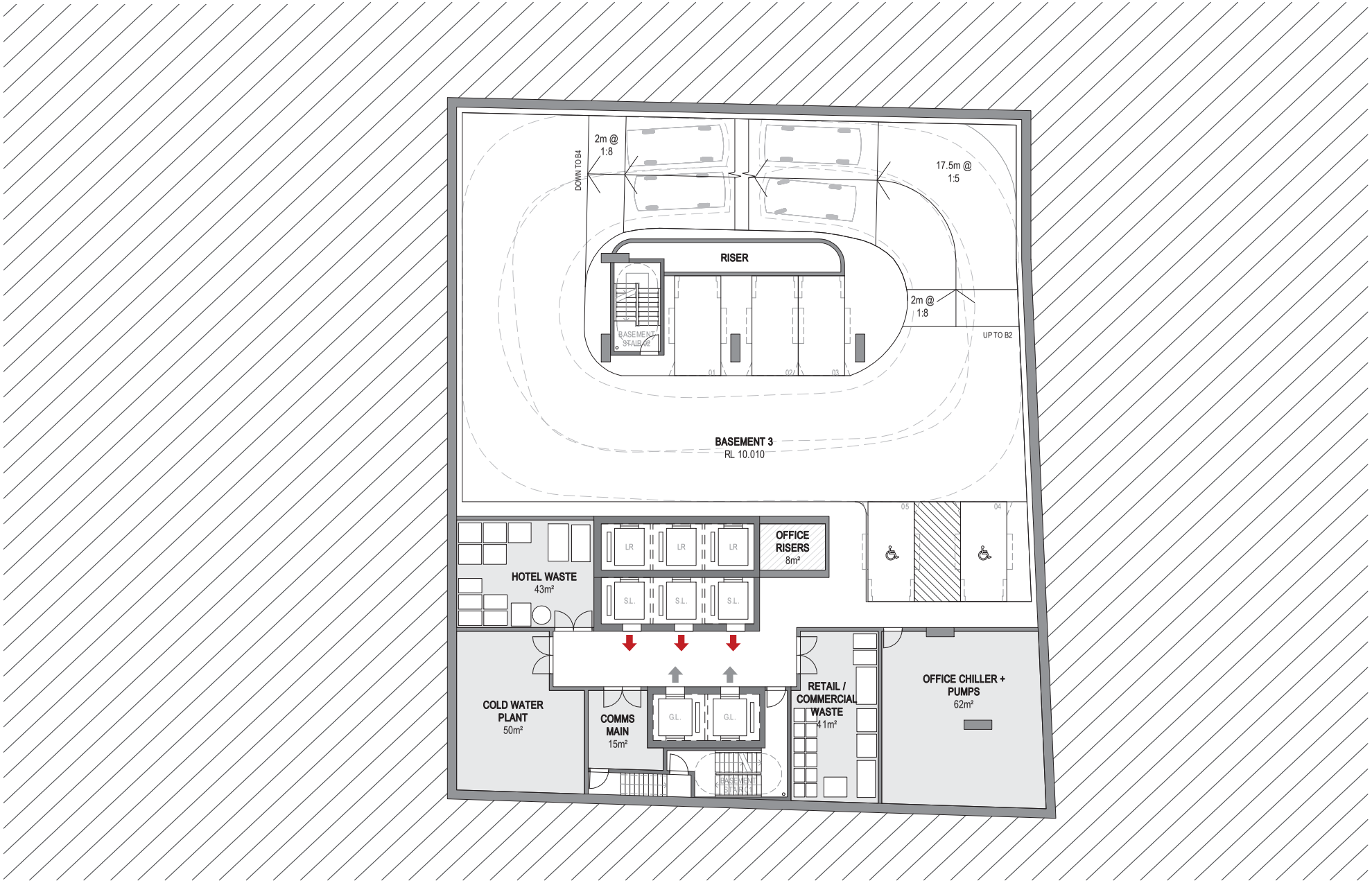
Drawing:	**Basement Level 04 Plan**
Drawing no:	RD1001
Issue:	5
Scale @ A3:	1 : 200
Date	20/07/17

North

Architectus Sydney
Level 18 MLC Centre
19 Martin Place
Sydney NSW 2000
sydney@architectus.com.au

architectus™

GA - Basement Level 03 Plan



4-6 Bligh Street, Sydney

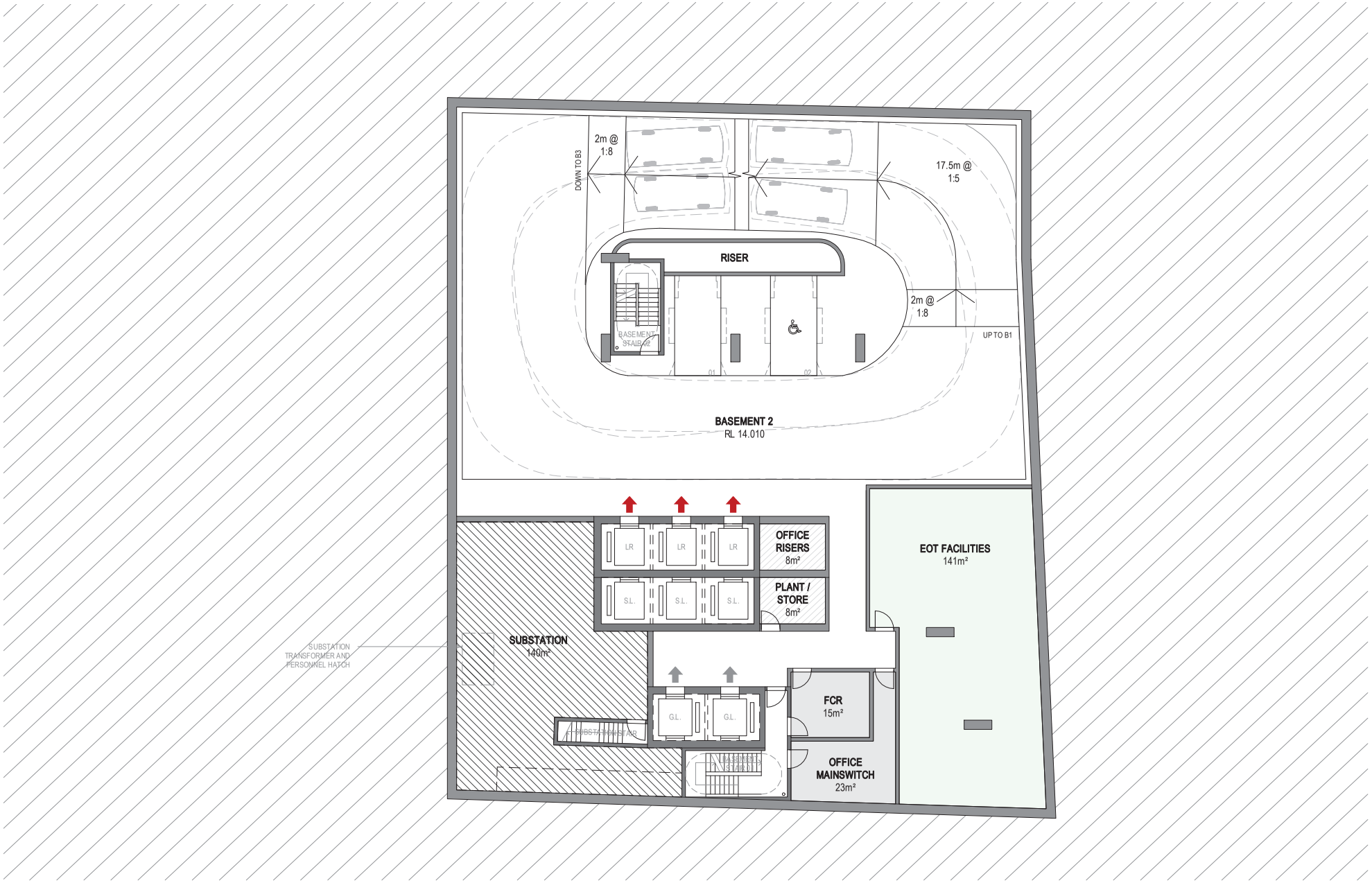
Drawing:	**Basement Level 03 Plan**
Drawing no:	RD1002
Issue:	5
Scale @ A3:	1 : 200
Date	20/07/17

North

Architectus Sydney
Level 18 MLC Centre
19 Martin Place
Sydney NSW 2000
sydney@architectus.com.au

architectus™

GA - Basement Level 02 Plan



4-6 Bligh Street, Sydney

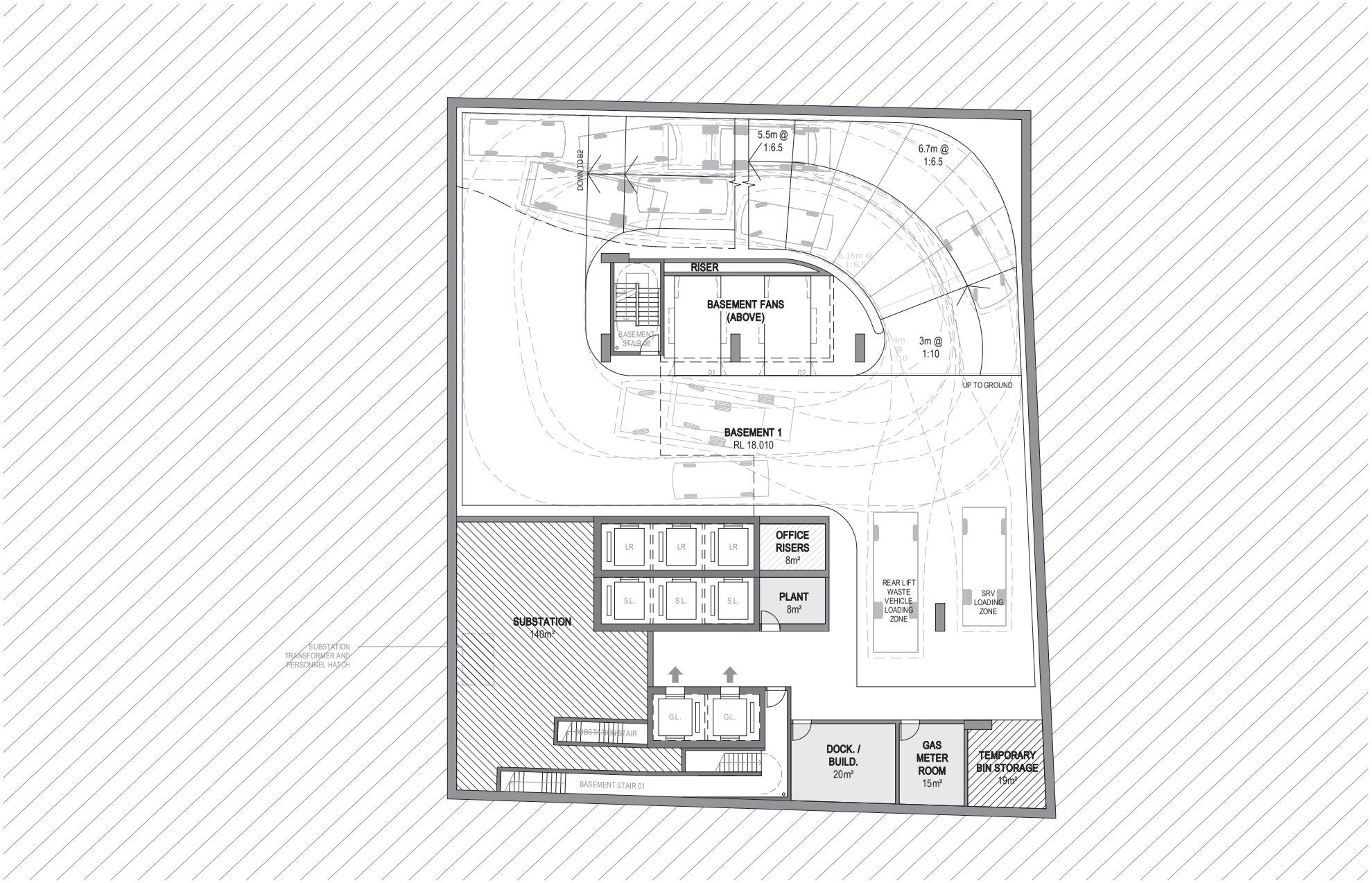
Drawing:	**Basement Level 02 Plan**
Drawing no:	RD1003
Issue:	5
Scale @ A3:	1 : 200
Date	20/07/17

North

Architectus Sydney
Level 18 MLC Centre
19 Martin Place
Sydney NSW 2000
sydney@architectus.com.au

architectus™

GA - Basement Level 01 Plan



4-6 Bligh Street, Sydney

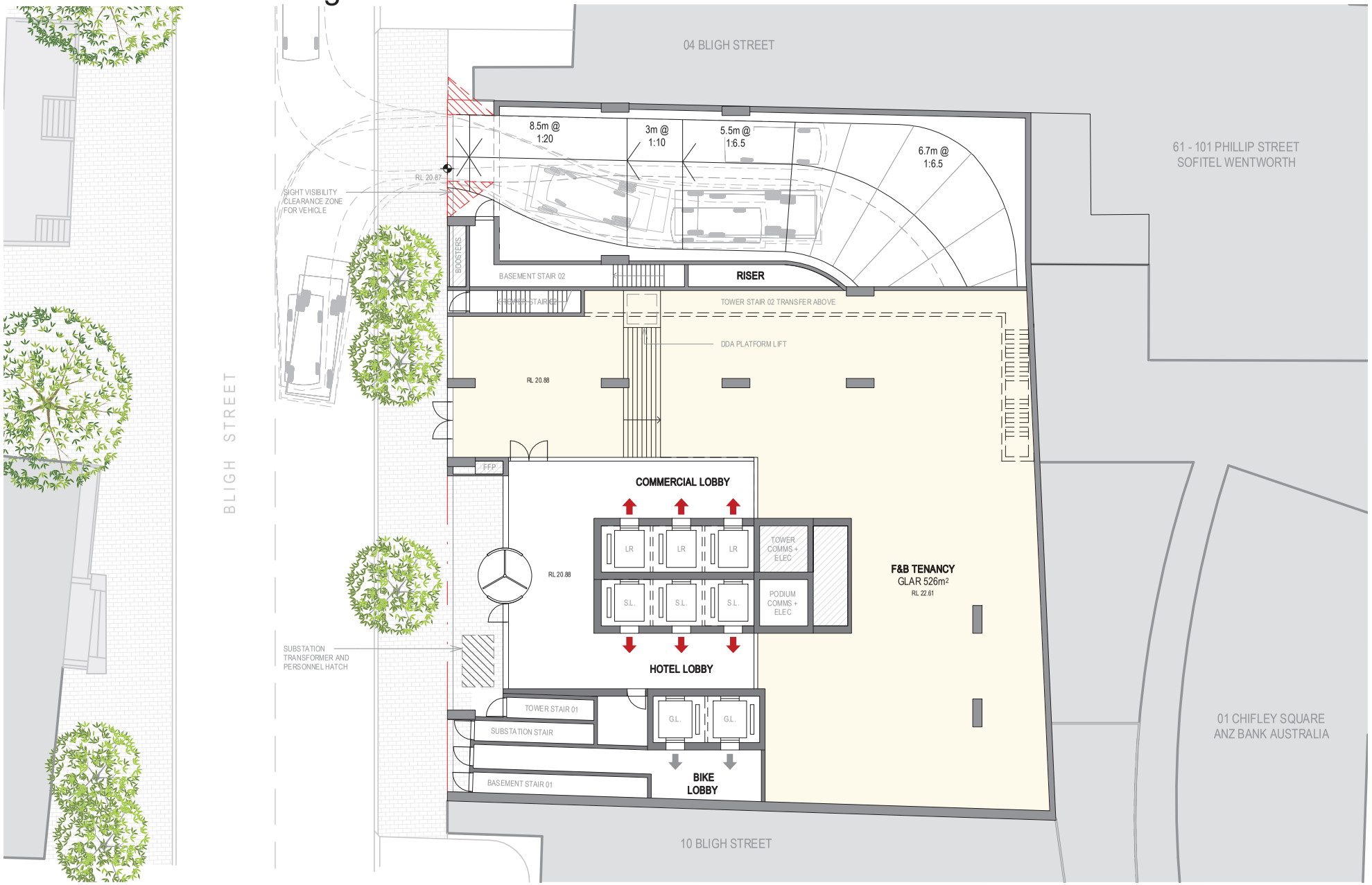
Drawing:	**Basement Level 01 Plan**
Drawing no:	RD1004
Issue:	5
Scale @ A3:	1 : 200
Date	20/07/17

North

Architectus Sydney
Level 18 MLC Centre
19 Martin Place
Sydney NSW 2000
sydney@architectus.com.au

architectus™

GA - Ground Level Plan - Bligh Street



4-6 Bligh Street, Sydney

Drawing:	**Ground Level Plan**
Drawing no:	RD1005
Issue:	6
Scale @ A3:	1 : 200
Date	20/07/17

North

Architectus Sydney
Level 18 MLC Centre
19 Martin Place
Sydney NSW 2000
sydney@architectus.com.au

architectus™

GA - Level 01 Plan (Podium Function)

4-6 Bligh Street, Sydney

Drawing:	**Level 01 Plan (Commercial)**
Drawing no:	RD1006
Issue:	6
Scale @ A3:	1 : 200
Date	20/07/17

North

Architectus Sydney
Level 18 MLC Centre
19 Martin Place
Sydney NSW 2000
sydney@architectus.com.au

architectus™

GA - Level 02 Plan (Podium Plant)

4-6 Bligh Street, Sydney

Drawing:	**Level 02 Plan (Podium Plant)**
Drawing no:	RD1007
Issue:	6
Scale @ A3:	1 : 200
Date	20/07/17

North

Architectus Sydney
Level 18 MLC Centre
19 Martin Place
Sydney NSW 2000
sydney@architectus.com.au

architectus™

GA - Level 03-07 Plan (Typical Commercial)

4-6 Bligh Street, Sydney

Drawing:	**Level 03-07 Plan (Typical Commercial)**
Drawing no:	RD1008
Issue:	6
Scale @ A3:	1 : 200
Date	20/07/17

North

Architectus Sydney
Level 18 MLC Centre
19 Martin Place
Sydney NSW 2000
sydney@architectus.com.au

architectus™

GA - Level 08 Plan (Podium Gym)

4-6 Bligh Street, Sydney

Drawing:	**Level 8 Plan (Podium Gym)**
Drawing no:	RD1009
Issue:	6
Scale @ A3:	1 : 200
Date	20/07/17

North

Architectus Sydney
Level 18 MLC Centre
19 Martin Place
Sydney NSW 2000
sydney@architectus.com.au

architectus™

GA - Level 09 Plan (Podium Gym/Pool)

4-6 Bligh Street, Sydney

Drawing:	**Level 9 Plan (Podium Gym/Pool)**
Drawing no:	**RD1010**
Issue:	**3**
Scale @ A3:	**1 : 200**
Date	**20/07/17**

North

Architectus Sydney
Level 18 MLC Centre
19 Martin Place
Sydney NSW 2000
sydney@architectus.com.au

architectus™

GA - Level 10 Plan (Podium Roof/Hotel Lobby)

4-6 Bligh Street, Sydney

Drawing:	**Level 10 Plan (Podium Roof/Hotel Lobby)**
Drawing no:	**RD1011**
Issue:	**5**
Scale @ A3:	**1 : 200**
Date	**20/07/17**

North

Architectus Sydney
Level 18 MLC Centre
19 Martin Place
Sydney NSW 2000
sydney@architectus.com.au

architectus™

GA - Level 11 Plan (Podium Transfer/Plant)

4-6 Bligh Street, Sydney

Drawing:	**Level 11 Plan (Podium Transfer/Plant)**
Drawing no:	RD1012
Issue:	5
Scale @ A3:	1 : 200
Date	20/07/17

North

Architectus Sydney
Level 18 MLC Centre
19 Martin Place
Sydney NSW 2000
sydney@architectus.com.au

architectus™

GA - Typical Hotel Plan

4-6 Bligh Street, Sydney

Drawing:	**Typical Hotel Plan**
Drawing no:	RD1013
Issue:	5
Scale @ A3:	1 : 200
Date	20/07/17

North

Architectus Sydney
Level 18 MLC Centre
19 Martin Place
Sydney NSW 2000
sydney@architectus.com.au

architectus™

GA - Level 30 Plan (Mid Plant Level)

4-6 Bligh Street, Sydney

Drawing:	**Level 30 Plan (Mid Plant Level)**
Drawing no:	**RD1014**
Issue:	**6**
Scale @ A3:	**1 : 200**
Date	**20/07/17**

North

Architectus Sydney
Level 18 MLC Centre
19 Martin Place
Sydney NSW 2000
sydney@architectus.com.au

architectus™

GA - Level 50 Plan (Hotel Club Lounge)

4-6 Bligh Street, Sydney

Drawing:	**Level 50 Plan (Hotel Club Lounge)**
Drawing no:	**RD1015**
Issue:	**4**
Scale @ A3:	**1 : 200**
Date	**20/07/17**

North

Architectus Sydney
Level 18 MLC Centre
19 Martin Place
Sydney NSW 2000
sydney@architectus.com.au

architectus™

GA - Level 51 (Function)

4-6 Bligh Street, Sydney

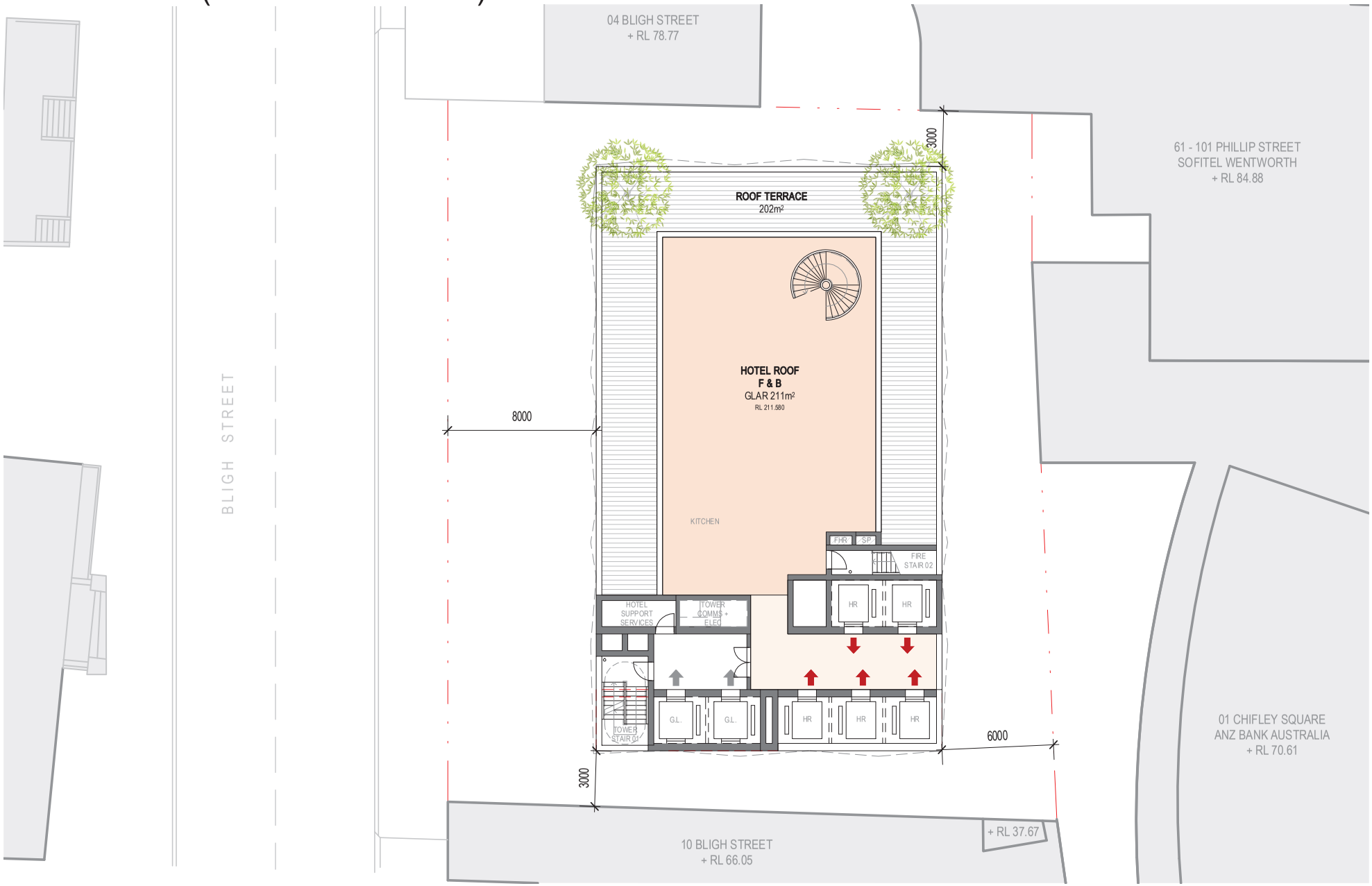
Drawing:	**Level 51 Plan (Function)**
Drawing no:	**RD1016**
Issue:	**5**
Scale @ A3:	**1 : 200**
Date	**20/07/17**

North

Architectus Sydney
Level 18 MLC Centre
19 Martin Place
Sydney NSW 2000
sydney@architectus.com.au

architectus™

GA - Level 52 Plan (Hotel Roof Terrace)



4-6 Bligh Street, Sydney

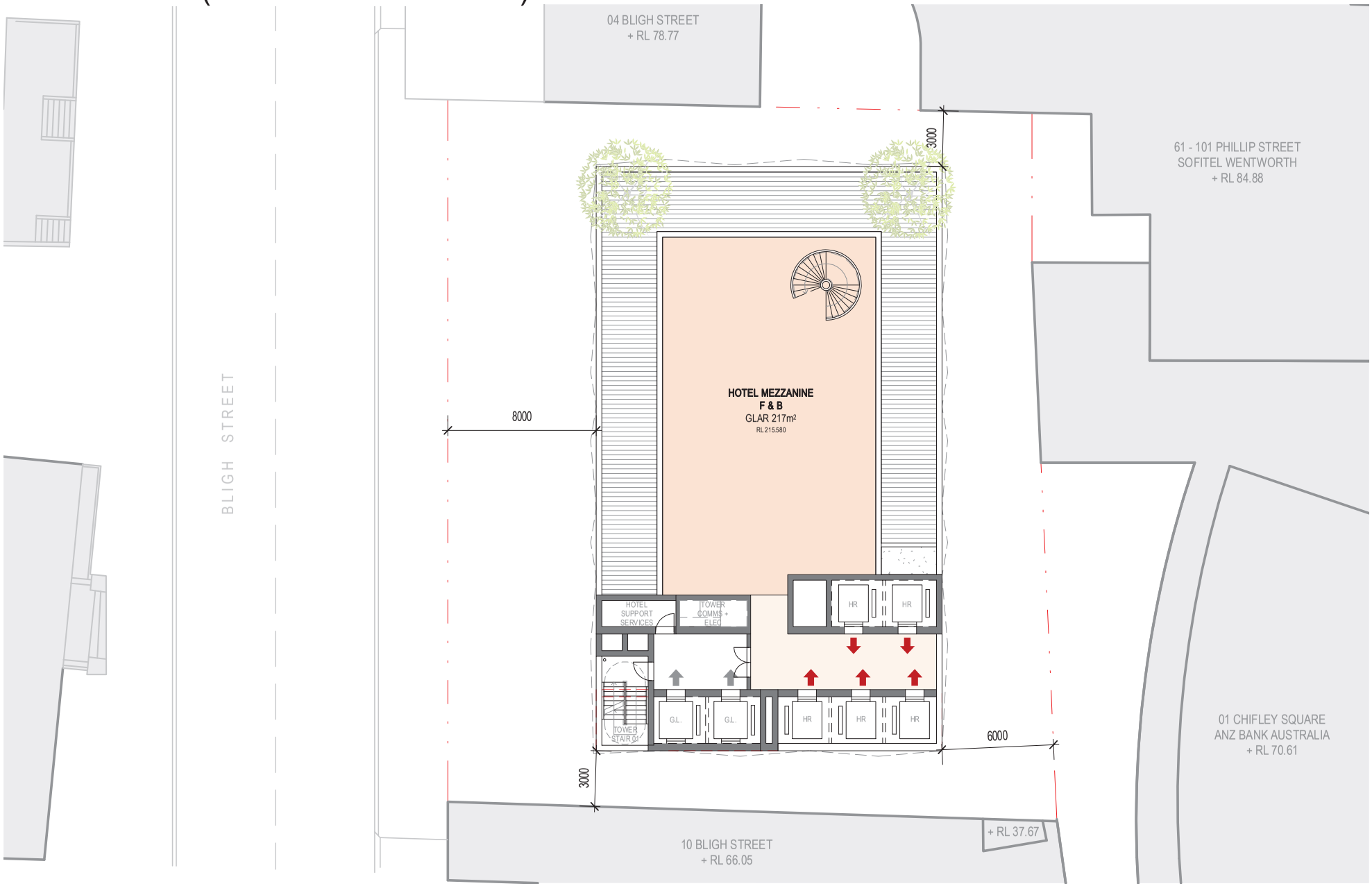
Drawing:	**Level 52 Plan (Hotel Roof Terrace)**
Drawing no:	**RD1017**
Issue:	**6**
Scale @ A3:	**1 : 200**
Date	**20/07/17**

North

Architectus Sydney
Level 18 MLC Centre
19 Martin Place
Sydney NSW 2000
sydney@architectus.com.au

architectus™

GA - Level 53 Plan (Hotel Roof Mezzanine)



4-6 Bligh Street, Sydney

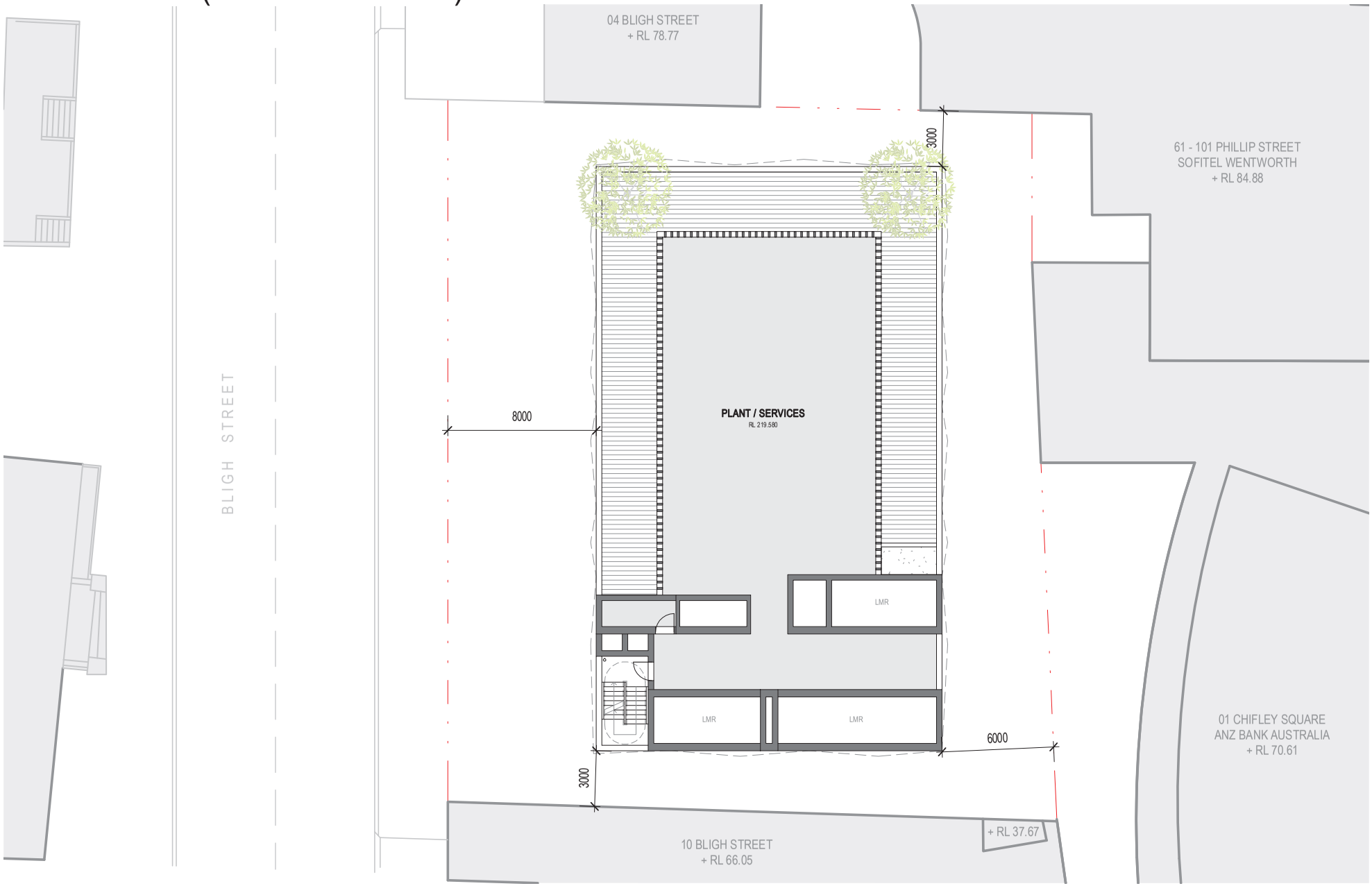
Drawing:	**Level 53 Plan (Hotel Roof Mezzanine)**
Drawing no:	**RD1018**
Issue:	**6**
Scale @ A3:	**1 : 200**
Date	**20/07/17**

North

Architectus Sydney
Level 18 MLC Centre
19 Martin Place
Sydney NSW 2000
sydney@architectus.com.au

architectus™

GA - Level 53 Plan (Tower Roof Plant)



4-6 Bligh Street, Sydney

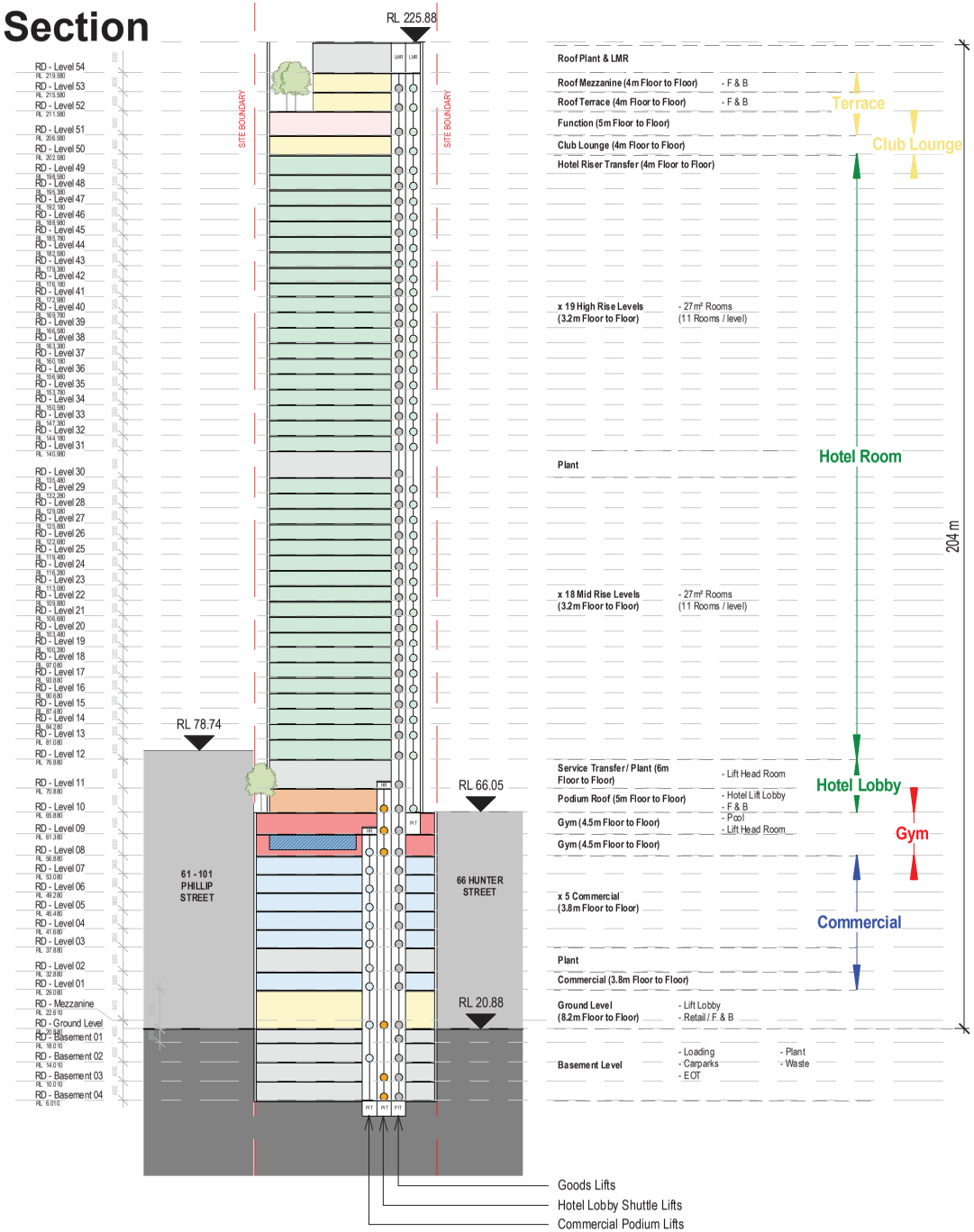
Drawing:	**Level 54 Plan (Tower Roof Plant)**
Drawing no:	**RD1019**
Issue:	**5**
Scale @ A3:	**1 : 200**
Date	**20/07/17**

North

Architectus Sydney
Level 18 MLC Centre
19 Martin Place
Sydney NSW 2000
sydney@architectus.com.au

architectus™

Section



Key

- Hotel
- Hotel Lobby
- Commercial
- Retail / F & B
- Function
- Gym
- Pool
- Plant

4-6 Bligh Street, Sydney

Drawing: **Section**
Drawing no: **RD2001**
Issue: **5**
Scale @ A3: **1 : 1000**
Date **20/07/17**

Architectus Sydney
Level 18 MLC Centre
19 Martin Place
Sydney NSW 2000
sydney@architectus.com.au

architectus™

Area Schedule

4-6 Bligh Street, Sydney

Planning Proposal - Reference Design

20/07/17

Site Area:	**1216 m²**
FSR + 10% design bonus:	15 :1
GFA + 10% design bonus:	18240 m²
Achieved FSR:	**20.3 :1**
Achieved GFA:	**24643 m²**
Achieved *GFA (FECA + UCA):	**39080 m²**
Total Retail (GLAR) :	**1168 m²**
Total Commercial (NLA) :	**6137 m²**
Total Hotel (NLA) :	**12651 m²**

	No. Levels	Type	RL	Height (m)	GFA	*GFA (FECA + UCA)	NLA (m²)	GLAR (m²)	Efficiency (NLA + GLAR / *GFA)
Basement	B4	Services	6.01	4		1153			
	B3	Car Parking - Hotel	10.01	4		1153			
	B2	Car Parking - Hotel	14.01	4		1153			
	B1	Loading / Car Parking / Plant	18.01	2.9		1153			
Total				**14.9**		4612			
Podium	GF	Retail / F & B / Lift Lobby / Hotel Shuttle Lift Lobby	20.88	8.2	668	1123		526	47%
	L1	Commercial	29.08	3.8	834	981	793		81%
	L2	Plant	32.88	5		981			
	L3	Commercial	37.88	3.8	834	981	793		81%
	L4	Commercial	41.68	3.8	834	981	793		81%
	L5	Commercial	45.48	3.8	834	981	793		81%
	L6	Commercial	49.28	3.8	834	981	793		81%
	L7	Commercial	53.08	3.8	834	981	793		81%
	L8	Gym	56.88	4.5	658	981	617		63%
	L9	Gym / Pool	61.38	4.5	793	981	759		77%
Total	**10**			**45**	**7125**	**9949**	**6137**	**526**	
Podium Roof	L10	Hotel Lift Lobby / F & B	65.88	5	381	522	147	214	69%
	L11	Service Transfer/Plant	70.88	6		558			
Total	**2**			**11**	**381**	**1080**	**146.884**	**214**	
Mid Rise	L12	Hotel	76.88	4.2	425	558	314		56%
	L13	Hotel	81.08	3.2	425	558	314		56%
	L14	Hotel	84.28	3.2	425	558	314		56%
	L15	Hotel	87.48	3.2	425	558	314		56%
	L16	Hotel	90.68	3.2	425	558	314		56%
	L17	Hotel	93.88	3.2	425	558	314		56%
	L18	Hotel	97.08	3.2	425	558	314		56%
	L19	Hotel	100.28	3.2	425	558	314		56%
	L20	Hotel	103.48	3.2	425	558	314		56%
	L21	Hotel	106.68	3.2	425	558	314		56%
	L22	Hotel	109.88	3.2	425	558	314		56%
	L23	Hotel	113.08	3.2	425	558	314		56%
	L24	Hotel	116.28	3.2	425	558	314		56%
	L25	Hotel	119.48	3.2	425	558	314		56%
	L26	Hotel	122.68	3.2	425	558	314		56%
	L27	Hotel	125.88	3.2	425	558	314		56%
	L28	Hotel	129.08	3.2	425	558	314		56%
	L29	Hotel	132.28	3.2	425	558	314		56%
Total	**18**			**59**	**7653**	**10044**	**5650**		
Plant	L30		135.48	5.5		558			
Total	**1**			**5.5**		**558**			
High Rise	L31	Hotel	140.98	3.2	425	558	314		56%
	L32	Hotel	144.18	3.2	425	558	314		56%
	L33	Hotel	147.38	3.2	425	558	314		56%
	L34	Hotel	150.58	3.2	425	558	314		56%
	L35	Hotel	153.78	3.2	425	558	314		56%
	L36	Hotel	156.98	3.2	425	558	314		56%
	L37	Hotel	160.18	3.2	425	558	314		56%
	L38	Hotel	163.38	3.2	425	558	314		56%
	L39	Hotel	166.58	3.2	425	558	314		56%
	L40	Hotel	169.78	3.2	425	558	314		56%
	L41	Hotel	172.98	3.2	425	558	314		56%
	L42	Hotel	176.18	3.2	425	558	314		56%
	L43	Hotel	179.38	3.2	425	558	314		56%
	L44	Hotel	182.58	3.2	425	558	314		56%
	L45	Hotel	185.78	3.2	425	558	314		56%
	L46	Hotel	188.98	3.2	425	558	314		56%
	L47	Hotel	192.18	3.2	425	558	314		56%
	L48	Hotel	195.38	3.2	425	558	314		56%
	L49	Hotel	198.58	4	425	558	314		56%
Total	**19**			**61.6**	**8078**	**10602**	**5964**		
Hotel Roof	L50	Hotel Club Lounge	202.58	4	423	558	400		72%
	L51	Function	206.58	5	444	558	421		75%
	L52	Roof Terrace / F&B	211.58	4	267	375	34	211	65%
	L53	Roof Mezzanine / F&B	215.58	4	273	370	34	217	68%
Total	**4**			**17**	**1407**	**1861**	**889.251**	**427**	
Plant	L54		219.58	6.3		373			
Total	**1**			**6.3**		**373**			
Grand Total	**55**		**225.880**	**205.000**	**24643**	**39080**	**18787**	**1168**	51%

Hotel Room	Levels	Rooms / Level	Rooms
Low Rise Typical	18	11	198
High Rise Typical	19	11	209
Total			407

- *GFA (FECA + UCA) - total area of footprint (per level) measured to the internal face of the external wall, with no deduction for stairs, cores, risers etc.
- Efficiency (*GFA/ NLA+GLAR) - the % shown is an estimate figure based on *GFA

4-6 Bligh Street, Sydney

Drawing: **Area Schedule**
Drawing no: **RD3001**
Issue: **5**
Scale @ A3:
Date **20/07/17**

Architectus Sydney
Level 18 MLC Centre
19 Martin Place
Sydney NSW 2000
sydney@architectus.com.au

architectus™

3D Perspective (Indicative Only) - Roof Bar & Restaurant

4-6 Bligh Street, Sydney

Drawing: **3D Perspectives (Indicative Only) - 01**
Drawing no: **RD4000**
Issue: **1**
Scale @ A3:
Date **20/07/17**

Architectus Sydney
Level 18 MLC Centre
19 Martin Place
Sydney NSW 2000
sydney@architectus.com.au

architectus™

3D Perspective (Indicative Only) - View from Bligh Street

4-6 Bligh Street, Sydney

Drawing:	**3D Perspectives (Indicative Only) - 02**
Drawing no:	**RD4001**
Issue:	**1**
Scale @ A3:	
Date	**20/07/17**

Architectus Sydney
Level 18 MLC Centre
19 Martin Place
Sydney NSW 2000
sydney@architectus.com.au

architectus™

3D Perspectives (Indicative Only) - View from the Domain

4-6 Bligh Street, Sydney

Drawing: **3D Perspectives (Indicative Only) - 03**
Drawing no: **RD4002**
Issue: **1**
Scale @ A3:
Date **20/07/17**

Architectus Sydney
Level 18 MLC Centre
19 Martin Place
Sydney NSW 2000
sydney@architectus.com.au

architectus™

Appendix B – Field Notes & Calibration Certificate

coffey

Groundwater Sampling Form (A) - General

PAGE ____ OF ____

PROJECT NAME: Bligh St **PROJECT NUMBER:** SYDEN205070

FIELD PERSONNEL: AC **DATE:** 12/11/18

PROJECT MANAGER: ML

WELL ID: _____ **METER ID& TYPE :** _____ **TOTAL WELL DEPTH:** _____ **SCREEN INTERVAL:** _____

EQUIPMENT USED: **BAILER** ☐ **WATERRA** ☐ **OTHER** _____ **WELL DIAMETER:** _____ **WELL STICK-UP:** _____

WELL GAUGING AND PURGE VOLUME CALCULATIONS

(TOTAL WELL DEPTH) – (DEPTH TO WATER) = (WATER COLUMN)

_____m - _____ = _____m

Use water column calculation together with the procedures in 'SOP- Groundwater Sampling - Bailers' to determine the correct volume to be purged from the well (enter this value in the field to the right)

LITRES PER 1 WELL VOLUME

_____L

WELL HEADSPACE PID READING

PID READING

PPM: _____

ORP REFERENCE ELECTRODE: (circle) SHE / Calomel Saturated KCl / Ag/AgCl 1M KCl / Ag/AgCl 4M KCl / Ag/AgCl Saturated KCl

TIME OF DAY	CYCLE/ PUMP RATE (ml/min)	VOLUME (L)	DEPTH TO WATER (m)	DISSOLVED OXYGEN (mg/l)		ELECTRICAL CONDUCTIVITY (mS or µS/cm)		pH (pH units)		REDOX POTENTIAL (mV)		TEMPERATURE (°C)		CLARITY – tick one					COMMENTS
				READING	CHANGE*	READING	CHANGE*	READING	CHANGE*	READING	CHANGE*	READING	CHANGE	Clear	Slightly Cloudy	Cloudy	Very Cloudy	Turbid	ODOUR, COLOUR, SEDIMENTS, PSH COLLECTED, etc
BH101			10.66	2.10		404.1		7.06		-45.4		21.7			X				Slightly Yellow, No odour or sheen
BH102			10.41	0.51		288.1		6.39		-39.4		21.5			X				" "
BH103			5.58	1.17		385.5		5.58		48.1		21.2			X				Clear, No odour or sheen
STABILISATION CRITERIA (3 readings within following ranges)				± 10%		± 3%		± 0.1 unit		± 10mV		± 0.2°C							

Well Depth
BH101 25.98
BH102 24.68
BH103 15.13

DUPLICATE COLLECTED: Y ☑ N ☐ DUPLICATE ID: QD01 Taken from BH102

TRIPLICATE COLLECTED: Y ☐ N ☒ TRIPLICATE ID: _____

WERE METALS FIELD FILTERED? Y ☐ N ☐ Unfiltered samples **must not** be put into a preserved container (i.e. 'metals' bottle)

HAS THIS FORM BEEN COMPLETED IN FULL? Y ☑ N ☐

coffey

Project No.	SYDEN205070
Date:	12/11/18
Page	1 of 1

DAILY FIELD SUMMARY

Project Name: Bligh st

Field Personnel (Initials): AC

Project Manager (Initials): ML

Time	Description of Tasks Undertaken: (Include details onsite, all personnel, standby, phone calls)
8.00 am	Packing for the day.
9.00 am	Leave office to site.
9.45 am	Onsite start works.
1.00 pm	Leave site - Head back to office.
1.35 pm	Arrive back to office - Complete paper work and
	organise samples/equipment.
2.30	Sign off Job.

Oil / Water Interface Meter

Instrument Interface Meter (30M)
Serial No. 312444

airmet
Air-Met Scientific Pty Ltd
1300 137 067

Item	Test	Pass	Comments
Battery	Compartment	✓	
	Capacity	✓	
Probe	Cleaned/Decon.	✓	
	Operation	✓	
Connectors	Condition	✓	
		✓	
Tape Check	Cleaned	✓	
	Checked for cuts	✓	
Instrument Test	At surface level	✓	

Certificate of Calibration

This is to certify that the above instrument has been cleaned and tested.

Calibrated by: Sarah Lian **Sarah Lian**

Calibration date: **6/11/2018**

Next calibration due: **5/01/2019**

09/11/2018

Multi Parameter Water Meter

airmet

Air-Met Scientific Pty Ltd
1300 137 067

Instrument YSI Quatro Pro Plus
Serial No. 13D100014

Item	Test	Pass	Comments
Battery	Charge Condition	✓	
	Fuses	✓	
	Capacity	✓	
Switch/keypad	Operation	✓	
Display	Intensity	✓	
	Operation (segments)	✓	
Grill Filter	Condition	✓	
	Seal	✓	
PCB	Condition	✓	
Connectors	Condition	✓	
Sensor	1. pH	✓	
	2. mV	✓	
	3. EC	✓	
	4. D.O	✓	
	5. Temp	✓	
Alarms	Beeper	✓	
	Settings	✓	
Software	Version	✓	
Data logger	Operation	✓	
Download	Operation	✓	
Other tests:			

Certificate of Calibration

This is to certify that the above instrument has been calibrated to the following specifications:

Sensor	Serial no	Standard Solutions	Certified	Solution Bottle Number	Instrument Reading
1. pH 10.00		pH10.00		320322	pH 9.78
2. pH 7.00		pH 7.00		317272	pH 6.90
3. pH 4.00		pH 4.00		320612	pH 4.16
4. mV		234mV		321773/325420	235.1mV
5. EC		2.76mS		320325	2.74mS
6. D.O		0.00ppm		10175	0.08ppm
7. Temp		20.6°C		Multithern	19.9°C

Calibrated by: Sarah Lian **Sarah Lian**

Calibration date: **09/11/2018**

Next calibration due: **10/12/2018**

Appendix C - Laboratory Reports

Certificate of Analysis

Coffey Environments Pty Ltd NSW
Level 20, Tower B, Citadel Tower 799 Pacific Highway
Chatswood
NSW 2067

Attention: **Matthew Locke**

Report **627443-W**
Project name BLIGH ST
Project ID SYDEN205070
Received Date Nov 12, 2018

Client Sample ID			**BH101**	**BH102**	**BH103**	**QD01**
Sample Matrix			**Water**	**Water**	**Water**	**Water**
Eurofins | mgt Sample No.			**M18-No16254**	**M18-No16255**	**M18-No16256**	**M18-No16257**
Date Sampled			**Nov 12, 2018**	**Nov 12, 2018**	**Nov 12, 2018**	**Nov 12, 2018**
Test/Reference	LOR	Unit				
Total Recoverable Hydrocarbons - 2013 NEPM Fractions						
Naphthalene[N02]	0.01	mg/L	< 0.01	< 0.01	< 0.01	< 0.01
TRH C6-C10	0.02	mg/L	< 0.02	< 0.02	< 0.02	< 0.02
TRH C6-C10 less BTEX (F1)[N04]	0.02	mg/L	< 0.02	< 0.02	< 0.02	< 0.02
TRH >C10-C16	0.05	mg/L	0.09	0.27	< 0.05	0.21
TRH >C10-C16 less Naphthalene (F2)[N01]	0.05	mg/L	0.09	0.27	< 0.05	0.21
TRH >C16-C34	0.1	mg/L	0.4	0.3	< 0.1	0.4
TRH >C34-C40	0.1	mg/L	< 0.1	< 0.1	< 0.1	< 0.1
TRH >C10-C40 (total)*	0.1	mg/L	0.49	0.57	< 0.1	0.61
Total Recoverable Hydrocarbons - 1999 NEPM Fractions						
TRH C6-C9	0.02	mg/L	< 0.02	< 0.02	< 0.02	< 0.02
TRH C10-C14	0.05	mg/L	< 0.05	0.07	< 0.05	< 0.05
TRH C15-C28	0.1	mg/L	0.4	0.5	< 0.1	0.5
TRH C29-C36	0.1	mg/L	< 0.1	< 0.1	< 0.1	0.1
TRH C10-36 (Total)	0.1	mg/L	0.4	0.57	< 0.1	0.6
BTEX						
Benzene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Toluene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Ethylbenzene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
m&p-Xylenes	0.002	mg/L	< 0.002	< 0.002	< 0.002	< 0.002
o-Xylene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Xylenes - Total	0.003	mg/L	< 0.003	< 0.003	< 0.003	< 0.003
4-Bromofluorobenzene (surr.)	1	%	133	132	139	126
Polycyclic Aromatic Hydrocarbons						
Acenaphthene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Acenaphthylene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Anthracene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Benz(a)anthracene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Benzo(a)pyrene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Benzo(b&j)fluoranthene[N07]	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Benzo(g.h.i)perylene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Benzo(k)fluoranthene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Chrysene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Dibenz(a.h)anthracene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Fluoranthene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Fluorene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001

Client Sample ID			BH101	BH102	BH103	QD01
Sample Matrix			Water	Water	Water	Water
Eurofins | mgt Sample No.			M18-No16254	M18-No16255	M18-No16256	M18-No16257
Date Sampled			Nov 12, 2018	Nov 12, 2018	Nov 12, 2018	Nov 12, 2018
Test/Reference	LOR	Unit				
Polycyclic Aromatic Hydrocarbons						
Indeno(1.2.3-cd)pyrene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Naphthalene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Phenanthrene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Pyrene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Total PAH*	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
2-Fluorobiphenyl (surr.)	1	%	73	50	58	95
p-Terphenyl-d14 (surr.)	1	%	72	87	128	74

Client Sample ID			RB01	TB	[R20]TS
Sample Matrix			Water	Water	Water
Eurofins | mgt Sample No.			M18-No16258	M18-No16259	M18-No16260
Date Sampled			Nov 12, 2018	Nov 12, 2018	Nov 12, 2018
Test/Reference	LOR	Unit			
Total Recoverable Hydrocarbons - 2013 NEPM Fractions					
Naphthalene[N02]	0.01	mg/L	< 0.01	< 0.01	81
TRH C6-C10	0.02	mg/L	< 0.02	< 0.02	87
TRH C6-C10 less BTEX (F1)[N04]	0.02	mg/L	< 0.02	< 0.02	-
TRH >C10-C16	0.05	mg/L	< 0.05	-	-
TRH >C10-C16 less Naphthalene (F2)[N01]	0.05	mg/L	< 0.05	-	-
TRH >C16-C34	0.1	mg/L	< 0.1	-	-
TRH >C34-C40	0.1	mg/L	< 0.1	-	-
TRH >C10-C40 (total)*	0.1	mg/L	< 0.1	-	-
Total Recoverable Hydrocarbons - 1999 NEPM Fractions					
TRH C6-C9	0.02	mg/L	< 0.02	< 0.02	86
TRH C10-C14	0.05	mg/L	< 0.05	-	-
TRH C15-C28	0.1	mg/L	< 0.1	-	-
TRH C29-C36	0.1	mg/L	< 0.1	-	-
TRH C10-36 (Total)	0.1	mg/L	< 0.1	-	-
BTEX					
Benzene	0.001	mg/L	< 0.001	< 0.001	95
Toluene	0.001	mg/L	< 0.001	< 0.001	100
Ethylbenzene	0.001	mg/L	< 0.001	< 0.001	120
m&p-Xylenes	0.002	mg/L	< 0.002	< 0.002	110
o-Xylene	0.001	mg/L	< 0.001	< 0.001	110
Xylenes - Total	0.003	mg/L	< 0.003	< 0.003	110
4-Bromofluorobenzene (surr.)	1	%	118	131	126
Polycyclic Aromatic Hydrocarbons					
Acenaphthene	0.001	mg/L	< 0.001	-	-
Acenaphthylene	0.001	mg/L	< 0.001	-	-
Anthracene	0.001	mg/L	< 0.001	-	-
Benz(a)anthracene	0.001	mg/L	< 0.001	-	-
Benzo(a)pyrene	0.001	mg/L	< 0.001	-	-
Benzo(b&j)fluoranthene[N07]	0.001	mg/L	< 0.001	-	-
Benzo(g.h.i)perylene	0.001	mg/L	< 0.001	-	-
Benzo(k)fluoranthene	0.001	mg/L	< 0.001	-	-
Chrysene	0.001	mg/L	< 0.001	-	-
Dibenz(a.h)anthracene	0.001	mg/L	< 0.001	-	-
Fluoranthene	0.001	mg/L	< 0.001	-	-

Client Sample ID			RB01	TB	[R20]TS
Sample Matrix			Water	Water	Water
Eurofins | mgt Sample No.			M18-No16258	M18-No16259	M18-No16260
Date Sampled			Nov 12, 2018	Nov 12, 2018	Nov 12, 2018
Test/Reference	LOR	Unit			
Polycyclic Aromatic Hydrocarbons					
Fluorene	0.001	mg/L	< 0.001	-	-
Indeno(1.2.3-cd)pyrene	0.001	mg/L	< 0.001	-	-
Naphthalene	0.001	mg/L	< 0.001	-	-
Phenanthrene	0.001	mg/L	< 0.001	-	-
Pyrene	0.001	mg/L	< 0.001	-	-
Total PAH*	0.001	mg/L	< 0.001	-	-
2-Fluorobiphenyl (surr.)	1	%	82	-	-
p-Terphenyl-d14 (surr.)	1	%	103	-	-

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported.
A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results (regarding both quality and NATA accreditation).

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Total Recoverable Hydrocarbons - 2013 NEPM Fractions	Melbourne	Nov 14, 2018	7 Day
- Method: LTM-ORG-2010 TRH C6-C40			
Total Recoverable Hydrocarbons	Melbourne	Nov 14, 2018	7 Day
- Method: LTM-ORG-2010 TRH C6-C40			
Total Recoverable Hydrocarbons - 1999 NEPM Fractions	Melbourne	Nov 14, 2018	7 Day
- Method: LTM-ORG-2010 TRH C6-C40			
BTEX	Melbourne	Nov 14, 2018	14 Day
- Method: LTM-ORG-2150 VOCs in Soils Liquid and other Aqueous Matrices			
Eurofins | mgt Suite B4			
Total Recoverable Hydrocarbons - 2013 NEPM Fractions	Melbourne	Nov 14, 2018	7 Day
- Method: LTM-ORG-2010 TRH C6-C40			
Polycyclic Aromatic Hydrocarbons	Melbourne	Nov 14, 2018	7 Day
- Method: LTM-ORG-2130 PAH and Phenols in Soil and Water			

eurofins | mgt

ABN– 50 005 085 521
e.mail : EnviroSales@eurofins.com
web : www.eurofins.com.au

Melbourne
2-5 Kingston Town Close
Oakleigh VIC 3166
Phone : +61 3 8564 5000
NATA # 1261
Site # 1254 & 14271

Sydney
Unit F3, Building F
16 Mars Road
Lane Cove West NSW 2066
Phone : +61 2 9900 8400
NATA # 1261 Site # 18217

Brisbane
1/21 Smallwood Place
Murarrie QLD 4172
Phone : +61 7 3902 4600
NATA # 1261 Site # 20794

Perth
2/91 Leach Highway
Kewdale WA 6105
Phone : +61 8 9251 9600
NATA # 1261
Site # 23736

Company Name:	Coffey Environments Pty Ltd NSW	**Order No.:**		**Received:**	Nov 12, 2018 3:09 PM
Address:	Level 20, Tower B, Citadel Tower 799 Pacific Highway Chatswood NSW 2067	**Report #:**	627443	**Due:**	Nov 19, 2018
		Phone:	+61 2 9406 1000	**Priority:**	5 Day
		Fax:	+61 2 9406 1004	**Contact Name:**	Matthew Locke
Project Name:	BLIGH ST				
Project ID:	SYDEN205070				

Eurofins | mgt Analytical Services Manager : Nibha Vaidya

Sample Detail						Eurofins | mgt Suite B4	BTEXN and Volatile TRH
Melbourne Laboratory - NATA Site # 1254 & 14271						X	X
Sydney Laboratory - NATA Site # 18217							
Brisbane Laboratory - NATA Site # 20794							
Perth Laboratory - NATA Site # 23736							
External Laboratory							
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**		
1	BH101	Nov 12, 2018		Water	M18-No16254	X	
2	BH102	Nov 12, 2018		Water	M18-No16255	X	
3	BH103	Nov 12, 2018		Water	M18-No16256	X	
4	QD01	Nov 12, 2018		Water	M18-No16257	X	
5	RB01	Nov 12, 2018		Water	M18-No16258	X	
6	TB	Nov 12, 2018		Water	M18-No16259		X
7	TS	Nov 12, 2018		Water	M18-No16260		X
Test Counts						5	2

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. This report replaces any interim results previously issued.

Holding Times

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

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

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

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

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

****NOTE:** pH duplicates are reported as a range NOT as RPD

Units

mg/kg: milligrams per kilogram

mg/L: milligrams per litre

ug/L: micrograms per litre

ppm: Parts per million

ppb: Parts per billion

%: Percentage

org/100mL: Organisms per 100 millilitres

NTU: Nephelometric Turbidity Units

MPN/100mL: Most Probable Number of organisms per 100 millilitres

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery.
CRM	Certified Reference Material - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
QSM	Quality Systems Manual ver 5.1 US Department of Defense
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR : No Limit

Results between 10-20 times the LOR : RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

Surrogate Recoveries: Recoveries must lie between 50-150%-Phenols & PFASs

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.1 where no positive PFAS results have been reported have been reviewed and no data was affected.

WA DWER (n=10): PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. Organochlorine Pesticide analysis - where reporting LCS data, Toxaphene & Chlordane are not added to the LCS.
4. Organochlorine Pesticide analysis - where reporting Spike data, Toxaphene is not added to the Spike.
5. Total Recoverable Hydrocarbons - where reporting Spike & LCS data, a single spike of commercial Hydrocarbon products in the range of C12-C30 is added and it's Total Recovery is reported in the C10-C14 cell of the Report.
6. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling.Therefore laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
7. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of Recovery the term "INT" appears against that analyte.
8. Polychlorinated Biphenyls are spiked only using Aroclor 1260 in Matrix Spikes and LCS.
9. For Matrix Spikes and LCS results a dash " -" in the report means that the specific analyte was not added to the QC sample.
10. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

eurofins | mgt

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	mg/L	< 0.01			0.01	Pass	
TRH C6-C10	mg/L	< 0.02			0.02	Pass	
TRH >C10-C16	mg/L	< 0.05			0.05	Pass	
TRH >C16-C34	mg/L	< 0.1			0.1	Pass	
TRH >C34-C40	mg/L	< 0.1			0.1	Pass	
Method Blank							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions							
TRH C6-C9	mg/L	< 0.02			0.02	Pass	
TRH C10-C14	mg/L	< 0.05			0.05	Pass	
TRH C15-C28	mg/L	< 0.1			0.1	Pass	
TRH C29-C36	mg/L	< 0.1			0.1	Pass	
Method Blank							
BTEX							
Benzene	mg/L	< 0.001			0.001	Pass	
Toluene	mg/L	< 0.001			0.001	Pass	
Ethylbenzene	mg/L	< 0.001			0.001	Pass	
m&p-Xylenes	mg/L	< 0.002			0.002	Pass	
o-Xylene	mg/L	< 0.001			0.001	Pass	
Xylenes - Total	mg/L	< 0.003			0.003	Pass	
Method Blank							
Polycyclic Aromatic Hydrocarbons							
Acenaphthene	mg/L	< 0.001			0.001	Pass	
Acenaphthylene	mg/L	< 0.001			0.001	Pass	
Anthracene	mg/L	< 0.001			0.001	Pass	
Benz(a)anthracene	mg/L	< 0.001			0.001	Pass	
Benzo(a)pyrene	mg/L	< 0.001			0.001	Pass	
Benzo(b&j)fluoranthene	mg/L	< 0.001			0.001	Pass	
Benzo(g.h.i)perylene	mg/L	< 0.001			0.001	Pass	
Benzo(k)fluoranthene	mg/L	< 0.001			0.001	Pass	
Chrysene	mg/L	< 0.001			0.001	Pass	
Dibenz(a.h)anthracene	mg/L	< 0.001			0.001	Pass	
Fluoranthene	mg/L	< 0.001			0.001	Pass	
Fluorene	mg/L	< 0.001			0.001	Pass	
Indeno(1.2.3-cd)pyrene	mg/L	< 0.001			0.001	Pass	
Naphthalene	mg/L	< 0.001			0.001	Pass	
Phenanthrene	mg/L	< 0.001			0.001	Pass	
Pyrene	mg/L	< 0.001			0.001	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	%	109			70-130	Pass	
TRH C6-C10	%	120			70-130	Pass	
TRH >C10-C16	%	119			70-130	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions							
TRH C6-C9	%	118			70-130	Pass	
TRH C10-C14	%	129			70-130	Pass	
LCS - % Recovery							
BTEX							
Benzene	%	118			70-130	Pass	
Toluene	%	116			70-130	Pass	

Test			Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Ethylbenzene			%	117			70-130	Pass	
m&p-Xylenes			%	117			70-130	Pass	
Xylenes - Total			%	117			70-130	Pass	
LCS - % Recovery									
Polycyclic Aromatic Hydrocarbons									
Acenaphthene			%	94			70-130	Pass	
Acenaphthylene			%	93			70-130	Pass	
Anthracene			%	93			70-130	Pass	
Benz(a)anthracene			%	82			70-130	Pass	
Benzo(a)pyrene			%	91			70-130	Pass	
Benzo(b&j)fluoranthene			%	84			70-130	Pass	
Benzo(g.h.i)perylene			%	90			70-130	Pass	
Benzo(k)fluoranthene			%	95			70-130	Pass	
Chrysene			%	97			70-130	Pass	
Dibenz(a.h)anthracene			%	85			70-130	Pass	
Fluoranthene			%	101			70-130	Pass	
Fluorene			%	95			70-130	Pass	
Indeno(1.2.3-cd)pyrene			%	79			70-130	Pass	
Naphthalene			%	79			70-130	Pass	
Phenanthrene			%	98			70-130	Pass	
Pyrene			%	103			70-130	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Spike - % Recovery									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1					
TRH >C10-C16	M18-No15175	NCP	%	120			70-130	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1					
TRH C10-C14	M18-No15175	NCP	%	113			70-130	Pass	
Spike - % Recovery									
Polycyclic Aromatic Hydrocarbons				Result 1					
Acenaphthene	M18-No16254	CP	%	73			70-130	Pass	
Acenaphthylene	M18-No16254	CP	%	70			70-130	Pass	
Anthracene	M18-No16254	CP	%	101			70-130	Pass	
Benz(a)anthracene	M18-No16254	CP	%	94			70-130	Pass	
Benzo(a)pyrene	M18-No16254	CP	%	102			70-130	Pass	
Benzo(b&j)fluoranthene	M18-No16254	CP	%	93			70-130	Pass	
Benzo(g.h.i)perylene	M18-No16254	CP	%	102			70-130	Pass	
Benzo(k)fluoranthene	M18-No16254	CP	%	108			70-130	Pass	
Chrysene	M18-No16254	CP	%	100			70-130	Pass	
Dibenz(a.h)anthracene	M18-No16254	CP	%	97			70-130	Pass	
Fluoranthene	M18-No16254	CP	%	111			70-130	Pass	
Fluorene	M18-No16254	CP	%	91			70-130	Pass	
Indeno(1.2.3-cd)pyrene	M18-No16254	CP	%	95			70-130	Pass	
Naphthalene	M18-No16254	CP	%	90			70-130	Pass	
Phenanthrene	M18-No16254	CP	%	107			70-130	Pass	
Pyrene	M18-No16254	CP	%	113			70-130	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Duplicate									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1	Result 2	RPD			
TRH >C10-C16	M18-No15174	NCP	mg/L	< 0.05	< 0.05	<1	30%	Pass	
TRH >C16-C34	M18-No15174	NCP	mg/L	< 0.1	< 0.1	<1	30%	Pass	
TRH >C34-C40	M18-No15174	NCP	mg/L	< 0.1	< 0.1	<1	30%	Pass	

Duplicate									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1	Result 2	RPD			
TRH C10-C14	M18-No15174	NCP	mg/L	< 0.05	< 0.05	<1	30%	Pass	
TRH C15-C28	M18-No15174	NCP	mg/L	< 0.1	< 0.1	<1	30%	Pass	
TRH C29-C36	M18-No15174	NCP	mg/L	< 0.1	< 0.1	<1	30%	Pass	
Duplicate									
Polycyclic Aromatic Hydrocarbons				Result 1	Result 2	RPD			
Acenaphthene	M18-No16256	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Acenaphthylene	M18-No16256	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Anthracene	M18-No16256	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Benz(a)anthracene	M18-No16256	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Benzo(a)pyrene	M18-No16256	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Benzo(b&j)fluoranthene	M18-No16256	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Benzo(g.h.i)perylene	M18-No16256	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Benzo(k)fluoranthene	M18-No16256	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Chrysene	M18-No16256	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Dibenz(a.h)anthracene	M18-No16256	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Fluoranthene	M18-No16256	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Fluorene	M18-No16256	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Indeno(1.2.3-cd)pyrene	M18-No16256	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Naphthalene	M18-No16256	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Phenanthrene	M18-No16256	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Pyrene	M18-No16256	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	

Comments

Eurofins | mgt accreditation number 1261, corporate site 1254 is currently in progress of a controlled transition to a new custom built location at 6 Monterey Road, Dandenong South, Victoria 3175. All results on this report denoted as being performed by Eurofins | mgt 2-5 Kingston Town Close, Oakleigh Victoria 3166 corporate site 1254, will have been performed on either Oakleigh or new Dandenong South site.

Sample Integrity

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

Qualifier Codes/Comments

Code	Description
N01	F2 is determined by arithmetically subtracting the "naphthalene" value from the ">C10-C16" value. The naphthalene value used in this calculation is obtained from volatiles (Purge & Trap analysis).
N02	Where we have reported both volatile (P&T GCMS) and semivolatile (GCMS) naphthalene data, results may not be identical. Provided correct sample handling protocols have been followed, any observed differences in results are likely to be due to procedural differences within each methodology. Results determined by both techniques have passed all QAQC acceptance criteria, and are entirely technically valid.
N04	F1 is determined by arithmetically subtracting the "Total BTEX" value from the "C6-C10" value. The "Total BTEX" value is obtained by summing the concentrations of BTEX analytes. The "C6-C10" value is obtained by quantitating against a standard of mixed aromatic/aliphatic analytes.
N07	Please note:- These two PAH isomers closely co-elute using the most contemporary analytical methods and both the reported concentration (and the TEQ) apply specifically to the total of the two co-eluting PAHs
R20	This sample is a Trip Spike and therefore all results are reported as a percentage

Authorised By

Nibha Vaidya	Analytical Services Manager
Harry Bacalis	Senior Analyst-Volatile (VIC)
Joseph Edouard	Senior Analyst-Organic (VIC)

Glenn Jackson
General Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please click here.

Appendix D - QA/QC Data Evaluation

Coffey Services Australia Pty Ltd
A.B.N. 55 139 460 521
DATA VALIDATION REPORT
Job No: 754-SYDEN205070
Groundwater Analysis - Lab Batch References – 627443-W

I. SAMPLE HANDLING

	Yes	No (Comment below)
1. Were the sample **holding times** met?	☒	☐
2. Were the samples in **proper custody** between the field and reaching the laboratory?	☒	☐
3. Were the samples **properly and adequately** preserved? *This includes keeping the samples chilled, where applicable.*	☐	☒
4. Were the samples received by the laboratory in good condition?	☒	☐

COMMENTS:

No ice was used to keep the samples chilled. However, this is unlikely to affect the results as there were only three samples collected, time on site was short and samples were delivered on the same day as they were collected.

Sample Handling was:

☒ Satisfactory
☐ Partially Satisfactory
☐ Unsatisfactory

Coffey Services Australia Pty Ltd
A.B.N. 55 139 460 521
DATA VALIDATION REPORT
Job No: 754-SYDEN205070
Groundwater Analysis - Lab Batch References – 627443-W

II PRECISION/ACCURACY ASSESSMENT

	Yes	No (Comment below)
1. Was a NATA registered laboratory used?	☒	☐
2. Did the laboratory perform the requested tests?	☒	☐
3. Were the laboratory methods adopted NATA endorsed?	☒	☐
4. Were the appropriate test procedures followed?	☒	☐
5. Were the reporting limits satisfactory?	☒	☐
6. Was the NATA Seal on the reports?	☒	☐
7. Were the reports signed by an authorised person?	☒	☐

COMMENTS:

No Comments.

Precision/Accuracy of the Laboratory Report	☒ Satisfactory ☐ Partially Satisfactory	☐ Unsatisfactory

III. FIELD QA/QC

1. Number of Samples Analysed — Soil: 0; Groundwater: 3

2. Number of Days of Sampling: 1

3. Number and Type of QA/QC Samples Collected:

Quality Control Sample Type	No.	% Total No. Samples
Intra-lab Duplicates (Soil)	0	
Inter-lab Duplicates (Soil)	0	
Intra-lab Duplicates (Groundwater)	1	33.33%
Inter-lab Duplicates (Groundwater)	0	0%
Trip Blanks	1	-
Trip Spike	1	-
Equipment Rinsate	1	-

4. FIELD DUPLICATES

	Yes	**No** (Comment below)
A. Were an Adequate Number of field duplicates analysed for each chemical?	☒	☐
B. Were RPDs within Control Limits?		
a. Organics (No limit (<10 x LOR); 50% (10-20 x LOR); 30% (>20 x LOR))	☒	☐
b. Metals/Inorganics (No limit (<10 x LOR); 50% (10-20 x LOR); 30% (>20 x LOR))	☐	☐
c. Volatile & semi volatile organics (No limit (<10 x LOR); 50% (10-20 x LOR); 30% (>20 x LOR))	☒	☐

COMMENTS:

Metals/Inorganics were not analysed for these samples (not the CoPCs).

IV. TRIP BLANKS (TB) AND TRIP SPIKES (TS)

	Yes	No (Comment below)
A. Were an Adequate Number of trip blanks and spikes analysed?	☒	☐
B. Were the trip blanks free of contaminants and trip spike were within acceptance limit?	☒	☐
C. Were the trip spikes reported within acceptable recoveries?	☒	☐

COMMENTS:

No Comments.

6. EQUIPMENT RINSATE SAMPLES

	Yes	No (Comment below)
A. Were an adequate number of Equipment Rinsate Samples collected?	☒	☐
B. Were the Equipment Rinsate Samples free of contaminants?	☒	☐

Field QA/QC was:	☒ Satisfactory	☐ Unsatisfactory
	☐ Partially Satisfactory	

V LABORATORY INTERNAL QUALITY CONTROL PROCEDURES

1. Type of QA/QC Samples

	Yes	No
Laboratory Blanks/Reagent Blanks	☒	☐
Laboratory Duplicates	☒	☐
Matrix Spikes/Matrix Spike Duplicates	☒	☐
Laboratory Control Spike	☒	☐
Surrogate (where appropriate)*	☒	☐

	Yes	**No** (Comment below)
2 Were the laboratory blanks/reagents blanks free of contamination?	☒	☐
3. Were the spike recoveries within control limits?		
a. Organics (70% to 130%)	☒	☐
b. Metals/Inorganic (70% to 130%)	☐	☐
4. Were the RPDs of the laboratory duplicates within control limits?	☒	☐
5. Were the surrogate recoveries within control limits?	☒	☐

COMMENTS:

No Metals/Inorganics were collected as part of this investigation.

5. The laboratory internal QA/QC was:	☒ Satisfactory	☐ Unsatisfactory
	☐ Partially Satisfactory	

VI DATA USABILITY

1.	Data Directly Usable	☒
2.	Data Usable with the following considerations	☐
3.	Data Not Usable.	☐

COMMENTS:

No Comments.

Appendix E - Geotechnical Borehole Logs

Rock Description Explanation Sheet (1 of 2)

The descriptive terms used by Coffey are given below. They are broadly consistent with Australian Standard AS1726:2017.

DEFINITIONS: Rock material, defect, structure and rock mass are defined as follows:

Rock material	In engineering terms rock material is any naturally occurring aggregate of minerals and/or organic materials that cannot be disaggregated by hand in air or water without prior soaking. Rock material is intact rock that is bounded by defects. Material which can be disaggregated or remoulded should be described as a soil.
Defect	Discontinuity, fracture, break or void in the material or materials across which there is little or no tensile strength.
Structure	Nature and configuration of the different defects within the rock mass and their relationship with each other.
Rock mass	It is the entirety of the system formed by all of the rock material and all of the defects. That is, it is a body of material which is not effectively homogeneous.

MATERIAL DESCRIPTIVE TERMS:

Rock name	Simple rock names are used rather than precise geological classification.
Particle size	Grain size terms for sandstone are:
Coarse grained	Mainly 0.6mm to 2mm
Medium grained	Mainly 0.2mm to 0.6mm
Fine grained	Mainly 0.06mm (just visible) to 0.2mm
Fabric	When grains show an alignment, a preferred orientation or a layering (e.g. bedding or lamination for sedimentary rocks, and foliation or cleavage for metamorphic rocks) the terms used are:
Massive	No layering or penetrative fabric.
Indistinct	Layering or fabric just visible. Little effect on strength properties.
Distinct	Layering or fabric is easily visible. Rock may break more easily parallel to the fabric.

CLASSIFICATION OF MATERIAL WEATHERING

Term	Abbreviation	Definition
Residual Soil	**RS**	Material is weathered to such an extent that it has soil properties. Mass structure and material texture and fabric of original rock are no longer visible. Soil has not been significantly transported.
Extremely Weathered	**XW**	Material is weathered to such an extent that it has soil properties, i.e. it either disaggregates or can be remoulded in water. Mass structure and material texture and fabric of original rock are still visible.
Highly Weathered[1]	**HW**	The whole of the rock material is discoloured, usually by iron staining or bleaching to the extent that the colour of the original rock is not recognisable. Rock strength is significantly changed by weathering. Some primary minerals have weathered to clay minerals. Porosity may be increased by leaching or may be decreased due to the deposition of weathering products in pores.
Moderately Weathered[1]	**MW**	The whole of the rock material is discoloured, usually by iron staining or bleaching to the extent that the colour of the original rock is no longer recognisable. Little or no change of strength from fresh rock.
Slightly Weathered	**SW**	Rock is partially discoloured with staining or bleaching adjacent to defects, but shows little or no change of strength from fresh rock.
Fresh	**FR**	Rock shows no sign of decomposition of individual minerals or colour changes.

Notes on Weathering:

1. The term 'Distinctly Weathered' (DW) may be used where it is not practicable (or it is judged that there is no advantage in making such a distinction) to distinguish between 'Highly Weathered' and 'Moderately Weathered'. 'Distinctly Weathered' is defined as follows: 'Rock strength usually changed by weathering. The rock may be highly discoloured, usually by iron staining. Porosity may be increased by leaching, or may be decreased due to deposition of weathering products in pores'.
2. Where physical and chemical changes of the rock material are caused by hot gases or liquids at depth (process called alteration) the term 'altered' may be substituted for 'weathering' to give the abbreviations XA, HA, MA, SA and DA.

ROCK MATERIAL STRENGTH TERMS

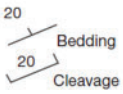
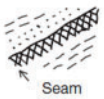
Term (Abbreviation)	Guide to Strength: Point Load Strength Index, $I_{s(50)}$ (MPa)	Guide to Strength: Field Assessment
Very Low (VL)	0.03 - 0.1	Material crumbles under firm blows with sharp end of pick; can be peeled with a knife; too hard to cut a triaxial sample by hand; pieces up to 30mm thick can be broken by finger pressure.
Low (L)	0.1 - 0.3	Easily scored with a knife; indentations 1mm to 3mm show with firm bows of a pick point; has a dull sound under hammer. A piece of core 150mm long by 50mm diameter may be broken by hand. Sharp edges of core may be friable and break during handling.
Medium (M)	0.3 to 1.0	Readily scored with a knife; a piece of core 150mm long by 50mm diameter can be broken by hand with difficulty.
High (H)	1 to 3	A piece of core 150mm long by 50mm diameter cannot be broken by hand but can be broken by a pick with a single firm blow; rock rings under hammer.
Very High (VH)	3 to 10	Hand specimen breaks after more than one blow; rock rings under hammer.
Extremely High (EH)	More than 10	Specimen requires many blows with geological pick to break through intact material; rock rings under hammer.

Notes on Rock Material Strength:

1. Material with strength less than 'Very Low' should be described using soil characteristics.
2. The method of measuring the $I_{S(50)}$ should be in accordance with AS 4133.4.2.
3. The rock strength should be determined perpendicular to any anisotropy in the rock. High strength anisotropic rocks may readily break parallel to the planar anisotropy.
4. Although AS1726:2017 provides a basis for rock strength terms based on Unconfined Compressive Strength (UCS), the ratio between UCS and $I_{S(50)}$ may vary from less than 10 to over 30 depending on the rock type and overall strength. The UCS/$I_{S(50)}$ strength ratio should be determined for each rock material.
5. The rock strength classification using $I_{S(50)}$ above should be considered indicative only. The rock strength classified in accordance with AS1726:2017 may be higher or lower if UCS results are available.

Rock Description Explanation Sheet (2 of 2)

COMMON ROCK DEFECT TYPES

Term	Definition	Diagram	Map Symbol	Graphic Log (Note 1)
Parting	A surface or crack across which the rock has little or no tensile strength. Parallel or sub-parallel to layering (e.g. bedding) or a planar anisotropy in the rock material (e.g. cleavage). May be open or closed.			
Joint	A surface or crack with no apparent shear displacement and across which the rock has little or no tensile strength, but which is not parallel or sub-parallel to layering or to planar anisotropy in the rock material. May be open or closed.			
Sheared Zone/Seam (Note 3)	Zone of rock material with roughly parallel near planar, curved or undulating boundaries cut by closely spaced joints, sheared surfaces or other defects. Some of the defects are usually curved and intersect to divide the mass into lenticular or wedge shaped blocks.			
Sheared Surface (Note 3)	A near planar, curved or undulating surface which is usually smooth, polished or slickensided and which shows evidence of shear displacement.			
Crushed Seam (Note 3)	Seam of soil material with roughly parallel almost planar boundaries, composed of disoriented, usually angular fragments of the host rock material which may be more weathered than the host rock. The seam has soil properties.			
Infilled Seam	Seam of soil material usually with distinct roughly parallel boundaries formed by the migration of soil into an open cavity or joint, infilled seams up to 1mm thick may be described as veneer or coating on a joint surface.			
Extremely Weathered Seam	Seam of soil material, often with gradational boundaries. Formed by weathering of the rock material in place.			

Notes on Defects:

1. Usually borehole logs show the true dip of defects, and face sketches and sections show the apparent dip.
2. Partings and joints are not usually shown on the graphic log unless considered significant.
3. Sheared zones/seams, sheared surfaces and crushed seams are generally faults in geological terms.

DEFECT SHAPE TERMS

Planar	The defect does not vary in orientation
Curved	The defect has a gradual change in orientation
Undulating	The defect has a wavy surface
Stepped	The defect has one or more well defined steps
Irregular	The defect has many sharp changes of orientation

Note: The assessment of defect shape is partly influenced by the scale of the observation.

DEFECT ROUGHNESS TERMS

Very Rough	Many large surface irregularities (amplitude generally more than 1mm). Feels like, or coarser than very coarse sand paper.
Rough	Many small surface irregularities (amplitude generally less than 1mm). Feels like fine to coarse sand paper.
Smooth	Smooth to touch. Few or no surface irregularities.
Polished	Shiny smooth surface.
Slickensided	Grooved or striated surface, usually polished.

DEFECT COATING TERMS

Clean	No visible coating.
Stained	No visible coating but surfaces are discoloured.
Veneer	A visible coating of soil or mineral, too thin to measure; may be patchy.
Coating	A visible coating up to 1mm thick. Thicker soil material should be described using appropriate defect terms (e g. infilled seam). Thicker rock strength material should be described as a vein.

DIMENSION OF DEFECTS

Spacing, length, openness and thickness

The spacing, length, aperture (openness), and seam thickness should generally be described directly in millimetres or metres.

Block Shape

Where it is considered significant, block shape (e.g. tabular, prismatic, columnar) should be described using the terms in Table 23 of AS 1726:2017.

coffey
A TETRA TECH COMPANY

Engineering Log - Borehole

Borehole ID.	**BH101**
sheet:	1 of 5
project no.	**754-SYDGE205019**
client:	**Recap Management**
date started:	**01 Nov 2018**
principal:	
date completed:	**03 Nov 2018**
project:	**4-6 Bligh Street**
logged by:	**YA**
location:	**4-6 Bligh Street, Sydney, NSW**
checked by:	**AJB**

position: E: 334,465.60; N: 6,251,284.97 (MGA94) | surface elevation: 17.90 m (AHD) | angle from horizontal: 90°

drill model: , Track mounted | drilling fluid: | hole diameter :

drilling information | **material substance**

method & support	penetration 1 2 3	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description (SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components)	moisture condition	consistency / relative density	hand penetrometer (kPa) 100 200 300 400	structure and additional observations
								CONCRETE SLAB: angular, no voids, 20-40mm aggregate, separate at two layers 150mm rubber.				**CONCRETE**
								BALLAST: 70-80mm coarse aggregate, angular, well compacted.				**BALLAST**
								SANDSTONE: ironstains.				**BEDROCK**
				17	1.0			Borehole BH101 continued as cored hole				
				16	2.0							
				15	3.0							
				14	4.0							
				13	5.0							
				12	6.0							
				11	7.0							
				10								

CDF_0_9_06_LIBRARY.GLB rev:AR Log COF BOREHOLE: NON CORED 754-SYDGE205019.GPJ <<DrawingFile>> 15/11/2018 16:44

method
- AD auger drilling*
- AS auger screwing*
- HA hand auger
- W washbore
- DT diatube

* bit shown by suffix
e.g. AD/T
- B blank bit
- T TC bit
- V V bit

support
- M mud
- C casing
- N nil

penetration
1 2 3 — no resistance ranging to refusal

water
- 10-Oct-12 water level on date shown
- water inflow
- water outflow

samples & field tests
- B bulk disturbed sample
- D disturbed sample
- E environmental sample
- SS split spoon sample
- U## undisturbed sample ##mm diameter
- HP hand penetrometer (kPa)
- N standard penetration test (SPT)
- N* SPT - sample recovered
- Nc SPT with solid cone
- VS vane shear; peak/remouded (kPa)
- R refusal
- HB hammer bouncing

classification symbol & soil description
based on Unified Classification System

moisture
- D dry
- M moist
- W wet
- Wp plastic limit
- Wl liquid limit

consistency / relative density

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

coffey
A TETRA TECH COMPANY

Engineering Log - Cored Borehole

Borehole ID.	**BH101**
sheet:	2 of 5
project no.	**754-SYDGE205019**
client:	**Recap Management**
date started:	**01 Nov 2018**
principal:	
date completed:	**03 Nov 2018**
project:	**4-6 Bligh Street**
logged by:	**YA**
location:	**4-6 Bligh Street, Sydney, NSW**
checked by:	**AJB**

position: E: 334,465.60; N: 6,251,284.97 (MGA94) surface elevation: 17.90 m (AHD) angle from horizontal: 90°

drill model: , Track mounted drilling fluid: hole diameter : vane id.:

drilling information | **material substance** | **rock mass defects**

method & support	water	RL (m)	depth (m)	graphic log	material description: **ROCK TYPE**: grain characterisics, colour, structure, minor components	weathering & alteration	estimated strength & Is50 (X = axial; O = diametral) VL L M H VH EH	samples, field tests & Is(50) (MPa) a = axial; d = diametral	core run & RQD	defect spacing (mm) 30 100 300 1000 3000	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other) particular / general
					start coring at 0.63m						
					NO CORE: 0.21 m						
		17	1.0		**SANDSTONE**: medium grained, pale grey and orange-brown, 5°-10° distinctly bedded, ironstains, moist, massive.	MW		a=0.41 d=0.35			SM, 0°, PL, VR, SN, iron oxide
								a=1.13 d=1.36	86%		
		16	2.0		2.46 to 2.85 m: vertical joint, 2-3mm wide, filled with iron oxide						PT, 15°, PL, RO, CN, iron oxide
		15	3.0					a=1.01 d=0.85	100%		JT, 90°, UN, RO, SN, iron oxide PT, 0°, PL, RO, CO - Clay, iron oxide
								a=1.21 d=0.88			
		14	4.0								PT, 5°, PL, RO, CN
					4.40 to 4.60 m: becomes grey, brown, hairline to 1mm cracks, moist, 5°-10° to bedding			a=0.95 d=1.26	100%		SZ, 0°, PL, RO, CO - Clay
		13	5.0			SW					PT, 5°, PL, RO, CN PT, 5°, PL, RO, CN PT, 0°, UN, RO, CN
								a=0.49 d=0.87			
		12	6.0						100%		
					6.40 to 6.75 m: hairline to 1mm cracks, moist, 0° bedding			a=1.11 d=0.74			PT, 5°, PL, SO, SN, black
					6.50 to 6.60 m: shale, moist						PT, 2°, PL, SO, SN
		11	7.0								
								a=1.03 d=1.19	100%		PT, 2°, PL, SO, SN, black
		10									PT, 0°, PL, SO, SN

Defects are: PT, 0°, PL, RO, CN, unless otherwise described

CDF_0_9_06_LIBRARY.GLB rev:AR Log COF BOREHOLE: CORED 754-SYDGE205019.GPJ <<DrawingFile>> 15/11/2018 16:45

method & support
AS auger screwing
AD auger drilling
CB claw or blade bit
W washbore
NMLC NMLC core (51.9 mm)
NQ wireline core (47.6mm)
HQ wireline core (63.5mm)
PQ wireline core (85.0mm)
SPT standard penetration test
DT diatube

water
10/10/12, water level on date shown
water inflow
complete drilling fluid loss
partial drilling fluid loss
25uL water pressure test result (lugeons) for depth interval shown

graphic log / core recovery
core recovered (graphic symbols indicate material)
no core recovered

core run & RQD
barrel withdrawn
RQD = Rock Quality Designation (%)

weathering & alteration*
RS residual soil
XW extremely weathered
HW highly weathered
DW distinctly weathered
MW moderately weathered
SW slightly weathered
FR fresh
*W replaced with A for alteration

strength
VL very low
L low
M medium
H high
VH very high
EH extremely high

defect type
PT parting
JT joint
SZ shear zone
SS shear surface
CO contact
CS crushed seam
SM seam

planarity
PL planar
CU curved
UN undulating
ST stepped
IR Irregular

roughness
SL slickensided
POL polished
SO smooth
RO rough
VR very rough

coating
CN clean
SN stain
VN veneer
CO coating

coffey
A TETRA TECH COMPANY

Engineering Log - Cored Borehole

Borehole ID.	**BH101**
sheet:	3 of 5
project no.	**754-SYDGE205019**
client:	**Recap Management**
date started:	**01 Nov 2018**
principal:	
date completed:	**03 Nov 2018**
project:	**4-6 Bligh Street**
logged by:	**YA**
location:	**4-6 Bligh Street, Sydney, NSW**
checked by:	**AJB**

position: E: 334,465.60; N: 6,251,284.97 (MGA94) surface elevation: 17.90 m (AHD) angle from horizontal: 90°

drill model: , Track mounted drilling fluid: hole diameter : vane id.:

drilling information | **material substance** | **rock mass defects**

method & support	water	RL (m)	depth (m)	graphic log	material description **ROCK TYPE**: grain characterisics, colour, structure, minor components	weathering & alteration	estimated strength & Is50 (X = axial; O = diametral) VL L M H VH EH	samples, field tests & Is(50) (MPa) a = axial; d = diametral	core run & RQD	defect spacing (mm) 30 100 300 1000 3000	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other) particular	general
		9	9.0		**SANDSTONE**: medium grained, pale grey and orange-brown, 5°-10° distinctly bedded, ironstains, moist, massive. *(continued)* 8.05 to 8.15 m: hairline cracks 8.25 to 8.32 m: shale layer and having cracks, moist 8.65 to 8.68 m: cracks	SW		a=1.13 d=1.17	100%		PT, 2°, PL, RO, SN PT, 0°, PL, SO, SN CS, 5°, CU, SO, SN PT, 2°, PL, RO, CN PT, 5°, PL, RO, CN SM, 5°, PL, RO, CN	
		8	10.0		**SANDSTONE**: medium grained, orange, red brown, dry, indistinctly bedded.			a=1.60 d=0.92 a=1.32 d=1.22	100%		PT, 2°, PL, RO, CN CS, 5°, PL, RO, CO - Clay PT, 2°, CU, RO, CN PT, 1°, PL, RO, CN	Defects are: PT, 0°, PL, RO, CN, unless otherwise described
		7	11.0					a=1.34 d=1.95			PT, 5°, PL, RO, CN PT, 2°, CU, RO, CO - Clay	
		6	12.0					a=1.83 d=1.36	100%		PT, 2°, PL, RO, CN PT, 0°, CU, RO, CN	
		5	13.0		**SANDSTONE**: medium to coarse grained, yellow brown, indistinctly bedded, high quartz content.			a=2.61 d=1.22			JT, 90°, IR, RO, CN	
		4	14.0		**SHALE**: fine to medium grained, pale grey, moist, sheared zone (fault). 13.33 to 13.39 m: clay seam, extremely weathered, very low strength **SANDSTONE**: medium grained, dark grey and grey, indistinctly bedded with irregular shale inclusions.	XW SW			100%		PT, 5°, CU, RO, CN SZ, IR, RO, CN	Defects are: CS, 0°, PL, RO, CO unless otherwise described
		3	15.0		**BRECCIATED SHALE**: fine grained, grey, indistinctly bedded, moderately weathered, medium strength. **SANDSTONE**: medium grained, grey brown, indistinctly bedded, slightly weathered, medium to high strength. **SHALE**: fine grained, grey to dark grey, indistinctly bedded, slightly weathered, medium to high strength.			a=2.47 d=0.63	100%		PT, 5°, ST, SO, CN CS, CN CS, 10°, UN, RO, CO - Clay	
		2						a=0.84 d=0.82	100%			

CDF_0_9_06_LIBRARY.GLB rev:AR Log COF BOREHOLE: CORED 754-SYDGE205019.GPJ <<DrawingFile>> 15/11/2018 16:45

method & support
AS auger screwing
AD auger drilling
CB claw or blade bit
W washbore
NMLC NMLC core (51.9 mm)
NQ wireline core (47.6mm)
HQ wireline core (63.5mm)
PQ wireline core (85.0mm)
SPT standard penetration test
DT diatube

water
10/10/12, water level on date shown
water inflow
complete drilling fluid loss
partial drilling fluid loss
25uL water pressure test result (lugeons) for depth interval shown

graphic log / core recovery
core recovered (graphic symbols indicate material)
no core recovered

core run & RQD
barrel withdrawn
RQD = Rock Quality Designation (%)

weathering & alteration*
RS residual soil
XW extremely weathered
HW highly weathered
DW distinctly weathered
MW moderately weathered
SW slightly weathered
FR fresh
*W replaced with A for alteration

strength
VL very low
L low
M medium
H high
VH very high
EH extremely high

defect type
PT parting
JT joint
SZ shear zone
SS shear surface
CO contact
CS crushed seam
SM seam

planarity
PL planar
CU curved
UN undulating
ST stepped
IR Irregular

roughness
SL slickensided
POL polished
SO smooth
RO rough
VR very rough

coating
CN clean
SN stain
VN veneer
CO coating

coffey
A TETRA TECH COMPANY

Engineering Log - Cored Borehole

Borehole ID.	**BH101**
sheet:	4 of 5
project no.	**754-SYDGE205019**
client: **Recap Management**	date started: **01 Nov 2018**
principal:	date completed: **03 Nov 2018**
project: **4-6 Bligh Street**	logged by: **YA**
location: **4-6 Bligh Street, Sydney, NSW**	checked by: **AJB**

position: E: 334,465.60; N: 6,251,284.97 (MGA94) surface elevation: 17.90 m (AHD) angle from horizontal: 90°

drill model: , Track mounted drilling fluid: hole diameter : vane id.:

drilling information | **material substance** | **rock mass defects**

method & support	water	RL (m)	depth (m)	graphic log	material description **ROCK TYPE**: grain characterisics, colour, structure, minor components	weathering & alteration	estimated strength & Is50 (X = axial; O = diametral) VL L M H VH EH	samples, field tests & Is(50) (MPa) a = axial; d = diametral	core run & RQD	defect spacing (mm) 30 100 300 1000 3000	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other) particular / general
		1	17.0		**SANDSTONE**: fine to coarse grained, pale grey to grey, 5°-10° distinctly bedded, common shale laminae throughout. *(continued)*	SW		a=0.68 d=0.63	100%		
								a=1.24 d=1.01			PT, 0°, PL, RO, VN - Clay PT, 0°, PL, RO, CO - Clay
						FR					
		0	18.0		17.65 m: 3mm thick clay band (shale) 17.90 m: 10mm thick clay bands, shale occassional clay bands between 18.2-18.4m			a=0.88 d=0.86	100%		PT, 0°, PL, RO, CO - Clay
		-1	19.0		18.60 m: trace of clay bands, and trace of basaltic feature, 2mm size 19.00 m: 20-40mm clay coating on surface only			a=0.73 d=0.20	100%		PT, 1°, CU, RO, CO - Clay PT, 5°, CU, RO, CO - Clay PT, 2°, PL, RO, CN
		-2	20.0					a=0.77 d=1.04			
		-3	21.0		21.00 to 21.40 m: hairline cracks			a=1.44 d=0.84	100%		PT, 2°, CU, RO, SN
		-4	22.0					a=1.63 d=1.22	100%		PT, 2°, PL, RO, CN PT, 0°, PL, SO, CN
		-5	23.0		22.60 to 23.15 m: hairline cracks			a=1.15 d=0.85	100%		PT, 0°, PL, SO, SN
		-6									

Defects are: PT, 0°, PL, RO, CN, unless otherwise described

CDF_0_9_06_LIBRARY.GLB rev:AR Log COF BOREHOLE: CORED 754-SYDGE205019.GPJ <<DrawingFile>> 15/11/2018 16:45

method & support
AS auger screwing
AD auger drilling
CB claw or blade bit
W washbore
NMLC NMLC core (51.9 mm)
NQ wireline core (47.6mm)
HQ wireline core (63.5mm)
PQ wireline core (85.0mm)
SPT standard penetration test
DT diatube

water
10/10/12, water level on date shown
water inflow
complete drilling fluid loss
partial drilling fluid loss
25uL water pressure test result (lugeons) for depth interval shown

graphic log / core recovery
core recovered (graphic symbols indicate material)
no core recovered

core run & RQD
barrel withdrawn
RQD = Rock Quality Designation (%)

weathering & alteration*
RS residual soil
XW extremely weathered
HW highly weathered
DW distinctly weathered
MW moderately weathered
SW slightly weathered
FR fresh
*W replaced with A for alteration

strength
VL very low
L low
M medium
H high
VH very high
EH extremely high

defect type
PT parting
JT joint
SZ shear zone
SS shear surface
CO contact
CS crushed seam
SM seam

planarity
PL planar
CU curved
UN undulating
ST stepped
IR Irregular

roughness
SL slickensided
POL polished
SO smooth
RO rough
VR very rough

coating
CN clean
SN stain
VN veneer
CO coating

coffey
A TETRA TECH COMPANY

Engineering Log - Cored Borehole

Borehole ID.	**BH101**
sheet:	5 of 5
project no.	**754-SYDGE205019**
client:	**Recap Management**
date started:	**01 Nov 2018**
principal:	
date completed:	**03 Nov 2018**
project:	**4-6 Bligh Street**
logged by:	**YA**
location:	**4-6 Bligh Street, Sydney, NSW**
checked by:	**AJB**

position: E: 334,465.60; N: 6,251,284.97 (MGA94) surface elevation: 17.90 m (AHD) angle from horizontal: 90°

drill model: , Track mounted drilling fluid: hole diameter : vane id.:

drilling information | **material substance** | **rock mass defects**

method & support	water	RL (m)	depth (m)	graphic log	material description **ROCK TYPE**: grain characterisics, colour, structure, minor components	weathering & alteration	estimated strength & Is50 (X = axial; O = diametral) VL L M H VH EH	samples, field tests & Is(50) (MPa) a = axial; d = diametral	core run & RQD	defect spacing (mm) 30 100 300 1000 3000	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other) particular / general
		-7	25.0		**SANDSTONE**: fine to coarse grained, pale grey to grey, 5°-10° distinctly bedded, common shale laminae throughout. *(continued)*	FR		a=1.30 d=0.93	100%		
					25.05 to 25.50 m: hairline to 1mm, shale laminae			a=0.64 d=0.57	100%		
		-8	26.0					a=1.19 d=0.88			PT, 2°, PL, SO, SN
					26.50 to 26.65 m: hairline shale laminae						PT, 2°, CU, SO, SN
		-9	27.0						100%		
		-10	28.0					a=1.10 d=0.98			
								a=1.18 d=0.82	100%		
		-11	29.0								PT, 2°, PL, RO, CN
								a=0.84 d=0.84			
		-12	30.0		Borehole BH101 terminated at 29.30 m						
		-13	31.0								
		-14									

Defects are: PT, 0°, PL, RO, CN, unless otherwise described

CDF_0_9_06_LIBRARY.GLB rev:AR Log COF BOREHOLE: CORED 754-SYDGE205019.GPJ <<DrawingFile>> 15/11/2018 16:45

method & support
AS auger screwing
AD auger drilling
CB claw or blade bit
W washbore
NMLC NMLC core (51.9 mm)
NQ wireline core (47.6mm)
HQ wireline core (63.5mm)
PQ wireline core (85.0mm)
SPT standard penetration test
DT diatube

water
10/10/12, water level on date shown
water inflow
complete drilling fluid loss
partial drilling fluid loss
25uL water pressure test result (lugeons) for depth interval shown

graphic log / core recovery
core recovered (graphic symbols indicate material)
no core recovered

core run & RQD
barrel withdrawn
RQD = Rock Quality Designation (%)

weathering & alteration*
RS residual soil
XW extremely weathered
HW highly weathered
DW distinctly weathered
MW moderately weathered
SW slightly weathered
FR fresh
*W replaced with A for alteration

strength
VL very low
L low
M medium
H high
VH very high
EH extremely high

defect type
PT parting
JT joint
SZ shear zone
SS shear surface
CO contact
CS crushed seam
SM seam

planarity
PL planar
CU curved
UN undulating
ST stepped
IR Irregular

roughness
SL slickensided
POL polished
SO smooth
RO rough
VR very rough

coating
CN clean
SN stain
VN veneer
CO coating

BH101 0.63 - 5.00 m

drawn	YA
approved	AJB
date	16/11/2018
scale	N.T.S.
original size	A4

coffey
A TETRA TECH COMPANY

client: Recap Management

project: 4-6 Bligh Street
4-6 Bligh Street, Sydney, NSW

title: **CORE PHOTOGRAPH BH101**

project no: 754-SYDGE205019 | fig no: **FIGURE 1** | rev:

BH101 5.00 - 10.00 m

drawn	YA
approved	AJB
date	16/11/2018
scale	N.T.S.
original size	A4

coffey
A TETRA TECH COMPANY

client: Recap Management

project: 4-6 Bligh Street
4-6 Bligh Street, Sydney, NSW

title: **CORE PHOTOGRAPH**
BH101

project no: 754-SYDGE205019 | fig no: **FIGURE 2** | rev:

BH101 10.00 - 15.00 m

drawn	YA
approved	AJB
date	16/11/2018
scale	N.T.S.
original size	A4

coffey
A TETRA TECH COMPANY

client:	Recap Management
project:	4-6 Bligh Street 4-6 Bligh Street, Sydney, NSW
title:	**CORE PHOTOGRAPH** **BH101**
project no: 754-SYDGE205019	fig no: **FIGURE 3** rev:

BH101 15.00 - 20.00 m

drawn	YA
approved	AJB
date	16/11/2018
scale	N.T.S.
original size	A4

coffey
A TETRA TECH COMPANY

client:	Recap Management
project:	4-6 Bligh Street 4-6 Bligh Street, Sydney, NSW
title:	**CORE PHOTOGRAPH** **BH101**
project no: 754-SYDGE205019	fig no: **FIGURE 4** rev:

BH101 20.00 - 25.00 m

drawn	YA
approved	AJB
date	16/11/2018
scale	N.T.S.
original size	A4

coffey
A TETRA TECH COMPANY

client: Recap Management

project: 4-6 Bligh Street
4-6 Bligh Street, Sydney, NSW

title: **CORE PHOTOGRAPH BH101**

project no: 754-SYDGE205019 | fig no: **FIGURE 5** | rev:

BH101 25.00 - 29.30 m

drawn	YA
approved	AJB
date	16/11/2018
scale	N.T.S.
original size	A4

coffey
A TETRA TECH COMPANY

client:	Recap Management
project:	4-6 Bligh Street 4-6 Bligh Street, Sydney, NSW
title:	**CORE PHOTOGRAPH** **BH101**
project no: 754-SYDGE205019	fig no: **FIGURE 6** rev:

coffey
A TETRA TECH COMPANY

Piezometer Installation Log

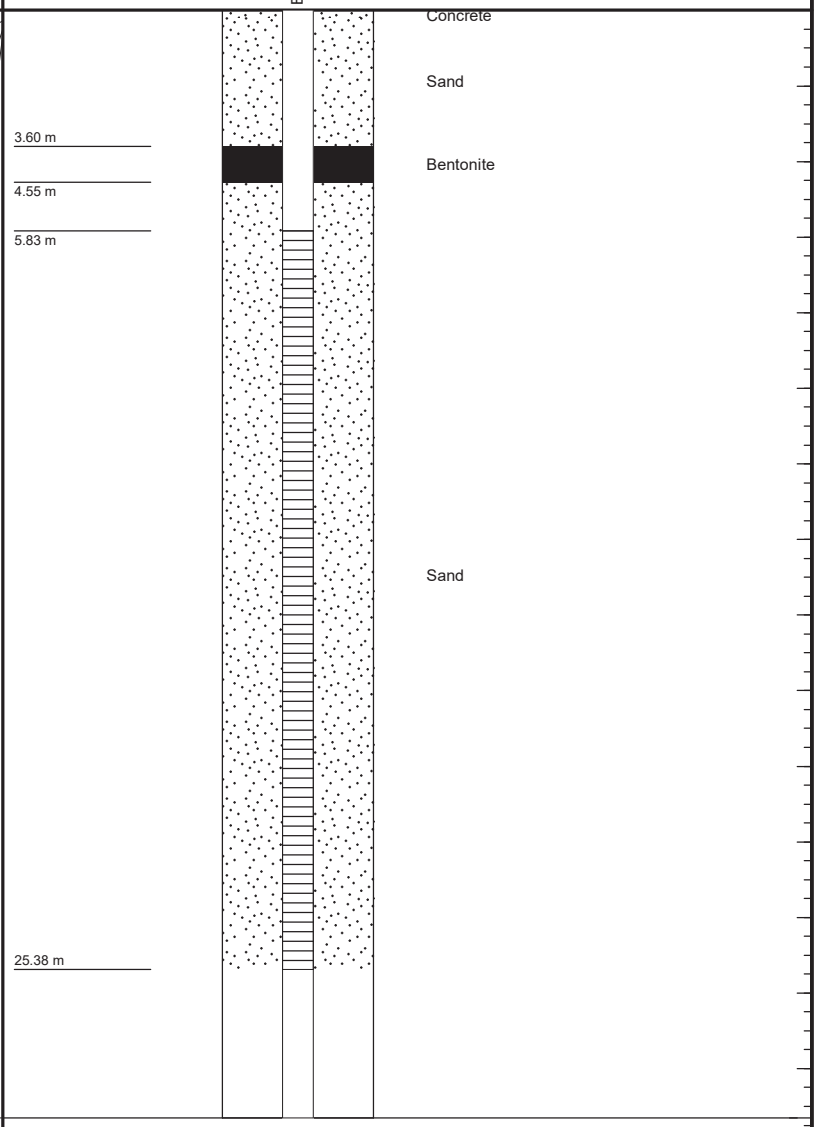
Hole ID.	**BH101**
sheet:	1 of 1
project no.	**754-SYDGE205019**
client:	**Recap Management**
date started:	**01 Nov 2018**
principal:	
date completed:	**03 Nov 2018**
project:	**4-6 Bligh Street**
logged by:	**YA**
location:	**4-6 Bligh Street, Sydney, NSW**
checked by:	**AJB**

position: E: 334,465.60; N: 6,251,284.97 (MGA94) | surface elevation: 17.90 m (AHD) | angle from horizontal: 90°

equipment type: , Track mounted | drilling fluid: | hole diameter :

drilling information | **material substance** | **piezometer construction details**

method & support	water	RL (m)	depth (m)	graphic log	material name
		16	4		CONCRETE
					BALLAST
					BEDROCK
		12	8		
		8	12		
		4	16		
		0	20		
		-4	24		
		-8	28		
		-12			



method & support
see engineering log for details

water
- 10-Oct-12, water level on date shown
- water inflow
- complete drilling fluid loss
- partial drilling fluid loss
- 25 — water pressure test result (lugeons) for depth interval shown

graphic log / core recovery
- core recovered (graphic symbols indicate material)
- no core recovered

ID	type	installation date	stickup (m)	tip depth (m)	water level (m)	Relative Levels (AHD) stickup	tip	water level
BH101	standpipe piezo.			29.30 m			-11.40	

coffey
A TETRA TECH COMPANY

Engineering Log - Borehole

Borehole ID.	**BH102**
sheet:	1 of 4
project no.	**754-SYDGE205019**
client:	**Recap Management**
date started:	**29 Oct 2018**
principal:	
date completed:	**31 Oct 2018**
project:	**4-6 Bligh Street**
logged by:	**YA**
location:	**4-6 Bligh Street, Sydney, NSW**
checked by:	**AJB**

position: E: 334,477.59; N: 6,251,298.59 (MGA94) | surface elevation: 17.90 m (AHD) | angle from horizontal: 90°

drill model: , Track mounted | drilling fluid: | hole diameter : 215 mm

drilling information | **material substance**

method & support	penetration 1 2 3	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description (SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components)	moisture condition	consistency / relative density	hand penetrometer (kPa) 100 200 300 400	structure and additional observations
DT								**CONCRETE**: 5-20mm coarse aggregate, angular, no voids.				**BASEMENT SLAB**
								CONCRETE: 20-40mm coarse aggregate, angular, no voids.				**BASE COURSE**
								BALLAST: 60-90mm coarse aggregate, angular, well compacted.				**BALLAST**
				17	1.0			**SANDSTONE**: medium grained, pale grey, distinct, iron stains, visible, fresh, very high strength.				**BEDROCK**
								Borehole BH102 continued as cored hole				
				16	2.0							
				15	3.0							
				14	4.0							
				13	5.0							
				12	6.0							
				11	7.0							
				10								

CDF_0_9_06_LIBRARY.GLB rev:AR Log COF BOREHOLE: NON CORED 754-SYDGE205019.GPJ <<DrawingFile>> 15/11/2018 16:44

method
- AD auger drilling*
- AS auger screwing*
- HA hand auger
- W washbore
- DT diatube

* bit shown by suffix
e.g. AD/T
- B blank bit
- T TC bit
- V V bit

support
- M mud
- C casing
- N nil

penetration
1 2 3 — no resistance ranging to refusal

water
- 10-Oct-12 water level on date shown
- water inflow
- water outflow

samples & field tests
- B bulk disturbed sample
- D disturbed sample
- E environmental sample
- SS split spoon sample
- U## undisturbed sample ##mm diameter
- HP hand penetrometer (kPa)
- N standard penetration test (SPT)
- N* SPT - sample recovered
- Nc SPT with solid cone
- VS vane shear; peak/remouded (kPa)
- R refusal
- HB hammer bouncing

classification symbol & soil description
based on Unified Classification System

moisture
- D dry
- M moist
- W wet
- Wp plastic limit
- Wl liquid limit

consistency / relative density

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

coffey
A TETRA TECH COMPANY

Engineering Log - Cored Borehole

Borehole ID.	**BH102**
sheet:	2 of 4
project no.	**754-SYDGE205019**
client:	**Recap Management**
date started:	**29 Oct 2018**
principal:	
date completed:	**31 Oct 2018**
project:	**4-6 Bligh Street**
logged by:	**YA**
location:	**4-6 Bligh Street, Sydney, NSW**
checked by:	**AJB**

position: E: 334,477.59; N: 6,251,298.59 (MGA94) surface elevation: 17.90 m (AHD) angle from horizontal: 90°

drill model: , Track mounted drilling fluid: hole diameter : 215 mm vane id.:

drilling information | **material substance** | **rock mass defects**

method & support	water	RL (m)	depth (m)	graphic log	material description **ROCK TYPE**: grain characterisics, colour, structure, minor components	weathering & alteration	estimated strength & Is50 (X = axial; O = diametral) VL L M H VH EH	samples, field tests & Is(50) (MPa) a = axial; d = diametral	core run & RQD	defect spacing (mm) 30 100 300 1000 3000	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other) particular / general
					start coring at 0.65m						SM, 0°, IR, SO, CO PT, 0°, PL, RO, CN
		17	1.0		**SANDSTONE**: medium grained, pale pinkish grey, indistinctly bedded, red iron staining. 0.99 m: trace pyrite, some quartz grains upto 15mm, glassy	SW		a=0.67 d=0.92	100%		
								a=1.00 d=0.49			PT, 5 - 10°, PL, RO, CN PT, 5°, PL, RO, CN
		16	2.0						100%		
					2.35 to 3.32 m: interbedded grey and red bands, bedding angle 10°-15°, very closely spaced			a=0.38 d=0.86			PT, 10°, PL, RO, CN
		15	3.0								
					3.32 to 4.50 m: interbedded grey shale laminae			a=0.90 d=0.97			PT, 5°, PL, RO, CN
		14	4.0						100%		
								a=0.89 d=1.44			PT, 2°, PL, RO, CN SM, 0°, PL, SO, VN, 5 mm, clay infill
					4.55 to 5.05 m: occasional shale laminae						
		13	5.0								PT, 0°, PL, RO, CN
								a=0.99 d=0.92	100%		PT, 2°, PL, RO, CN
		12	6.0								
								a=0.84 d=0.58			PT, 2°, PL, RO, VN, 2 mm, clay infill
		11	7.0		6.88 to 7.40 m: shale laminae, black	MW			100%		CS, 0°, CU, SO, CO, black PT, 0°, PL, RO, CO, black
											PT, 0°, PL, RO, CO, black
								a=0.90 d=0.86			PT, 0°, PL, RO, CO, black
						SW					PT, 0°, PL, SO, VN, clay infill
		10							100%		PT, 0°, PL, RO, CN, black

CDF_0_9_06_LIBRARY.GLB rev:AR Log COF BOREHOLE: CORED 754-SYDGE205019.GPJ <<DrawingFile>> 15/11/2018 16:45

method & support
AS auger screwing
AD auger drilling
CB claw or blade bit
W washbore
NMLC NMLC core (51.9 mm)
NQ wireline core (47.6mm)
HQ wireline core (63.5mm)
PQ wireline core (85.0mm)
SPT standard penetration test
DT diatube

water
10/10/12, water level on date shown
water inflow
complete drilling fluid loss
partial drilling fluid loss
25uL water pressure test result (lugeons) for depth interval shown

graphic log / core recovery
core recovered (graphic symbols indicate material)
no core recovered

core run & RQD
barrel withdrawn
RQD = Rock Quality Designation (%)

weathering & alteration*
RS residual soil
XW extremely weathered
HW highly weathered
DW distinctly weathered
MW moderately weathered
SW slightly weathered
FR fresh
*W replaced with A for alteration

strength
VL very low
L low
M medium
H high
VH very high
EH extremely high

defect type
PT parting
JT joint
SZ shear zone
SS shear surface
CO contact
CS crushed seam
SM seam

planarity
PL planar
CU curved
UN undulating
ST stepped
IR Irregular

roughness
SL slickensided
POL polished
SO smooth
RO rough
VR very rough

coating
CN clean
SN stain
VN veneer
CO coating

coffey
A TETRA TECH COMPANY

Engineering Log - Cored Borehole

Borehole ID.	**BH102**
sheet:	3 of 4
project no.	**754-SYDGE205019**
client:	**Recap Management**
date started:	**29 Oct 2018**
principal:	
date completed:	**31 Oct 2018**
project:	**4-6 Bligh Street**
logged by:	**YA**
location:	**4-6 Bligh Street, Sydney, NSW**
checked by:	**AJB**

position: E: 334,477.59; N: 6,251,298.59 (MGA94) surface elevation: 17.90 m (AHD) angle from horizontal: 90°

drill model: , Track mounted drilling fluid: hole diameter : 215 mm vane id.:

drilling information | **material substance** | **rock mass defects**

method & support	water	RL (m)	depth (m)	graphic log	material description **ROCK TYPE**: grain characterisics, colour, structure, minor components	weathering & alteration	estimated strength & Is50 (X = axial; O = diametral) VL L M H VH EH	samples, field tests & Is(50) (MPa) a = axial; d = diametral	core run & RQD	defect spacing (mm) 30 100 300 1000 3000	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other) particular / general
		9	9.0		**SANDSTONE**: medium grained, pale grey, 0°, planar isotropic, indistinctly bedded, alternative clay bands visible.	SW		a=1.14 d=1.20	100%		PT, 5°, PL, SO, CO, black SM, 0°, PL, SO, VN, 2 mm, clay infill
		8	10.0		**SANDSTONE**: medium grained, reddish-brown, becoming massive.	FR		a=1.66 d=1.23 a=1.52 d=1.42	100%		PT, 0°, PL, RO, CO
		7	11.0								
		6	12.0		**SANDSTONE**: fine to medium grained, pale grey, distinctly bedded. 11.74 to 12.68 m: occasional thin shale beds 12.30 to 12.36 m: shale bed	MW		a=0.70 d=1.44	100%		PT, 0°, PL, RO, CO, black PT, 2°, CU, RO, CN SM, 0°, PL, SO, VN, 2 mm, clay infill SM, 0°, PL, SO, VN, 5 mm, clay infill SM, 0°, IR, RO, CO PT, 10°, PL, SO, CN, dark grey
		5	13.0		**NO CORE:** 0.06 m **SANDSTONE**: fine to medium grained, pale grey, distinctly bedded.	SW		a=1.34 d=1.12 a=1.54 d=1.39	95%		
		4	14.0		**SHALE**: fine grained, pale grey, indistinctly bedded, inclusions of basaltic fill. 13.89 to 14.00 m: brecciated shale 14.18 to 14.30 m: brecciated shale	DW		a=0.38 d=0.27	100%		JT, 20°, PL, SO, VN JT, 20°, UN - IR, SL, CO PT, 2°, CU, RO, CN JT, 10°, IR, SO, CN JT, 15°, CU, SO, CN
		3	15.0		15.25 to 15.55 m: intrebedded, shale bands up to 2mm thick				100%		PT, 0°, PL, SO, CN PT, 0°, PL, SO, CN
		2			**SANDSTONE**: medium grained, pale grey, trace of basaltic inclusions.	FR		a=0.35 d=0.86	100%		PT, 0°, PL, SO, CO - Clay PT, 2°, PL, SO, CO - Clay PT, 20°, PL, RO, CN

Defects are: PT, 0°, PL, RO, CN, unless otherwise described

CDF_0_9_06_LIBRARY.GLB rev:AR Log COF BOREHOLE: CORED 754-SYDGE205019.GPJ <<DrawingFile>> 15/11/2018 16:45

method & support
AS auger screwing
AD auger drilling
CB claw or blade bit
W washbore
NMLC NMLC core (51.9 mm)
NQ wireline core (47.6mm)
HQ wireline core (63.5mm)
PQ wireline core (85.0mm)
SPT standard penetration test
DT diatube

water
10/10/12, water level on date shown
water inflow
complete drilling fluid loss
partial drilling fluid loss
25uL water pressure test result (lugeons) for depth interval shown

graphic log / core recovery
core recovered (graphic symbols indicate material)
no core recovered

core run & RQD
barrel withdrawn
RQD = Rock Quality Designation (%)

weathering & alteration*
RS residual soil
XW extremely weathered
HW highly weathered
DW distinctly weathered
MW moderately weathered
SW slightly weathered
FR fresh
*W replaced with A for alteration

strength
VL very low
L low
M medium
H high
VH very high
EH extremely high

defect type
PT parting
JT joint
SZ shear zone
SS shear surface
CO contact
CS crushed seam
SM seam

planarity
PL planar
CU curved
UN undulating
ST stepped
IR Irregular

roughness
SL slickensided
POL polished
SO smooth
RO rough
VR very rough

coating
CN clean
SN stain
VN veneer
CO coating

coffey
A TETRA TECH COMPANY

Engineering Log - Cored Borehole

Borehole ID.	**BH102**
sheet:	4 of 4
project no.	**754-SYDGE205019**
client:	**Recap Management**
date started:	**29 Oct 2018**
principal:	
date completed:	**31 Oct 2018**
project:	**4-6 Bligh Street**
logged by:	**YA**
location:	**4-6 Bligh Street, Sydney, NSW**
checked by:	**AJB**

position: E: 334,477.59; N: 6,251,298.59 (MGA94) | surface elevation: 17.90 m (AHD) | angle from horizontal: 90°

drill model: , Track mounted | drilling fluid: | hole diameter : 215 mm | vane id.:

drilling information | **material substance** | **rock mass defects**

method & support	water	RL (m)	depth (m)	graphic log	material description **ROCK TYPE**: grain characterisics, colour, structure, minor components	weathering & alteration	estimated strength & Is50 (X = axial; O = diametral) VL L M H VH EH	samples, field tests & Is(50) (MPa) a = axial; d = diametral	core run & RQD	defect spacing (mm) 30 100 300 1000 3000	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other) particular / general
		1	17.0		**SANDSTONE**: medium grained, pale grey, trace of basaltic inclusions. *(continued)*	FR		a=0.42 d=0.60	100%		PT, 0°, PL, SO, CN
					16.73 to 17.55 m: alternative shale laminae, easily broken parallel to bedding				100%		PT, 0°, PL, SO, CN
		0	18.0		17.85 m: 10mm, dark grey, shale laminae			a=1.13 d=1.10			PT, 2°, UN, RO, CN
					18.28 to 18.40 m: 3-10mm, dark grey, shale band			a=1.05 d=0.45			
		-1	19.0		18.60 to 18.66 m: dark grey ckay layer				97%		SZ, 0°, UN, RO, VN, clay infill PT, 5°, CU, RO, VN - Clay SM, 0°, PL, RO, VN - Clay
					NO CORE: 0.05 m 19.25 m: clay infill	FR					
		-2	20.0		**SANDSTONE**: medium grained, pale grey, trace of shale laminae. 19.30 m: becoming massive, occasional shale laminae			a=1.27 d=1.28	100%		PT, 0°, CU, RO, CN
		-3	21.0					a=1.26 d=1.61			PT, 0°, PL, RO, SN, black
		-4	22.0					a=1.45 d=1.17	100%		
		-5	23.0					a=0.90 d=0.85			
		-6			Borehole BH102 terminated at 22.38 m						

Defects are: PT, 0°, PL, RO, CN, unless otherwise described

CDF_0_9_06_LIBRARY.GLB rev:AR Log COF BOREHOLE: CORED 754-SYDGE205019.GPJ <<DrawingFile>> 15/11/2018 16:45

method & support
AS auger screwing
AD auger drilling
CB claw or blade bit
W washbore
NMLC NMLC core (51.9 mm)
NQ wireline core (47.6mm)
HQ wireline core (63.5mm)
PQ wireline core (85.0mm)
SPT standard penetration test
DT diatube

water
10/10/12, water level on date shown
water inflow
complete drilling fluid loss
partial drilling fluid loss
25uL water pressure test result (lugeons) for depth interval shown

graphic log / core recovery
core recovered (graphic symbols indicate material)
no core recovered

core run & RQD
barrel withdrawn
RQD = Rock Quality Designation (%)

weathering & alteration*
RS residual soil
XW extremely weathered
HW highly weathered
DW distinctly weathered
MW moderately weathered
SW slightly weathered
FR fresh
*W replaced with A for alteration

strength
VL very low
L low
M medium
H high
VH very high
EH extremely high

defect type
PT parting
JT joint
SZ shear zone
SS shear surface
CO contact
CS crushed seam
SM seam

planarity
PL planar
CU curved
UN undulating
ST stepped
IR Irregular

roughness
SL slickensided
POL polished
SO smooth
RO rough
VR very rough

coating
CN clean
SN stain
VN veneer
CO coating

BH102 0.65 - 5.00 m

drawn	YA
approved	AJB
date	16/11/2018
scale	N.T.S.
original size	A4

coffey
A TETRA TECH COMPANY

client: Recap Management

project: 4-6 Bligh Street
4-6 Bligh Street, Sydney, NSW

title: **CORE PHOTOGRAPH BH102**

project no: 754-SYDGE205019 | fig no: **FIGURE 1** | rev:

BH102 5.00 - 10.00 m

drawn	YA
approved	AJB
date	16/11/2018
scale	N.T.S.
original size	A4

coffey
A TETRA TECH COMPANY

client: Recap Management

project: 4-6 Bligh Street
4-6 Bligh Street, Sydney, NSW

title: **CORE PHOTOGRAPH**
BH102

project no: 754-SYDGE205019 | fig no: **FIGURE 2** | rev:

BH102 10.00 - 15.00 m

drawn	YA
approved	AJB
date	16/11/2018
scale	N.T.S.
original size	A4

coffey
A TETRA TECH COMPANY

client: Recap Management

project: 4-6 Bligh Street
4-6 Bligh Street, Sydney, NSW

title: **CORE PHOTOGRAPH BH102**

project no: 754-SYDGE205019 | fig no: **FIGURE 3** | rev:

BH102 15.00 - 20.00 m

drawn	YA
approved	AJB
date	16/11/2018
scale	N.T.S.
original size	A4

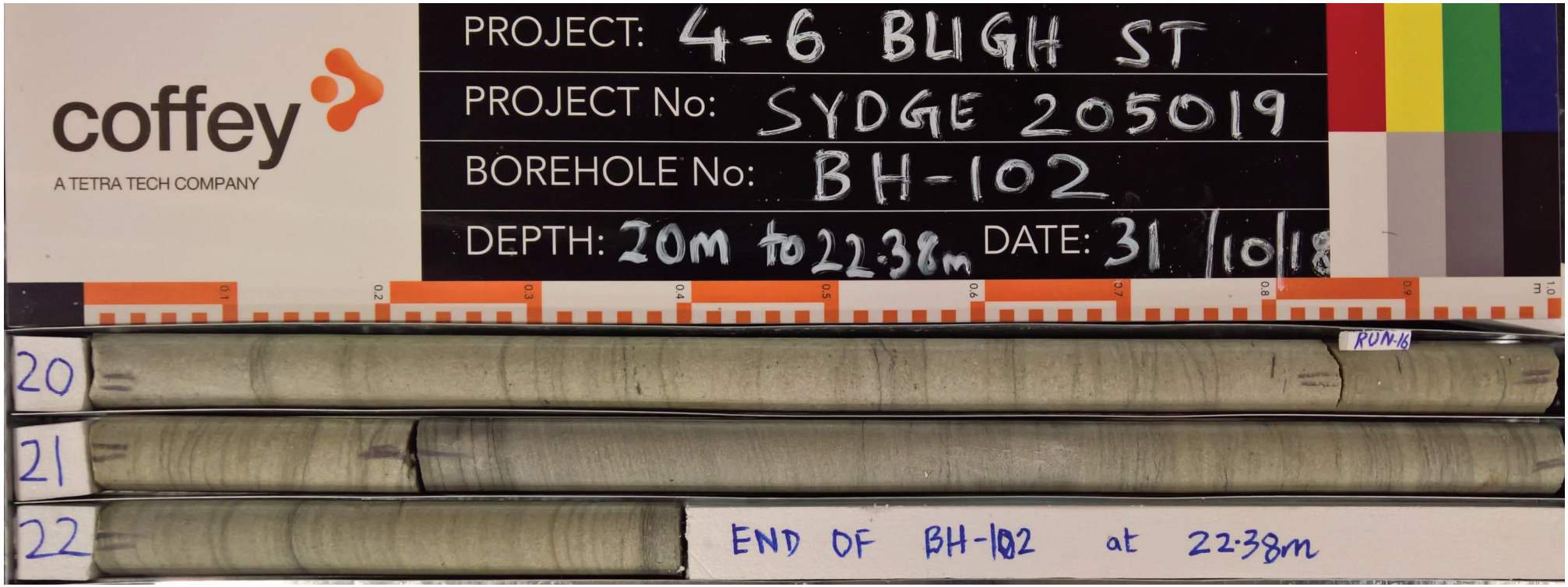
coffey
A TETRA TECH COMPANY

client: Recap Management

project: 4-6 Bligh Street
4-6 Bligh Street, Sydney, NSW

title: **CORE PHOTOGRAPH**
BH102

project no: 754-SYDGE205019 | fig no: **FIGURE 4** | rev:



BH102 20.00 - 22.38 m

drawn	YA
approved	AJB
date	16/11/2018
scale	N.T.S.
original size	A4

coffey
A TETRA TECH COMPANY

client: Recap Management

project: 4-6 Bligh Street
4-6 Bligh Street, Sydney, NSW

title: **CORE PHOTOGRAPH BH102**

project no: 754-SYDGE205019 | fig no: **FIGURE 5** | rev:

coffey
A TETRA TECH COMPANY

Piezometer Installation Log

		Hole ID.	**BH102**
		sheet:	1 of 1
		project no.	**754-SYDGE205019**
client:	**Recap Management**	date started:	**29 Oct 2018**
principal:		date completed:	**31 Oct 2018**
project:	**4-6 Bligh Street**	logged by:	**YA**
location:	**4-6 Bligh Street, Sydney, NSW**	checked by:	**AJB**

position: E: 334,477.59; N: 6,251,298.59 (MGA94) | surface elevation: 17.90 m (AHD) | angle from horizontal: 90°

equipment type: , Track mounted | drilling fluid: | hole diameter : 215 mm

drilling information | **material substance** | **piezometer construction details**

method & support	water	RL (m)	depth (m)	graphic log	material name	BH102
DT		16			BASEMENT SLAB	0.15 m
					BASE COURSE	0.88 m
			4		BALLAST	1.38 m
		12			BEDROCK	
			8			
		8				
			12			
		4				
			16			
		0				
			20			22.38 m
		-4				

bore construction license:
drilling company:
driller:
driller's permit no.:

Concrete
Bentonite
Sand

CDF_0_9_06_LIBRARY.GLB rev:AR Log COF PIEZOMETER ONE PAGE SUMMARY 754-SYDGE205019.GPJ <<DrawingFile>> 15/11/2018 16:46

method & support
see engineering log for details

water
- 10-Oct-12, water level on date shown
- water inflow
- complete drilling fluid loss
- partial drilling fluid loss
- 25 water pressure test result (lugeons) for depth interval shown

graphic log / core recovery
- core recovered (graphic symbols indicate material)
- no core recovered

ID	type	installation date	stickup (m)	tip depth (m)	water level (m)	Relative Levels (AHD) stickup	tip	water level
BH102	standpipe			22.38 m			-4.48	

coffey
A TETRA TECH COMPANY

Engineering Log - Borehole

Borehole ID.	**BH103**
sheet:	1 of 3
project no.	**754-SYDGE205019**
client:	**Recap Management**
date started:	**04 Nov 2018**
principal:	
date completed:	**06 Nov 2018**
project:	**4-6 Bligh Street**
logged by:	**YA**
location:	**4-6 Bligh Street, Sydney, NSW**
checked by:	**AJB**

position: E: 334,491.89; N: 6,251,287.55 (MGA94) | surface elevation: 12.80 m (AHD) | angle from horizontal: 90°

drill model: , Track mounted | drilling fluid: | hole diameter :

drilling information | **material substance**

method & support	penetration 1 2 3	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description (SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components)	moisture condition	consistency / relative density	hand penetrometer (kPa) 100 200 300 400	structure and additional observations
								CONCRETE BASEMENT SLAB: 5-20mm aggregate, angular to sub-rounded, 2-5% voids, 6mm rebar used?? (mesh??).				**CONCRETE**
								CONCRETE: 10-20mm aggregate, 2% voids, (no mesh).				**BALLAST**
				12				**BALLAST**: 50-80mm coarse, ballast, angular, medium to dense compacted.				**BEDROCK**
					1.0			**SANDSTONE**.				
								Borehole BH103 continued as cored hole				
				11	2.0							
				10	3.0							
				9	4.0							
				8	5.0							
				7	6.0							
				6	7.0							
				5								

CDF_0_9_06_LIBRARY.GLB rev:AR Log COF BOREHOLE: NON CORED 754-SYDGE205019.GPJ <<DrawingFile>> 15/11/2018 16:44

method
- AD auger drilling*
- AS auger screwing*
- HA hand auger
- W washbore
- DT diatube

* bit shown by suffix
e.g. AD/T
- B blank bit
- T TC bit
- V V bit

support
- M mud
- C casing
- N nil

penetration
1 2 3 — no resistance ranging to refusal

water
- 10-Oct-12 water level on date shown
- water inflow
- water outflow

samples & field tests
- B bulk disturbed sample
- D disturbed sample
- E environmental sample
- SS split spoon sample
- U## undisturbed sample ##mm diameter
- HP hand penetrometer (kPa)
- N standard penetration test (SPT)
- N* SPT - sample recovered
- Nc SPT with solid cone
- VS vane shear; peak/remouded (kPa)
- R refusal
- HB hammer bouncing

classification symbol & soil description
based on Unified Classification System

moisture
- D dry
- M moist
- W wet
- Wp plastic limit
- Wl liquid limit

consistency / relative density

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

coffey
A TETRA TECH COMPANY

Engineering Log - Cored Borehole

Borehole ID.	**BH103**
sheet:	2 of 3
project no.	**754-SYDGE205019**
client:	**Recap Management**
date started:	**04 Nov 2018**
principal:	
date completed:	**06 Nov 2018**
project:	**4-6 Bligh Street**
logged by:	**YA**
location:	**4-6 Bligh Street, Sydney, NSW**
checked by:	**AJB**

position: E: 334,491.89; N: 6,251,287.55 (MGA94) surface elevation: 12.80 m (AHD) angle from horizontal: 90°

drill model: , Track mounted drilling fluid: hole diameter : vane id.:

drilling information | **material substance** | **rock mass defects**

method & support	water	RL (m)	depth (m)	graphic log	material description **ROCK TYPE**: grain characterisics, colour, structure, minor components	weathering & alteration	estimated strength & Is50 (X = axial; O = diametral) VL L M H VH EH	samples, field tests & Is(50) (MPa) a = axial; d = diametral	core run & RQD	defect spacing (mm) 30 100 300 1000 3000	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other) particular / general
					start coring at 0.79m						
		12	1.0		**SANDSTONE**: fine to medium grained, pale grey, indistinctly bedded, dry. 1.20 to 1.32 m: laminated shale, hairline to 2mm, extremely closely laminated	SW		a=1.08 d=0.92	100%		PT, 3°, PL, RO, CN PT, 0°, PL, SO, CN PT, 20°, PL, RO, CN
		11	2.0					a=0.89 d=0.90			PT, 5°, PL, RO, CN PT, 2°, PL, SO, SN, black PT, 2°, PL, SO, SN, black PT, 2°, PL, SO, SN, black
		10	3.0		2.80 to 3.70 m: becoming pale grey, massive, high quartz content			a=0.72 d=0.76	100%		PT, 2°, PL, RO, CN CS, 0°, IR, RO, SN PT, 0°, IR, RO, CN
		9	4.0		3.70 to 5.64 m: pale reddish to brown			a=1.39 d=1.60	100%		PT, 1°, CU, RO, CN PT, 2°, UN, RO, CN PT, 1°, PL, RO, CN PT, 0°, IR, RO, SN, dark grey PT, 0°, PL, RO, CO - SN, clay PT, 2°, PL, RO, CN PT, 20°, PL, RO, CN PT, 20°, IR, RO, CN
		8	5.0					a=1.12 d=1.58			PT, 20°, IR, RO, CN
		7	6.0		5.64 to 6.17 m: pale yellow grey, trace shale laminae and clay seams (up to 8mm thick)			a=1.25 d=1.31	100%		CS, 10 - 30°, IR, RO, SN CS, 0 - 20°, PL - CU, RO, CO - Clay
		6	7.0		6.17 to 7.25 m: pale reddish to brown			a=0.74 d=1.21	100%		PT, 1°, PL, RO, CN PT, 0°, PL, RO, SN
		5			7.25 to 7.70 m: pale yellow grey			a=1.47 d=0.36	100%		PT, 1°, PL, RO, SN PT, 0°, PL, SO, CN PT, 0°, PL, SO, CN

Defects are: PT, 0°, PL, RO, CN, unless otherwise described

CDF_0_9_06_LIBRARY.GLB rev:AR Log COF BOREHOLE: CORED 754-SYDGE205019.GPJ <<DrawingFile>> 15/11/2018 16:45

method & support
AS auger screwing
AD auger drilling
CB claw or blade bit
W washbore
NMLC NMLC core (51.9 mm)
NQ wireline core (47.6mm)
HQ wireline core (63.5mm)
PQ wireline core (85.0mm)
SPT standard penetration test
DT diatube

water
10/10/12, water level on date shown
water inflow
complete drilling fluid loss
partial drilling fluid loss
25uL water pressure test result (lugeons) for depth interval shown

graphic log / core recovery
core recovered (graphic symbols indicate material)
no core recovered

core run & RQD
barrel withdrawn
RQD = Rock Quality Designation (%)

weathering & alteration*
RS residual soil
XW extremely weathered
HW highly weathered
DW distinctly weathered
MW moderately weathered
SW slightly weathered
FR fresh
*W replaced with A for alteration

strength
VL very low
L low
M medium
H high
VH very high
EH extremely high

defect type
PT parting
JT joint
SZ shear zone
SS shear surface
CO contact
CS crushed seam
SM seam

planarity
PL planar
CU curved
UN undulating
ST stepped
IR Irregular

roughness
SL slickensided
POL polished
SO smooth
RO rough
VR very rough

coating
CN clean
SN stain
VN veneer
CO coating

coffey
A TETRA TECH COMPANY

Engineering Log - Cored Borehole

Borehole ID.	**BH103**
sheet:	3 of 3
project no.	**754-SYDGE205019**
client:	**Recap Management**
date started:	**04 Nov 2018**
principal:	
date completed:	**06 Nov 2018**
project:	**4-6 Bligh Street**
logged by:	**YA**
location:	**4-6 Bligh Street, Sydney, NSW**
checked by:	**AJB**

position: E: 334,491.89; N: 6,251,287.55 (MGA94) | surface elevation: 12.80 m (AHD) | angle from horizontal: 90°

drill model: , Track mounted | drilling fluid: | hole diameter : | vane id.:

drilling information | **material substance** | **rock mass defects**

method & support	water	RL (m)	depth (m)	graphic log	material description **ROCK TYPE**: grain characterisics, colour, structure, minor components	weathering & alteration	estimated strength & Is50 (X = axial; O = diametral) VL L M H VH EH	samples, field tests & Is(50) (MPa) a = axial; d = diametral	core run & RQD	defect spacing (mm) 30 100 300 1000 3000	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other) particular / general
		4	9.0		**SANDSTONE**: fine to medium grained, pale grey, indistinctly bedded, dry. *(continued)*	FR		a=1.15 d=0.63	100%		PT, 20°, IR, RO, CN PT, 20°, CU, RO, CN
						HW					PT, 0°, PL, SO, CO - Clay PT, 0°, PL, SO, CN PT, 20°, IR, RO, CO - Clay CS, 0 - 20°, IR, SO, CO - Clay
					SHALE: fine grained, slightly weathered, medium to high strength.						
					BRECCIATED SHALE: slightly weathered, medium strength.						PT, 10°, IR, VR, CN
								a=0.68 d=0.56	100%		PT, 0°, CU, RO, CN
					SHALE: fine grained, slightly weathered, medium to high strength.	FR					PT, 10°, IR, RO, CN PT, 5°, CU, RO, CN
		3	10.0		**SANDSTONE**: medium to coarse grained, pale yellow grey, indistinct bedding.						PT, 5°, PL, RO, CN
								a=1.11 d=1.27	100%		
		2	11.0								
								a=0.71 d=0.65			
					11.50 to 11.90 m: band of shale and shale laminae	SW					
		1	12.0			FR			100%		
								a=0.91 d=0.95			CS, 0°, UN, RO, SN, black
		0	13.0		**SANDSTONE**: fine to coarse grained, pale grey, high quartz content, slightly weathered, medium to high strength.			a=2.14 d=0.32			PT, 0°, PL, RO, CO - Clay PT, 2°, CU, RO, CO - CL Clay
					SANDSTONE: medium to coarse grained, grey, indistinct bedding, fresh.				100%		PT, 2°, CU, RO, CO - Clay
		-1	14.0								
								a=1.57 d=1.92			
		-2	15.0						100%		PT, 0°, PL, RO, CO - Clay PT, 2°, PL, RO, CN
		-3			Borehole BH103 terminated at 15.31 m						

Defects are: PT, 0°, PL, RO, CN, unless otherwise described

CDF_0_9_06_LIBRARY.GLB rev:AR Log COF BOREHOLE: CORED 754-SYDGE205019.GPJ <<DrawingFile>> 15/11/2018 16:45

method & support
AS auger screwing
AD auger drilling
CB claw or blade bit
W washbore
NMLC NMLC core (51.9 mm)
NQ wireline core (47.6mm)
HQ wireline core (63.5mm)
PQ wireline core (85.0mm)
SPT standard penetration test
DT diatube

water
10/10/12, water level on date shown
water inflow
complete drilling fluid loss
partial drilling fluid loss
25uL water pressure test result (lugeons) for depth interval shown

graphic log / core recovery
core recovered (graphic symbols indicate material)
no core recovered

core run & RQD
barrel withdrawn
RQD = Rock Quality Designation (%)

weathering & alteration*
RS residual soil
XW extremely weathered
HW highly weathered
DW distinctly weathered
MW moderately weathered
SW slightly weathered
FR fresh
*W replaced with A for alteration

strength
VL very low
L low
M medium
H high
VH very high
EH extremely high

defect type
PT parting
JT joint
SZ shear zone
SS shear surface
CO contact
CS crushed seam
SM seam

planarity
PL planar
CU curved
UN undulating
ST stepped
IR Irregular

roughness
SL slickensided
POL polished
SO smooth
RO rough
VR very rough

coating
CN clean
SN stain
VN veneer
CO coating

BH103 0.76 - 5.00 m

drawn	YA
approved	AJB
date	16/11/2018
scale	N.T.S.
original size	A4

coffey
A TETRA TECH COMPANY

client: Recap Management

project: 4-6 Bligh Street
4-6 Bligh Street, Sydney, NSW

title: **CORE PHOTOGRAPH BH103**

project no: 754-SYDGE205019 | fig no: **FIGURE 1** | rev:

BH103 5.00 - 10.00 m

drawn	YA
approved	AJB
date	16/11/2018
scale	N.T.S.
original size	A4

coffey
A TETRA TECH COMPANY

client: Recap Management

project: 4-6 Bligh Street
4-6 Bligh Street, Sydney, NSW

title: **CORE PHOTOGRAPH**
BH103

project no: 754-SYDGE205019 | fig no: **FIGURE 2** | rev:

BH103 10.00 - 15.00 m

drawn	YA
approved	AJB
date	16/11/2018
scale	N.T.S.
original size	A4

coffey
A TETRA TECH COMPANY

client: Recap Management

project: 4-6 Bligh Street
4-6 Bligh Street, Sydney, NSW

title: **CORE PHOTOGRAPH**
BH103

project no: 754-SYDGE205019 | fig no: **FIGURE 3** | rev:

coffey
A TETRA TECH COMPANY

Piezometer Installation Log

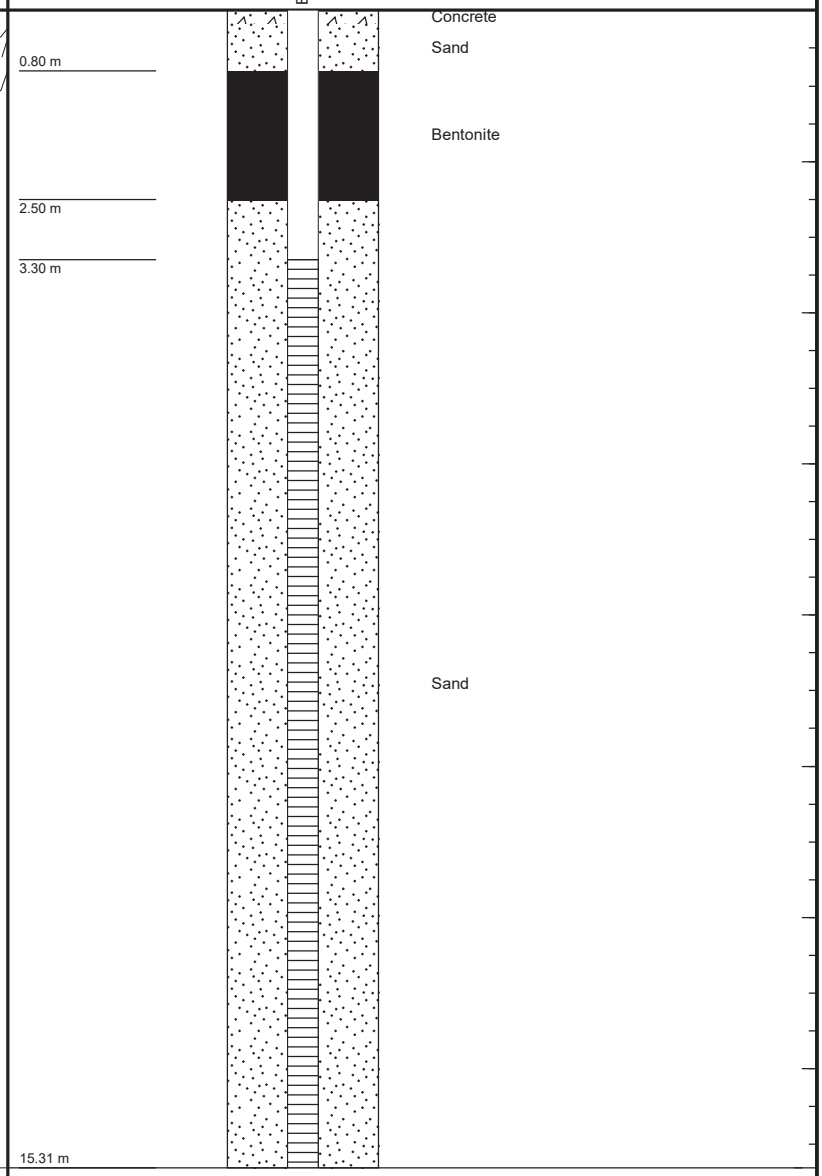
		Hole ID.	**BH103**
		sheet:	1 of 1
		project no.	**754-SYDGE205019**
client:	**Recap Management**	date started:	**04 Nov 2018**
principal:		date completed:	**06 Nov 2018**
project:	**4-6 Bligh Street**	logged by:	**YA**
location:	**4-6 Bligh Street, Sydney, NSW**	checked by:	**AJB**

position: E: 334,491.89; N: 6,251,287.55 (MGA94) | surface elevation: 12.80 m (AHD) | angle from horizontal: 90°

equipment type: , Track mounted | drilling fluid: | hole diameter :

drilling information | **material substance** | **piezometer construction details**

method & support	water	RL (m)	depth (m)	graphic log	material name
		12	1		CONCRETE
					BALLAST
					BEDROCK
		10	2		
			3		
		8	4		
			5		
		6	6		
			7		
		4	8		
			9		
		2	10		
			11		
		0	12		
			13		
		-2	14		
			15		



method & support
see engineering log for details

water
- 10-Oct-12, water level on date shown
- water inflow
- complete drilling fluid loss
- partial drilling fluid loss
- 25 water pressure test result (lugeons) for depth interval shown

graphic log / core recovery
- core recovered (graphic symbols indicate material)
- no core recovered

ID	type	installation date	stickup (m)	tip depth (m)	water level (m)	Relative Levels (AHD) stickup	tip	water level
BH103	standpipe piezo.			15.31 m			-2.51	

This page has been left intentionally blank