REPORT TO

HAMMONDCARE

ON

REMEDIATION ACTION PLAN

FOR

PROPOSED HOSPITAL REDEVELOPMENT

AT

NERINGAH HOSPITAL, 4-12 NERINGAH AVENUE SOUTH, WAHROONGA, NSW

Date: 11 November 2022
Ref: E35312BRrpt5Rev1

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Executive Summary

HammondCare ('the client') commissioned JK Environments (JKE) to prepare a Remediation Action Plan (RAP) for the proposed hospital redevelopment at Neringah Hospital, 4-12 Neringah Avenue South, Wahroonga, NSW.

This RAP is to be submitted to the Department of Planning and Environment (DPE) in support of a State Significant Development Application (SSD-45121248) for the redevelopment of part of the site at 4-12 Neringah Avenue South, Wahroonga for the purposes of delivering additional community health services, seniors housing, as well as upgraded palliative care facilities that will contribute to the broader operation of 'Neringah Hospital.' The extent of the development area subject to this RAP is shown on the figures attached in the appendices.

Specifically, this SSDA seeks approval for the following:

- Site preparation works comprising:
  - Demolition of the Neringah Hospital building, kiosk, and existing at-grade carparks;
  - Clearing of nominated vegetation on the proposed development areas;
  - Bulk earthworks including basement excavation; and
  - Remediation works where necessary across the site.
- Construction and use of an integrated seniors housing and health services facility across two buildings ranging from 4-5 storeys above ground, comprising:
  - 2 basement levels containing minimum of 130 car parking spaces and service dock;
  - 12 residential aged care facility beds (extension to existing Stage 1 provision);
  - 18 palliative care hospice beds (Schedule 3 health services facility);
  - Community healthcare services, including outpatient palliative care, centre for positive ageing and Hammond at Home;
  - 57 seniors housing dwellings; and
  - On-site administration, amenities and ancillary operations space.
- Ground level and on-building landscaping works, including the provision of a through site pedestrian link connecting Archdale Park and Balcombe Park;
- Public domain works, specifically, regrading of part of the pedestrian walkway known as 'Archdale Walk' to provide accessible connection; and
- Extension and augmentation of infrastructure and services required including new site signage.

This report has been prepared to respond to the Secretary's Environmental Assessment Requirements (SEARs) for SSD-45121248 that were issued on 24 June 2022. A table referencing responses has been provided below.

SEAR	Relevant section of report
17. Contamination and Remediation Assess and quantify any soil and groundwater contamination and demonstrate that the site is suitable (or will be suitable, after remediation) for the development.	This report outlines the strategy to remediate the site to be suitable (from a contamination viewpoint) for the development. The site characterisation and conceptual site model are presented in Section 3, the data gaps are outlined in Section 4, the remediation options are discussed in Section 5 and the conclusions are presented in Section 10.

Based on the information provided to JKE, the proposed development includes major earthworks (cut/fill) over the majority of the site to achieve the development levels. We understand that the finished floor level of the lowest basement level is proposed to be at RL 192.920mAHD. Excavation to a maximum depth of approximately 14m below ground level (BGL) are anticipated to accommodate the basement levels. Selected plans issued for the preparation of this report are attached in the appendices.

The goal of the remediation is to render the development area suitable for the proposed hospital redevelopment from a contamination viewpoint. The primary aim of the remediation at the development area is to reduce the human health and environmental risks posed by on-site contamination to an acceptable level.

The primary objectives of the RAP are to:

- Summarise previous investigations and historical contamination data;
- Identify any data gaps which may require addressing prior to the commencement of remediation or during remediation works;
- Provide a methodology to remediate and validate the development area;
- Provide a contingency plan and unexpected finds protocol for the remediation works; and
- Outline on-site management procedures to be implemented during remediation.

For the purpose of the RAP, the extent of remediation includes relatively localised zinc impacts to fill in one location (BH106), asbestos fines/fibrous asbestos (AF/FA) impacts to fill in one location (BH1), and asbestos containing materials (ACM – i.e. bonded asbestos) impacts to fill in one location (BH111). There is potential for further AF/FA and/or ACM impacts to be identified during the remediation process. Remediation of the underground storage tank (UST) and associated infrastructure is also required. The remediation extent has been determined after consideration of the potential for complete source-pathway-receptor (SPR) linkages to exist before and/or after development.

The depth of fill in the vicinity of BH106 was approximately 0.5mBGL. However, as the zinc impacts to fill pose a potential risk to ecological receptors only, the lateral extent of the remediation for zinc impacts to fill is limited to the landscaped area in the east of the development area. The depth of fill in the vicinity of BH1 was approximately 0.5mBGL, and the depth of the fill in the vicinity of BH111 was 0.2mBGL. The extent of remediation (horizontal and vertical) associated with the asbestos impacts will be guided by the validation. It is anticipated that the impacts will likely be relatively localised (i.e. within an approximate 20m x 20m grid), and limited to the depth of fill in the vicinity of BH1 and BH111. The extent of remediation (horizontal and vertical) associated with the UST and associated infrastructure will be guided by the validation. It is anticipated that the tank pit could be approximately 2-3m deep. The extent of remediation will be guided by the validation. The approximate soil remediation extents are shown on Figure 5 attached in the appendices.

The preferred soil remediation approach for the UST, associated infrastructure including any backfill, and the asbestos impacted fill in the vicinity of BH1 and BH111 is removal of the material to an appropriate facility (Option 4 of Table 5-1). The preferred soil remediation approach for the zinc-impacted fill in the vicinity of BH106 and any asbestos-impacted fill within the tree protection zone (TPZ) is isolation of impacted soil by cap and containment (Option 3 of Table 5-1).

The preferred options for remediation are considered to be appropriate on the basis that:

- Considerable earthworks (cut/fill) will be required to achieve the design levels;
- The asbestos impacts to fill are typically limited to the surficial/shallow fill soils;
- The potential hydrocarbon impacts associated with the UST and associated infrastructure are anticipated to be localised;
- The UST and associated infrastructure will be removed from site, removing a potential source of hydrocarbon impacts;
- The zinc-impacted fill is within a TPZ, and the vicinity will include surface plantings. Asbestos-impacted fill may also be present. The proposed approach avoids disturbance of the soils within the TPZ; and
- The strategies are sustainable, economically viable, commensurate with the level of risk posed by the contaminants and technically achievable to implement concurrently with the proposed development works.

The RAP includes a methodology to remediate and validate the site. A contingency plan for remediation is included together with site management procedures and an Unexpected Finds Protocol (UFP) to be implemented during remediation.

A site validation report is to be prepared on completion of remediation activities and submitted to the consent authority to demonstrate that the site is suitable for the proposed development. In the event that asbestos-impacted fill is retained on-site (i.e. capped within the TPZ), a Long-Term Environmental Management Plan (LTEMP) will be required and will provide a passive management approach which would not impose major constraints under the proposed development scenario.

The conclusions and recommendations should be read in conjunction with the limitations presented in the body of this report.

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Attachments

Abbreviations

Ambient Background Concentrations	**ABC**
Asphaltic Concrete	**AC**
Australian Business Number	**ABN**
Added Contaminant Limits	**ACL**
Asbestos Containing Material	**ACM**
Australian Company Number	**ACN**
Area of Environmental Concern	**AEC**
Australian Height Datum	**AHD**
Acid Sulfate Soil	**ASS**
Below Ground Level	**BGL**
Benzo(a)pyrene Toxicity Equivalent Factor	**BaP TEQ**
Bureau of Meteorology	**BOM**
Benzene, Toluene, Ethylbenzene, Xylene	**BTEX**
Cation Exchange Capacity	**CEC**
Construction Environment Management Plan	**CEMP**
Contaminated Land Management	**CLM**
Chain of Custody	**COC**
Conceptual Site Model	**CSM**
Development Application	**DA**
Data Quality Indicator	**DQI**
Data Quality Objective	**DQO**
Department of Planning and Environment	**DPE**
Ecological Investigation Level	**EIL**
Environmental Investigation Services	**EIS**
Ecological Screening Level	**ESL**
Environmental Management Plan	**EMP**
Excavated Natural Material	**ENM**
Environment Protection Authority	**EPA**
Environment Protection Licence	**EPL**
Environmental Site Assessment	**ESA**
Ecological Screening Level	**ESL**
Excavated Natural Material	**ENM**
Groundwater Monitoring Event	**GME**
Ground Penetrating Radar	**GPR**
Human Health Risk Assessment	**HHRA**
Hazardous Ground Gases	**HGG**
Health Investigation Level	**HILs**
Health Screening Level	**HSL**
JK Environments	**JKE**
Light non-Aqueous Phase Liquids	**LNAPL**
Long Term EMP	**LTEMP**
Map Grid of Australia	**MGA**
National Association of Testing Authorities	**NATA**
National Environmental Protection Measure	**NEPM**
Organochlorine Pesticides	**OCP**
Organophosphate Pesticides	**OPP**
Polycyclic Aromatic Hydrocarbons	**PAH**
Polychlorinated Biphenyls	**PCBs**
Photo-ionisation Detector	**PID**
Protection of the Environment Operations	**POEO**
Practical Quantitation Limit	**PQL**
Quality Assurance	**QA**
Quality Control	**QC**
Remediation Action Plan	**RAP**

Relative Percentage Difference	**RPD**
Remediation Works Plan	**RWP**
Site Assessment Criteria	**SAC**
Sampling, Analysis and Quality Plan	**SAQP**
Secretary Environmental Assessment Requirements	**SEARs**
Source, Pathway, Receptor	**SPR**
State Significant Development Application	**SSDA**
Standing Water Level	**SWL**
Tree Protection Zone	**TPZ**
Total Recoverable Hydrocarbons	**TRH**
Upper Confidence Limit	**UCL**
Urban Residential and Public Open Spaces	**URPOS**
United States Environmental Protection Agency	**USEPA**
Underground Storage Tank	**UST**
Validation Assessment Criteria	**VAC**
Virgin Excavated Natural Material	**VENM**
Work Health and Safety	**WHS**

Units

Litres	**L**
Metres BGL	**mBGL**
Metres	**m**
Millilitres	**ml or mL**
Milligrams per Kilogram	**mg/kg**
Percentage	**%**
Percentage weight for weight	**%w/w**

1 INTRODUCTION

HammondCare ('the client') commissioned JK Environments (JKE) to prepare a Remediation Action Plan (RAP) for the proposed hospital redevelopment at Neringah Hospital, 4-12 Neringah Avenue South, Wahroonga, NSW. This report has been revised to include the amended development details.

This RAP is to be submitted to the Department of Planning and Environment (DPE) in support of a State Significant Development Application (SSD-45121248) for the redevelopment of part of the site at 4-12 Neringah Avenue South, Wahroonga for the purposes of delivering additional community health services, seniors housing, as well as upgraded palliative care facilities that will contribute to the broader operation of 'Neringah Hospital.' The extent of the site is shown on Figure A below. The extent of the development area subject to this RAP is shown on the figures attached in the appendices.

Figure A: Outline of the site, with the portion of the site subject to the SCC shaded dark red (R4 zone)

Specifically, this SSDA seeks approval for the following:

- Site preparation works comprising:
  - Demolition of the Neringah Hospital building, kiosk, and existing at-grade carparks;
  - Clearing of nominated vegetation on the proposed development areas;
  - Bulk earthworks including basement excavation; and
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1.1 Proposed Development Details

The proposed development details are outlined in Section 1 above. Based on the information provided to JKE, the proposed development includes major earthworks (cut/fill) over the majority of the site to achieve the development levels. We understand that the finished floor level of the lowest basement level is proposed to be at RL 192.920mAHD. Excavation to a maximum depth of approximately 14m below ground level (BGL) are anticipated to accommodate the basement levels.

Selected plans issued for the preparation of this report are attached in the appendices.

1.2 Remediation Goal, Aims and Objectives

The goal of the remediation is to render the development area suitable for the proposed hospital redevelopment from a contamination viewpoint. The primary aim of the remediation at the development area is to reduce the human health and environmental risks posed by on-site contamination to an acceptable level.

The primary objectives of the RAP are to:

- Summarise previous investigations and historical contamination data;
- Identify any data gaps which may require addressing prior to the commencement of remediation or during remediation works;
- Provide a methodology to remediate and validate the development area;
- Provide a contingency plan and unexpected finds protocol for the remediation works; and
- Outline on-site management procedures to be implemented during remediation.

1.3 Scope of Work

The RAP was prepared generally in accordance with a JKE proposal (Ref: EP56645BR) of 27 May 2022 and written acceptance in the form of a purchase order (PO No: 72359) issued by the client on 27 July 2022. The scope of work included consultation with the client, a review of previous reports and Conceptual Site Model (CSM), and preparation of the RAP.

The scope of work was undertaken with reference to the National Environmental Protection (Assessment of Site Contamination) Measure 1999 as amended (2013)[1], State Environmental Planning Policy (Resilience and Hazards) 2021[2] and other guidelines made under or with regards to the CLM Act 1997, including the Consultants Reporting on Contaminated Land (2020)[3] guidelines.

A list of reference documents/guidelines is included in the appendices.

[1] National Environment Protection Council (NEPC), (2013). *National Environmental Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013).* (referred to as NEPM 2013)

[2] *State Environmental Planning Policy (Resilience and Hazards) 2021* (NSW) (referred to as Resilience and Hazards SEPP)

[3] NSW EPA, (2020). *Consultants reporting on contaminated land, Contaminated Land Guidelines.* (referred to as Consultants Reporting Guidelines)

2 SITE INFORMATION

2.1 Background

2.1.1 Preliminary Site Investigation (PSI)

A Preliminary Site Investigation (PSI) was undertaken for the site by Environmental Investigation Services (EIS, now JKE) in 2010[4]. The scope of the PSI included a review of various historical documents; a site walkover inspection and soil sampling from 12 boreholes drilled for the concurrent geotechnical investigation. Five boreholes (BH1 to BH4, and BH6) were within the current proposed development areas (see Figure 2 attached in the appendices).

The site history information indicated that the site was likely used as a hospital since at least the 1970s. Prior to the 1970s, the site was likely used for residential purposes, and possibly activities associated with the church and the Red Cross Society.

During the site inspection, a suspected underground storage tank (UST) was identified beneath the driveway in the central-east section of the site (to the south of the main hospital building). No records relating to the UST were available for review.

Selected soil samples were analysed for: heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc), total petroleum hydrocarbons (TPH), monocyclic aromatic hydrocarbons (Benzene, toluene, ethylbenzene, xylenes - BTEX), polycyclic aromatic hydrocarbons (PAH), organochlorine pesticides (OCPs), organophosphate pesticides (OPPs), polychlorinated biphenyls (PCBs), and asbestos.

The investigation identified asbestos in one fill soil sample collected from BH1 located at the subject site (see Figure 3 attached in the appendices). All other soil results were below the site assessment criteria (SAC). The asbestos was identified as loose fibre bundles, and was considered to be asbestos fines/fibrous asbestos (AF/FA) (i.e. friable asbestos). The asbestos was identified in fill soil beneath concrete pavement (and therefore inaccessible), and was assessed to not present an immediate risk to human health.

The EIS PSI concluded that the site could be made suitable for the proposed development (alterations/additions and continued hospital use), subject to the following:

- An additional investigation was to be undertaken in the vicinity of the suspected UST;
- An asbestos consultant was to be engaged prior to any works in the vicinity of BH1; and
- A hazardous building materials (HAZMAT) survey was to be prepared prior to demolition.

[4] Environmental Investigation Services, (2010). *Report to HammondCare on stage 1 Preliminary Environmental Site Assessment for Proposed Hospital Redevelopment at Neringah Hospital, 3-9 Woonona Avenue South and 2-12 Neringah Avenue South, Wahroonga, NSW.* (Ref: E24031Krpt, dated June 2010). (Referred to as EIS PSI)

2.1.2 Additional Environmental Site Assessment

An additional environmental site assessment was undertaken by EIS in 2012[5]. The purpose of the assessment was to assess whether the UST was present beneath the driveway in the central-east section of the site, and to inspect an area where subsurface asbestos was detected during the EIS PSI (i.e. vicinity of BH1).

A ground-penetrating radar (GPR) survey of the suspected UST was undertaken by a specialist sub-contractor. The scan confirmed the presence of the suspected UST. The UST was estimated to be approximately 4.6m long and 2.5m wide. The depth was not able to be determined.

EIS considered the risk of exposure to asbestos in soils in the vicinity of BH1 to be very low. This was based on the surface of this area being concrete paved, and that no development was planned in the vicinity of BH1 (i.e. the soil would remain undisturbed). EIS recommended:

- The building maintenance sections were notified of the presence of asbestos in soil in the vicinity of BH1;
- The pavement and/or soil in the vicinity of BH1 was not disturbed, unless necessary; and
- If the area is to be disturbed, a qualified asbestos consultant must be engaged to provide a work plan and appropriate asbestos clearance.

JKE is not aware of any works being completed in the vicinity of BH1.

2.1.3 Detailed Site Investigation (DSI)

A Detailed Site Investigation (DSI) was undertaken by JKE in 2022[6]. The DSI included a review of site information and site history information (including the reports discussed above), soil sampling from 15 locations throughout the development area and groundwater sampling from four monitoring wells installed within the development area. A GPR survey was also undertaken.

The GPR survey was limited to the approximate location of the known UST in the east of the development area. The survey identified sub-surface anomalies which were indicative of a UST. The approximate dimensions were generally consistent with the GPR survey undertaken in 2012.

The site history information and the walkover inspection of the development area confirmed the potential sources of on-site contamination/AEC identified in the JKE PSI.

The DSI identified a concentration of zinc above the ecological SAC in one location (BH106), and a concentration of TRH F3 above the ecological SAC in one location (BH107). The source of the impact was considered likely associated with historically imported fill. The TRH F3 may also have been associated with surficial leaks/spills permeating the surface.

[5] Environmental Investigation Services, (2012). *Additional Environmental Site Assessment. Proposed Hospital Redevelopment. Neringah Hospital; 3-9 Woonona Avenue South, Wahroonga, NSW.* (Ref: E24031Klet2, dated 28 May 2012). (Referred to as EIS AESA).
[6] JK Environments, (2022). *Report to HammondCare on Detailed (Stage 2) Site Investigation for Proposed Hospital Redevelopment at Neringah Hospital, 4-12 Neringah Avenue South, Wahroonga, NSW.* (Ref: E35312BRrpt4) (Referred to as DSI)

BH106 was located within a garden area within the east of the development area, and it is noted that the garden area will remain based on the proposed configuration. The elevated concentration of zinc was detected in the surficial fill soils, and the surface comprised of exposed soils. As the surface was exposed, and will remain as a landscape area, the zinc impact to fill was considered to represent a potential risk to ecological receptors and required remediation.

BH107 was located within an area sealed by pavement and within the proposed building footprint. On this basis, the TRH F3 exceedance was considered to not pose a risk to ecological receptors due to an incomplete source-pathway-receptor (SPR) linkage.

The DSI identified asbestos containing material (ACM) within the sub-surface soils in one location (BH111). The concentration of ACM was below the SAC. As the ACM was identified in the sub-surface soils, the ACM was not considered to represent an immediate risk to receptors in the current configuration, as no complete SPR linkages were identified. It was noted that excavation would be required in this vicinity for the proposed building, and that once the surficial soils were removed, the ACM may pose a risk to receptors. Remediation was recommended to address this risk.

The DSI identified heavy metals (copper, nickel and zinc) and perfluorooctanesulfonic acid (PFOS) in groundwater at concentrations above the ecological SAC. The concentrations of heavy metals and PFOS within the soils indicated the development area was unlikely to be the source of the heavy metals and PFOS within the groundwater. JKE was of the opinion that the concentrations were likely a regional issue and noted that the concentrations did not pose a risk to on-site receptors in the context of the proposed development. However, the concentrations may require some treatment for off-site disposal of groundwater to stormwater during dewatering activities.

The DSI identified that the pH readings of the groundwater samples were outside (i.e. below the lower threshold) the SAC for ecological receptors. JKE was of the opinion that the pH was likely a regional issue, however, would require some treatment prior to off-site disposal of groundwater to stormwater during dewatering activities.

The DSI concluded that the site could be made suitable for the proposed development. The following was recommended:

- Prepare and implement an Asbestos Management Plan (AMP) to outline the required measures to manage the risks associated with asbestos in soils in the development area;
- When the development area becomes fully accessible (i.e. after demolition), undertake an inspection and additional soil sampling in the footprints of buildings/structures and in the vicinity of the UST;
- Prepare a RAP to address the contamination issues identified within the development area; and
- Undertake a validation assessment documenting the remediation works.

2.1.4 Hazardous Building Material Survey (Hazmat) and Other JKE Reports

JKE were engaged by the client to complete the following reports for the SSD in conjunction with the DSI:

- An acid sulfate soil (ASS) assessment[7];
- A salinity investigation[8]; and
- A HAZMAT survey[9].

The ASS assessment included a desktop review of geological and ASS risk mapping, walkover inspection of the development area and soil sampling from four boreholes drilled for the DSI. The ASS information reviewed identified that the development area was located in an area of no known occurrence of ASS and was classed as having low probability of ASS occurrence. The results of field tests and laboratory analysis were not indicative of ASS conditions. Based on the findings of the assessment, the JKE ASS report concluded that ASS or potential ASS was unlikely to be encountered and that an ASS management plan (ASSMP) was not considered necessary for the proposed development.

The salinity investigation included a desktop review of salinity information and mapping, walkover inspection of the development area, soil sampling from four boreholes drilled for the DSI and groundwater sampling from four monitoring wells installed for the DSI. The salinity information indicated that the site was not located within a mapped dryland salinity risk area. No visual indications of saline conditions were observed during the inspection. The results of the soil and groundwater analysis identified the following:

- The soils were classed as extremely acidic to strongly alkaline;
- The soils were classed as non-saline;
- The soils were generally non-sodic;
- The soils were moderately aggressive toward buried concrete;
- The soils were non-aggressive towards buried steel;
- The groundwater was moderately aggressive towards buried concrete; and
- The groundwater was mildly aggressive towards buried steel.

The salinity investigation concluded that a salinity management plan (SMP) was not considered necessary for the proposed development. JKE recommended that the results of the salinity investigation were reviewed and incorporated into the design of the proposed development by the project team (civil, structural and landscaping).

The HAZMAT survey included an inspection and sampling of representative materials for: asbestos fibre containing materials; lead containing materials; PCB containing electrical equipment; and synthetic mineral fibre (SMF) containing materials. The inspection identified asbestos, in the form of bonded/non-friable ACM and friable asbestos and lead in paint systems within the interior and exterior of buildings and structures within the development area, and SMF within the interior of building and structures within the development area. Light fittings potentially housing PCBs were visually identified within the development area. Reference should be made to the JKE HAZMAT report for further details.

[7] JKE, (2022a). *Report to HammondCare on Acid Sulfate Soil Assessment for Proposed Hospital Redevelopment at Neringah Hospital, 4-12 Neringah Avenue South, Wahroonga, NSW.* (Ref: E35312BRrpt2). (referred to as JKE ASS Report).

[8] JKE, (2022b). *Report to HammondCare on Salinity Investigation for Proposed Hospital Redevelopment at Greenwich Neringah Hospital, 4-12 Neringah Avenue South, Wahroonga, NSW.* (Ref: E35312BRrpt3). (referred to as JKE Salinity Report).

[9] JKE, (2022c). *Report to HammondCare on Hazardous Building Materials Survey for Proposed Demolition Works at Neringah Hospital, 4-12 Neringah Avenue South, Wahroonga, NSW.* (Ref: E35312BLrpt-HAZ). (referred to as JKE HAZMAT).

2.2 Site Identification

Table 2-1: Site Identification

Current Site Owner (certificate of title):	HammondCare
Site Address:	Part of 4-12 Neringah Avenue South, Wahroonga, NSW
Lot & Deposited Plan:	Lot 1 in DP960051, Lot 1 in DP19937, Lot 52 in DP2666 and Lot 1 in DP585805
Current Land Use:	Hospital (palliative care)
Proposed Land Use:	Hospital and Seniors Housing
Local Government Authority:	Ku-ring-gai Council
Current Zoning:	R4: High-density Residential
Development Area (m^2) (approx.):	5,700
RL (AHD in m) (approx.):	195-207
Geographical Location (decimal degrees) (approx.):	Latitude: -33.717627 Longitude: 151.114568
Site Location Plan:	Figure 1
Sample Location Plan:	Figure 2

2.3 Site Condition and Surrounding Environment

2.3.1 Location and Regional Setting

The site is located in a predominantly residential area of Wahroonga. The site is bounded by Neringah Avenue South to the east. The site is located approximately 750m to the south of Cockle Creek.

2.4 Topography

The site is located within undulating regional topography which generally falls to the north and north-east at a slope of approximately 5°. The site itself falls to the north and north-east in line with the regional topography. Parts of the site appear to have been levelled to account for the slope and accommodate the existing development.

2.5 Site Inspection

A walkover inspection of the development area was undertaken by JKE on 26 July 2022 for preparation of the SAQP and subsequent inspections for the DSI. The inspection was limited to accessible areas of the

development area and immediate surrounds. An internal inspection of buildings was not undertaken. The development area remained unchanged at the time of preparation of the RAP.

Selected photographs obtained during the inspection are attached in the appendices.

At the time of the inspection, a 2-4 storey building (main hospital building) was located within the central and northern sections of the development area, and a single-storey building (kiosk) was located in the south-eastern section of the development area. The main hospital building was of brick and concrete construction with fibre cement in-fill panels. The building appeared to be in generally good condition. The kiosk was located to the south of the main hospital building and was of sandstone block and concrete construction with fibre cement in-fill panels. Based on a cursory inspection, the kiosk appeared to be in reasonable condition. A brick-paved courtyard and formed gardens were to the north and east of the kiosk and appeared to be in good condition.

Asphaltic concrete (AC) and concrete paved carparks were observed to the north and south of the main hospital building, with driveways connecting to Neringah Avenue South to the east. A third concrete driveway provided vehicular access to the central courtyard of the main hospital and loading dock. The southern carpark and loading dock areas were in good condition, with minimal cracking observed. The northern carpark was in fair condition, with visible evidence of subsidence and potholes. No stains were observed on the paved surfaces.

The southern section of the development area was vacant and grass covered. Large trees and smaller shrubs were also observed in this area, generally near the kiosk and the western boundary of the development area. Based on a cursory inspection, the vegetation appeared healthy with no visible evidence of stress or die-back.

A back-up generator was located adjacent to the north of the main hospital building. The generator was located on a raised concrete platform. JKE were advised by the facility manager that the fuel storage for the generator was built into the generator. No stains or evidence of leaks/spills were observed on the concrete platform. A second generator was located to the south of the development area, within the wider property boundary. The generator was self-contained and appeared to be considerably newer than the generator in the north of the development area.

During the inspection of the development area, JKE observed the following land uses in the immediate surrounds:

- North – Residential properties (predominantly high-density residential) with basement parking;
- South – Sydney Water reservoir;
- East – Neringah Avenue South, with medium to high-density residential properties beyond; and
- West – Woonona Cottage and HammondCare Wahroonga (nursing home) within the wider site boundary.

2.5.1 Climatic Conditions

Key meteorological data presented in the DSI indicated the following:

- The highest mean rainfall occurs in March, with a total of 147.3mm;
- The lowest mean rainfall occurs in September, with a total of 67.2mm; and
- In the two weeks leading up to the JKE fieldworks for the DSI, a total of 71.4mm of rainfall was recorded.

2.6 Summary of Geology, Soils and Hydrogeology

2.6.1 Regional Geology

Regional geological information included in the DSI report indicated that the site is underlain by Ashfield Shale of the Wianamatta Group, which typically consists of black to light grey shale and laminite.

A summary of the subsurface conditions encountered in the DSI boreholes is provided below. A copy of the DSI borehole logs is attached in the appendices.

Table 2-2: DSI Summary - Subsurface Conditions

Profile	Description
Pavement	Asphaltic concrete pavement was encountered in BH101 to BH103 and BH107 to BH109 and ranged in thickness from approximately 10mm to 100mm.
Fill	Fill material was encountered at the surface or beneath the pavement in all boreholes and extended to depths of approximately 0.15mBGL (BH104 and BH105) to 1.2mBGL (BH108). BH106 was terminated in the fill at a maximum depth of approximately 0.5mBGL. The fill typically comprised of: silty sand; and silty and/or sandy clay. The fill contained inclusions of: gravel; ash; slag; mulch; and building rubble (glass, ceramic, plastic, rubber, tile, concrete, brick and fibre cement fragments). No stained or odorous soils were encountered during the investigation.
Natural Soil	Residual silty clay was encountered beneath the fill in all boreholes (except for BH106). BH101, BH103, BH104, BH108, BH110 to BH113 and BH115 were terminated in the residual soils at depths of approximately 0.8mBGL to 2.4mBGL.
Bedrock	Siltstone bedrock was encountered in BH102, BH105, BH107, BH109 and BH114 beneath the residual soils at depths of approximately 1mBGL (BH105) to 4mBGL (BH114). The bedrock was extremely weathered on first contact, becoming distinctly weathered at depths of approximately 5.5mBGL (BH114) to 8mBGL (BH107 and BH109).
Groundwater	Groundwater seepage was encountered in BH102, BH107, BH109, BH114 and BH115 at depths of approximately 2mBGL to 7.5mBGL. On completion of drilling, the standing water level (SWL) of the groundwater in BH102, BH107, BH109 and BH114 were measured to be approximately 3.6mBGL to 7.5mBGL. BH115 was dry on completion of drilling. All other boreholes remained dry on completion of drilling and a short time after.

2.6.2 Acid Sulfate Soil (ASS) Risk and Planning

Acid sulfate soil (ASS) information presented in the ASS report indicated the site is located in an area of 'no known occurrence'. The site is classed as having low probability of ASS occurrence.

The ASS assessment concluded that ASS and/or potential ASS (PASS) conditions were not encountered. Reference should be made to the ASS report for further details.

2.6.3 Hydrogeology

hydrogeological information included in the DSI report indicated that:

- The subsurface conditions at the site consist of relatively low permeability (residual) soils overlying shallow bedrock. The potential for viable groundwater abstraction and use of groundwater under these conditions is considered to be low. There is a reticulated water supply in the area and consumption of groundwater is not expected to occur. Use of groundwater is not proposed as part of the development; and
- The site location and regional topography indicates that surface water flows are expected to flow towards the north. The nearest down-gradient water body was Cockle Creek, located approximately 750m to the north of the site. Due to the distance from the site, this water body is not considered to be a potential receptor that could be impacted by direct migration.

A summary of the field screening results during groundwater sampling in the DSI is presented in the following table:

Table 2-3: DSI Summary - Groundwater Field Screening

Aspect	Details
Groundwater Depth & Flow	SWLs measured in the monitoring wells installed within the development area ranged from approximately 2.44mBGL to 4.71mBGL. The surface elevation of the wells was interpolated from spot height measurements presented on the provided survey and are approximate. Groundwater RLs calculated on these measurements ranged from approximately 195mAHD to 201mAHD. The groundwater RLs indicate that excavation for the proposed basement may intercept groundwater.
Groundwater Field Parameters	Field measurements recorded during sampling were as follows: - pH ranged from pH 4.09 to pH 5.68; - EC ranged from 365.1µS/cm to 1,147µS/cm; - Eh ranged from 22.7mV to 63.1mV; - DO ranged from 0.6ppm to 2.5ppm; and - PID readings measured in the well headspace ranged from 0ppm to 5.9ppm.
Light non-aqueous phase liquids (LNAPL) e.g. petroleum hydrocarbons	Phase separated product (i.e. LNAPL) were not detected using the interphase probe during groundwater sampling.

2.6.4 Receiving Water Bodies

Information included in the DSI report indicated that the nearest down-gradient surface water body is Cockle Creek located approximately 750m to the north of the site.

3 SITE CHARACTERISATION AND CONCEPTUAL SITE MODEL

NEPM (2013) defines a CSM as a representation of site related information regarding contamination sources, receptors and exposure pathways between those sources and receptors. The CSM for the development area is presented in the following sub-sections and is based on the previous investigation data, site history and site information presented in Section 2.

3.1 Summary of Contamination (Site Characterisation)

A copy of the soil and groundwater data summary tables and borehole logs from the DSI report is included in the appendices. The SAC exceedances are shown on Figure 3 attached in the appendices. The following exceedances of the SAC were reported in the DSI:

- A zinc concentration above the ecological-based SAC in fill soil in BH106;
- A TRH F3 concentration above the ecological-based SAC in fill soil at BH107. It is noted that following silica gel clean-up analysis of the sample to remove interference from non-petroleum-based hydrocarbons (i.e. organic and/or polar compounds), the TRH F3 concentration in BH107 was below the ecological-based SAC;
- Concentrations of heavy metals (copper and zinc) PFOS above the ecological SAC in the groundwater;
- Concentrations of PFOS above the ecological SAC in the majority of the groundwater samples; and
- The pH of the groundwater samples was outside (i.e. below the lower threshold) of ecological SAC.

Though not above the SAC, FCF/ACM was encountered in fill soils in BH111 during the DSI. The ACM was not encountered within the surficial fill and was assessed to not pose an immediate risk to human health. Once the surficial soils are removed (i.e. during demolition/construction), the ACM may be exposed and a source-pathway-receptor (SPR) linkage may exist.

The following exceedances of the SAC were reported during the PSI and are shown on the EIS Figure 2 attached in the appendices:

- Asbestos, as AF/FA (loose fibre bundles) were encountered in fill soil at BH1. The fill soil was sealed beneath concrete pavement and the friable asbestos in soils were assessed to not present an immediate risk to human health.

The UST and associated infrastructure were also considered potential source/s of localised hydrocarbon impacts.

3.2 CSM

The table below includes a review of the CSM which has been used to design the soil remediation strategy. The CSM will require further review if additional site data becomes available.

Table 3-1: CSM

Contaminant source(s) and contaminants of concern	**Contamination sources:** historically imported fill soil; UST and associated infrastructure; use of pesticides; and hazardous building materials. The contaminants in groundwater were associated with background sources. **Contaminants of concern for the RAP include:** Heavy metals; TRHs; BTEX; and asbestos. The contaminants in groundwater are not considered to pose a risk to site receptors and hence not addressed in this RAP. In the event of dewatering, reference should be made to Section 9.8 for more information. **The Contamination of Potential Concern (CoPC) for the DSI included:** heavy metals, BTEX, TRH, PAHs, OCPs, OPPs, PCBs, per-and polyfluoroalkyl substances (PFAS) and asbestos. The DSI included analysis of groundwater for volatile organic compounds (VOCs).
Affected media	Soil is the affected medium for this RAP. The groundwater has been impacted by heavy metals and PFOS. The source of the contaminants is likely associated with leaks/spills from potable water supply and regional issues. Groundwater has not been identified as a medium requiring remediation under this RAP as the contaminants are not considered to pose a risk to on-site receptors. However, some level of treatment may be required for off-site disposal of groundwater during dewatering.
Receptor identification	The DSI identified asbestos, and the potential for localised TRH/BTEX concentrations which may pose a risk to human receptors in the event that SPR linkages are complete. Human receptors include construction workers, intrusive maintenance workers and current and future site users. The risks of asbestos and TRH/BTEX to future site users (including accumulating in confined spaces and buildings) should be addressed in relation to the proposed development. The DSI identified zinc at concentrations that pose a risk to ecological receptors at the site. The impacts were generally limited to the surficial and near-surface soils in the landscaped (existing and proposed) area in the vicinity of BH106. These risks should be addressed in relation to the proposed development.
Exposure pathways and mechanisms	Potential exposure pathways relevant to the human receptors include primary contact, and inhalation of vapours (TRH/BTEX). The potential for exposure would typically be associated with the construction and excavation works, and future use of the site. Potential exposure pathways for ecological receptors include primary contact and ingestion. Exposure to human receptors during future site use could occur via inhalation of vapours within enclosed spaces such as buildings and basements, and during soil disturbance. Exposure to ecological receptors during future site use could occur via primary contact and ingestion of soils in unpaved areas, including landscaped areas and during soil disturbance. The following have been identified as potential exposure mechanisms for site contamination: • Vapour intrusion into confined spaces including service trenches; • Vapour intrusion into buildings; • Contact (dermal or ingestion) exposure to TRH/BTEX and/or lead in soil (in the vicinity of the UST); • Inhalation of asbestos fibres during soil disturbance; and

	• Contact (dermal or ingestion) exposure to zinc (ecological receptors).
Evaluation of data gaps	The DSI recommended further investigation to assess soil conditions beneath existing structures and an additional groundwater monitoring event (GME) as outlined in Section 4.

3.3 Remediation Extent

For the purpose of the RAP, the extent of remediation includes relatively localised zinc impacts to fill in one location (BH106), AF/FA impacts to fill in one location (BH1), and ACM impacts to fill in one location (BH111). There is potential for further AF/FA and/or ACM impacts to be identified during the remediation process. Remediation of the UST and associated infrastructure is also required. The remediation extent has been determined after consideration of the potential for complete SPR linkages to exist before and/or after development.

The depth of fill in the vicinity of BH106 was approximately 0.5mBGL. However, as the zinc impacts to fill pose a potential risk to ecological receptors only, the lateral extent of the remediation for zinc impacts to fill is limited to the landscaped area in the east of the development area.

The depth of fill in the vicinity of BH1 was approximately 0.5mBGL, and the depth of the fill in the vicinity of BH111 was 0.2mBGL. The extent of remediation (horizontal and vertical) associated with the asbestos impacts will be guided by the validation. It is anticipated that the impacts will likely be relatively localised (i.e. within an approximate 20m x 20m grid), and limited to the depth of fill in the vicinity of BH1 and BH111.

The extent of remediation (horizontal and vertical) associated with the UST and associated infrastructure will be guided by the validation. It is anticipated that the tank pit could be approximately 2-3m deep. The extent of remediation will be guided by the validation.

The approximate soil remediation extents are shown on Figure 5 attached in the appendices.

4 DATA GAP INVESTIGATION

The DSI recommended further investigation to close out the identified data gaps. The data gaps included that the existing building footprints were not assessed, and also recommended an additional groundwater monitoring event (GME). The data gap investigation (DGI) will largely need to be undertaken post-demolition of the existing structures. The additional GME may be completed prior to demolition of the existing structures.

The following sub-sections outline the plan to close out the data gaps.

4.1 Soils Beneath Existing Building Footprints

The DGI will include soil sampling from seven additional sampling locations (as a minimum) as nominated on Figure 6 attached in the appendices (BH201 to BH207 inclusive). Additional samples are also to be collected if any visual or olfactory indicators of potential contamination are observed in other areas. The nominated locations target the footprints of the existing buildings.

Soil sampling is to be undertaken from test pits using an excavator (where possible). The use of a drill rig and/or hand tools may be necessary due to access in some areas (i.e. sloping ground).

As a minimum, one soil sample per fill profile encountered (at each location) is to be analysed for heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc), TRH/BTEX, PAHs, OCPs, OPPs and asbestos (500mL quantification sample). A bulk (10L) sample (to the extent achievable based on sample return) from each fill profile encountered (at each location) is to be screened in the field for the presence of asbestos. Additional testing may be required in areas of deep fill.

As a minimum, one sample of the natural profile is to be collected from each sampling location and is to be analysed for heavy metals, TRH/BTEX and PAHs for waste classification purposes. The samples are to be selected based on the results of the fill soil analysis and field observations.

A record of any additional USTs and/or potential point source/s of contamination identified after demolition is to be maintained. After removal of the infrastructure/point source, the USTs and/or point source/s of contamination are to be assessed in accordance with the validation plan outlined in Section 7.1. Any deviation to the remediation strategy should be documented in a Remediation Works Plan (RWP).

4.2 Groundwater Monitoring Event (GME)

The DGI will include an additional GME to confirm the groundwater conditions encountered during the DSI. The additional GME is to include groundwater sampling from the four existing monitoring wells (MW102, MW107, MW109 and MW114) as shown on Figure 6 attached in the appendices.

Due to the passage of time since the DSI, the groundwater monitoring wells are to be redeveloped using a submersible electric pump. Development is to continue until steady-state conditions are encountered, or until the wells are pumped effectively dry. Steady state conditions are defined as the pH measurements over

a one-minute time interval varying by less than 0.2 units, the difference in EC over the same period varying by less than 10%, and the SWL not being in drawdown.

The groundwater wells are to be sampled approximately 5-7 days following development. The wells are to be purged to achieve steady state conditions prior to sampling. Where steady state conditions cannot be achieved, the wells may be sampled whilst the SWL is in drawdown.

As a minimum, one sample is to be collected from each monitoring well and is to be analysed for heavy metals, TRH/BTEX, low level PAHs, VOCs, PFAS (trace levels) and pH and EC. The practical quantification limits (PQLs) achieve should generally correlate with the PQLs for the DSI. Should the PQLs vary significantly, a discussion on the useability of the data set will be required.

4.3 DGI Reporting Requirements

On completion of the DGI, a stand-alone report should be prepared in accordance with the Consultants Reporting Guidelines. If the remediation approach varies from this RAP, a RWP is to be prepared to detail the remediation and validation requirements.

5 REMEDIATION OPTIONS

5.1 Soil Remediation

The NSW EPA follows the hierarchy set out in NEPM 2013 for the remediation of contaminated sites. The preferred order for soil remediation and management is as follows:

1. On-site treatment of soil so that the contaminant is either destroyed or the associated hazard is reduced to an acceptable level;
2. Off-site treatment of excavated material so that the contaminant is either destroyed or the associated hazard is reduced to an acceptable level, after which the soil is returned to the site;

Or if the above are not practicable:

3. Consolidation and isolation of the soil by on-site containment within a properly designed barrier; and
4. Removal of contaminated material to an approved site or facility, followed where necessary by replacement with clean material; or
5. Where the assessment indicates that remediation would have no net environmental benefit or would have a net adverse environmental effect, implementation of an appropriate management strategy.

For simplicity herein, the above hierarchy are respectively referred to as Option 1, Option 2, Option 3 etc.

The NEPM 2013 and Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia (2009)[10] prefer the following asbestos remediation hierarchy:

1. Minimisation of public risk;
2. Minimisation of contaminated soil disturbance; and
3. Minimisation of contaminated material/soil moved to landfill.

The NSW EPA Contaminated Land Management Guidelines for the NSW Site Auditor Scheme (3rd Edition) (2017)[11] provides the following additional requirements to be taken into consideration:

- Remediation should not proceed in the event that it is likely to cause a greater adverse effect than leaving the site undisturbed; and
- Where there are large quantities of soil with low levels of contamination, alternative strategies should be considered or developed.

The table below discusses and assesses a range of soil remediation options:

[10] Western Australian (WA) Department of Health (DoH), (2009). Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia. (referred to as WA DoH 2009)

[11] NSW EPA, (2017). *Contaminated land Management, Guidelines for the NSW Site Auditor Scheme (3rd ed.).* (referred to as Site Auditor Guidelines 2017)

Table 5-1: Consideration of Soil Remediation Options

Option	Discussion	Assessment/Applicability
Option 1 **On-site treatment of contaminated soil**	On-site treatment can provide a mechanism to reuse the processed material, and in some instances, avoid the need for large scale earthworks. Treatment options are contaminant-specific and can include bio-remediation, soil washing, air sparging and soil vapour extraction, and thermal desorption. Depending on the treatment option, licences may be necessary for specific individual waste streams due to the potential for air pollution and the formation of harmful by-products during incineration processes. Licences for re-use of treated material/waste may also be required.	Potentially applicable for the contaminants of concern. However, treatment is unlikely to be viable on such a small scale and would not be the preferred option due to the extent of earthworks proposed.
Option 2 **Off-site treatment of contaminated soil**	Contaminated soils are excavated, transported to an approved/licensed treatment facility, treated to remove/stabilise the contaminants then returned to the subject site, transported to an alternative site or disposed to an approved landfill facility. This option is also contaminant-specific. The cost per tonne for transport to and from the site and for treatment is considered to be relatively high. The material would also have to be assessed in terms of suitability for reuse as part of the proposed development works under the waste and resource recovery regulatory framework.	Not feasible option for the project due to the relatively localised impacted and the extent of earthworks proposed.
Option 3 **Consolidation and isolation of impacted soil by cap and containment**	This would include capping of zinc-impacted soil in-situ, followed by placement of an appropriate barrier over the material to reduce the potential for future disturbance. The capping must be appropriate for the specific contaminants of concern (i.e. asbestos and zinc) and protection for the relevant receptors (i.e. human health and ecological). In the event that asbestos-impacted fill is retained on-site, a Long-Term Environmental Management Plan (LTEMP) will be required and will need to be publicly notified and made to be legally enforceable.	This option is the most applicable for the remediation of asbestos and/or zinc impacted fill within the tree protection zone (TPZ) in the east of the site, as it avoids disturbance of soils within the TPZ.
Option 4 **Removal of contaminated material to an appropriate facility and reinstatement with clean material**	Contaminated soils would be classified in accordance with NSW EPA guidelines for waste disposal, excavated and disposed of off-site to a licensed landfill. The material would have to meet the requirements for landfill disposal. Landfill gate fees (which may be significant) would apply in addition to transport costs.	This option is the most applicable for the remediation of the USTs/infrastructure and asbestos-impacted fill (excluding within the TPZ) as it: aligns with the construction work (i.e. bulk excavation is required in the vicinity of the UST); is technically feasible; and economically viable. This option is applicable for the remediation of asbestos impacted fill given the likely

Option	Discussion	Assessment/Applicability
		small-scale of impacted fill and the extent of development proposed at the site.
<u>Option 5</u> Implementation of management strategy	Contaminated soils would be managed in such a way to reduce risks to the receptors and monitor the conditions over time so that there is an on-going minimisation of risk. This may occur via the implementation of monitoring programs.	The ecological and human health risks around the TPZ can be managed as outlined in the RAP. In the event that asbestos-impacted fill is retained, an LTEMP will be required to outline the management strategy and monitoring programs in relation to human health risks.

5.2 Rationale for the Preferred Option for Soil Remediation

The preferred soil remediation approach for the UST, associated infrastructure including any backfill, and the asbestos impacted fill in the vicinity of BH1 and BH111 is Option 4 – Excavation and Off-site Disposal.

The preferred soil remediation approach for the zinc-impacted fill in the vicinity of BH106 and any asbestos-impacted fill within the TPZ is Option 3 – Cap and Contain. This approach was assessed in consultation with the appointed project arborist and the client.

The preferred options for remediation are considered to be appropriate on the basis that:

- Considerable earthworks (cut/fill) will be required to achieve the design levels;
- The asbestos impacts to fill are typically limited to the surficial/shallow fill soils;
- The potential hydrocarbon impacts associated with the UST and associated infrastructure are anticipated to be localised;
- The UST and associated infrastructure will be removed from site, removing a potential source of hydrocarbon impacts;
- The zinc-impacted fill is within a TPZ, and the vicinity will include surface plantings. Asbestos-impacted fill may also be present. The proposed approach avoids disturbance of the soils within the TPZ; and
- The strategies are sustainable, economically viable, commensurate with the level of risk posed by the contaminants and technically achievable to implement concurrently with the proposed development works.

6 SOIL REMEDIATION DETAILS

6.1 Roles and Responsibilities

Table 6-1: Roles and Responsibilities

Role	Responsibility
Client / Developer	HammondCare Contact: TBC The client/developer is required to appoint the project team for the remediation and must provide all investigation reports including this RAP to the project manager, remediation contractor, consent authority and any other relevant parties involved in the project.
Project Manager	To be appointed. The project manager is required to review all documents prepared for the project and manage the implementation of the procedures outlined in this RAP. The project manager is to take reasonable steps so that the remediation contractor and others have understood the RAP and will implement it in its totality. The project manager will review the RAP and other documents and will update the parties involved of any changes to the development or remediation sequence (in consultation with the validation consultant).
Remediation Contractor	To be appointed. The remediation contractor is required to review all documents prepared for the project, apply for any relevant removal licences or permits and implement the remediation requirements outlined in this RAP. The remediation contractor may also be the construction contractor. The remediation contractor is required to collect all necessary documentation associated with the remediation activities and forward this documentation onto the client, project manager and validation consultant as they become available. The remediation contractor is required to advise the validation consultant at key points in the remediation and validation program, and implement various aspects of the validation plan assigned to them.
Validation Consultant	To be appointed. The validation consultant[12] provides consulting advice and validation services in relation to the remediation, and prepares the site validation report, and any other associated documentation such as the Asbestos Management Plan (AMP), Data Gap Investigation (DGI) report, RWP etc. The validation is required to review any deviation to this RAP or in the event of unexpected finds if and when encountered during the site work. It is recommended that the validation consultant has a Licensed Asbestos Assessor (LAA) on staff. The validation consultant is required to liaise with the client, project manager and remediation contractor on all matters pertaining to the site contamination, remediation and validation, carry out the required site inspections during capping, and collect validation samples for imported materials.

[12] It is recommended that the consultant be a certified practitioner (specialising in site contamination), under one of the NSW EPA endorsed certification schemes

Role	Responsibility
Site Auditor	To be appointed. The site auditor would review the information provided by the validation consultant, including (but not limited to) the site validation report. The auditor is to be engaged to review the RAP prior to commencement of the remediation. The developer, project manager and validation consultant are to consult with the auditor in the event of unexpected finds and/or deviations to the RAP.

6.2 Pre-commencement

The project team is to have a pre-commencement meeting to discuss the sequence of remediation, and the remediation and validation tasks. The site management plan for remediation works (see Section 9) should be reviewed by the project manager and remediation contractor, and appropriate steps are to be taken to ensure the adequate implementation of the plan.

6.3 Sequence of Remediation Works

JKE anticipate the following general sequence of work for the project (in the context of the remediation):

1. **Hold Point** - Preparation and implementation of an AMP for the proposed development;
2. Site establishment, demolition and removal of structures and pavement;
3. **Hold Point** - Completion of DGI and associated reports;
4. Decommissioning and removal of the USTs, backfill and associated infrastructure, followed by excavation and off-site disposal of soils associated with the tank pit and other impacted areas; and
5. Remediation of zinc impacted fill in the vicinity of BH106, AF/FA impacted fill in the vicinity of BH1 and ACM impacted fill in the vicinity of BH111. JKE note there is potential for ACM impacts to fill to be encountered across the site.

Details in relation to the above are outlined in the following subsections.

6.3.1 Asbestos Management Plan (AMP)

An AMP should be prepared for the site by a LAA and implemented for the site demolition, remediation and development works. The AMP should include the minimum PPE, WHS and other requirements outlined in the documents published by Safe Work Australia, WorkCover Authority of NSW, National Occupational Health and Safety Commission, and other relevant authorities as applicable.

6.3.2 Site Establishment and Demolition

The remediation contractor is to establish on site as required to facilitate the remediation. Consideration must be given to the work sequence and extent of remediation so that the site establishment (e.g. site sheds, fencing, access points etc) does not inhibit the remediation works.

The hazardous building materials in the existing structures should be demolished in accordance with the relevant codes and standards outlined in the JKE Hazmat report. An AMP is to be prepared prior to the

commencement of demolition (as discussed in Section 6.3.1). A clearance certificate is to be obtained from a LAA by the demolition contractor following the removal of any hazardous materials. The concrete slabs should be inspected for potential ACM post-demolition by the LAA.

All waste from the demolition is to be disposed to facilities that are licenced by the NSW EPA to accept the waste. The demolition contractor is to maintain adequate records and retain all documentation for such activities including:

- A summary register including details such as waste disposal dates, waste materials descriptions, disposal locations (i.e. facility details) and reconciliation of this information with waste disposal docket numbers;
- Waste tracking records and transport certificates (where waste is required to be tracked/transported in accordance with the regulations); and
- Disposal dockets for the waste. Legible dockets are to be provided for all waste materials so they can be reconciled with the register.

The above information is to be supplied to the validation consultant for assessment and inclusion in the site validation report.

6.3.3 Completion of DGI

The details for the DGI are outlined in Section 4 of this RAP.

6.3.4 Remediation Details - Tank Remediation

The UST and associated infrastructure (i.e. underground pipe work, vent pipes etc) are to be removed from the site in accordance with the Protection of the Environment Operations (Underground Petroleum Storage Systems) Regulation (2019)[13], Guidelines for the Implementation of the Protection of the Environment Operations (Underground Petroleum Storage Systems) Regulation 2019 (2020)[14] and the Australian Standard for The Removal and Disposal of Underground Petroleum Storage Tanks (AS4976-2008)[15]. Reference is also to be made to the UPSS Technical Note: Decommissioning, Abandonment and Removal of UPSS (2010)[16] and the UPSS Technical Note: Site Validation Reporting (2010)[17].

It is noted that various guidelines are outdated and/or are currently being updated to reflect the UPSS Regulation 2019. The remediation is to occur in accordance with the current regulation and best practice guidelines available when the remediation commences.

[13] *Protection of the Environment Operations (Underground Petroleum Storage Systems) Regulation 2019* (NSW). (referred to as UPSS Regulation 2019)
[14] NSW EPA, (2020). *Guidelines for the Implementation of the Protection of the Environment Operations (Underground Petroleum Storage Systems) Regulation 2019.* (referred to as UPSS Guidelines 2020)
[15] Standards Australia, (2008). *The Removal and Disposal of Underground Petroleum Storage Tanks.* (referred to as AS4976-2008)
[16] NSW DECCW, (2010). *UPSS Technical Note: Decommissioning, Abandonment and Removal of UPSS*
[17] NSW DECCW, (2010). *UPSS Technical Note: Site Validation Reporting*

Table 6-2: Remediation – UST and Associated Infrastructure

Step	Primary Role/ Responsibility	Procedure
1.	Remediation contractor	Address Stability Issues and Underground Services: Geotechnical advice should be sought regarding the stability of the adjacent structures and/or adjacent areas prior to commencing remediation (as required). Stability issues should be addressed to the satisfaction of a suitably qualified geotechnical engineer. This may require the installation of temporary shoring. All underground services are to be appropriately disconnected or rerouted to facilitate the works.
2.	Remediation contractor (or their nominated sub-contractor)	Initial Preparation: The pavement in the remediation area should be cut and removed with care using an excavator, or similar. An experienced contractor should be engaged for the removal of the UST. Liquid and/or sludge within the UST and associated pipe work should be pumped out and disposed of lawfully by a licensed liquid waste operator.
3.	Remediation contractor (or their nominated sub-contractor) and validation consultant	Removal of the USTs/infrastructure, impacted soils, followed by validation: The UST and associated infrastructure are to be removed by an appropriately licensed contractor in accordance with AS4976-2008 and with regards to the Work Health and Safety Regulation (2017)[18]. Following removal, remediation of the area will be undertaken as follows: • The backfill soils (most likely to be sandy fill) surrounding the UST should be excavated and stockpiled separately (all stockpiles should be placed on the adjacent hardstand with appropriate silt control). This material is to be validated by the validation consultant (for waste classification purposes) as outlined in Section 7.1; • Submit an application to dispose of the backfill soil (in accordance with the assigned waste classification) to a facility that is appropriately licensed to receive the waste, and obtain authorisation to dispose; • Load the backfill soil onto trucks and dispose in accordance with the assigned waste classification; • Depending on the contamination status of the backfill, excavation of additional material at the base and walls of the tank pits may be required. This should initially involve excavation of material to extend the pits (say 0.5m initially) in the direction of the suspected impact. The validation consultant should be present during the excavation to provide advice on the potential extent of contamination based on visual and olfactory indicators, and PID screening results; • Stockpile the excavated material separately (to the backfill that was initially excavated) and undertake a waste classification outlined above, then load the soil onto trucks and dispose in accordance with the assigned waste classification; • The validation consultant is to obtain validation samples from the walls and base of the excavation (see the Validation Plan in Section 7); and • Subject to successful validation, backfill or isolate the remedial excavation. All documents including landfill disposal dockets, UST disposal/destruction dockets, liquid waste disposal etc. should be retained by the remediation contractor and forwarded to the client and validation consultant. This documentation forms a key part of the validation process and is to be included in the validation report.
4.	Validation consultant	Validation sampling of the tank pit, waste classification sampling of stockpiled backfill and any groundwater seepage as outlined in Section 7.

[18] *Work Health and Safety Regulation 2017* (NSW). (Referred to as WHS regulation 2017)

Step	Primary Role/ Responsibility	Procedure
		Review of documentation issued by the remediation contractor and inclusion into validation report.

The detailed validation plan relevant to the above items is provided in Section 7.

6.3.5 Remediation Details - Excavation and Disposal of Contaminated Fill

The procedure for excavation of asbestos contaminated fill soil is outlined below:

Table 6-3: Remediation Details – Excavation and disposal of asbestos contaminated fill

Step	Primary Role/ Responsibility	Procedure
1.	Remediation contractor	Personal Protective Equipment (PPE) and Work Health and Safety (WHS): Check the AMP for PPE, asbestos air monitoring and WHS requirements prior to commencement of remediation works.
2.	Remediation contractor	Preparation of Excavation Area: The extent of the area (or areas) to be excavated for off-site disposal should be clearly delineated on-site using pegs/star pickets or other appropriate means. It is noted that there are TPZs on-site. Excavation of soils within the TPZs is not permitted. The extent of the TPZs must be considered in preparation of the excavation areas. The project geotechnical engineer is to be engaged by the client or the remediation contractor to provide advice relating to temporary shoring, earthworks and battering requirements etc to facilitate the scope of fill removal required for remediation.
3.	Remediation contractor	Removal of contaminated fill: Excavation of the remediation area will be undertaken as follows: • Engage a SafeWork NSW Class A licensed asbestos contractor to provide supervision during remediation works; • Submit an application to dispose the fill (in accordance with the assigned waste classification to be confirmed via the DGI process) to a landfill licensed by the NSW EPA to receive the waste and obtain authorisation to dispose. Noting the presence of asbestos in the waste stream where applicable, making the material Special Waste for off-site disposal; • Register with the NSW EPA WasteLocate tracking system to comply with the legislation in regards to transporting/movement of asbestos waste; • A water system will need to be in place to spray the excavated soil during excavation/ remediation works and to decontaminate trucks entering the work area. The general site area should be kept damp during remediation works to minimise the generation of dust; • Asbestos related controls including air monitoring for asbestos removal works are to be implemented as per the AMP; • The remediation area must be excavated to the base of the fill and down to the surface of the underlying natural soil. The works should be done in the most efficient manner that minimises cross contamination. We note that the natural soil levels may vary across the site and provisions will need to be made for careful, detailed excavation and removal of all fill. Even minor amount of fill, if

Step	Primary Role/ Responsibility	Procedure
		left present at the base of the remedial excavation (i.e. at the interface with the natural soil), will result in validation failure and the need for further excavation; • Load the fill onto trucks and dispose in accordance with the assigned waste classification. The receiving landfill facility should be contacted prior to disposal and should be licensed to accept the waste stream; • The occurrence of unexpected finds (staining/odours, asbestos in areas where not anticipated etc) during the soil removal are to be documented and addressed with regards to Section 8; • If any backfilling/reinstatement is required, this is to occur using clean/validated materials. Preferably the backfill would be sourced from on-site if site-won material is assessed to be suitable for re-use. However, if materials are imported for this purpose, the imported materials must be validated in accordance with the Validation Plan in Section 7; and • All documents including landfill disposal dockets must be retained by the remediation contractor and forwarded to the client and validation consultant. This documentation forms a key part of the validation process and is to be included in the validation report.
4.	Validation consultant	<u>Validation of Excavation Base and walls:</u> • Once all fill is removed, the base and walls of the excavation must be validated (by the validation consultant) in accordance with Section 7; • If the validation fails, the contaminated area must be chased out until the validation is successful; and • If the validation is successful, the excavation can be reinstated/backfilled as noted above (in accordance with the project geotechnical requirements), using clean/validated material. In the event that validation fails at the extent of the TPZ (i.e. asbestos is detected at the TPZ boundary), the asbestos-impacted fill is to be managed in accordance with the cap and contain strategy outlined in Section 6.3.6.

6.3.6 Remediation Details – Tree Protection Zone (TPZ) and BH106 Area

Excavation and/or disturbance of soils within the TPZs is not permitted without the approval of the appointed arborist. Contaminated soils will require capping and management in-situ. The appointed arborist is to be consulted regarding the plant types and their long-term health associated with planting in fill impacted by zinc.

The capping specification has been established in consultation with the appointed arborist. Any alterations to the capping specification must be confirmed with the appointed arborist and validation consultant. The capping specification is outlined in the following table:

Table 6-4: Capping Specification

Area	Capping Specification^
TPZs - existing trees being retained	Installation of >150mm of clean imported organic topsoil. The imported organic topsoil should be: • Hills Bark Blower Organic Garden Mix; or • Benedict Organic Garden Mix (M13); or

Area	Capping Specification^
	• An approved equivalent manufactured garden soil with a maximum 20% organic matter by volume. Consideration is also to be given to constructing a raised bed around the trees using garden edging in order to maintain the >150mm clean cover.
TPZs – Existing trees being retained (if asbestos is present)	Installation of: • Mesh geogrid overlapped by >1,000mm across the contaminated fill, installed to within 0.5m of the tree base; and • Installation of >150mm of clean imported organic topsoil. The imported organic topsoil should be: o Hills Bark Blower Organic Garden Mix; or o Benedict Organic Garden Mix (M13); or o An approved equivalent manufactured garden soil with a maximum 20% organic matter by volume.

^ The capping specification relates to the remediation only and has not considered engineering design requirements for the site.

The remediation steps for capping the site are provided below. The detailed validation plan relevant to this aspect of the remediation is provided in Section 7.

Table 6-5: Remediation – Areas to be Capped

Step	Primary Role/ Responsibility	Procedure
1.	Remediation contractor (or the nominated construction contractor)	Survey of site levels: A pre-capping levels survey is to be completed by the relevant contractor. This should occur before the installation of any overlying capping layers. The purpose of the survey is to provide a record of the site levels across the top of the asbestos and/or zinc-impacted fill. It is recommended that the survey points are recorded with a spacing of not more than 10m between adjacent points. Additional survey points will be required in the vicinity of changes in surface slope and for specific features. A post-capping levels survey is to be completed by the relevant contractor. This should occur after the installation of all overlying capping layers, and the survey points should generally align with the pre-capping survey points. The purpose of the survey is to provide a record of the thickness of the capping layers installed above the asbestos and/or zinc-impacted fill.
2.	Remediation contractor (or the nominated construction contractor) Validation consultant	Capping: The cap is to be constructed in accordance with the capping specification. Any variations to the specifications should be reviewed and approved by the appointed arborist and validation consultant. Any imported materials used are to be validated by the validation consultant in accordance with Section 7. The validation consultant is required to inspect the capping works and imported materials in accordance with the validation plan.
3.	Project Manager/Client	Long Term Management: Regular/routine (i.e. quarterly) inspections for indications of plant stress/dieback and visual inspection of the topsoil (for signs of erosion, settlement) are to be undertaken by the facilities maintenance staff. In the event that indications of plant

Step	Primary Role/ Responsibility	Procedure
		stress/dieback, the validation consultant and appointed arborist are to be consulted. The level of topsoil is to be maintained. Any additional topsoil required is to meet the capping specification. Any deviation is to be discussed and approved with the appointed arborist prior to importation of the alternative topsoil.

6.4 Remediation Documentation

The remediation contractor must retain all documentation associated with the remediation, including but not limited to:

- Waste disposal documentation, including waste classification documentation and tank destruction certificate;
- Waste tracking documentation (see additional details below in Section 6.4.1 and appendices);
- Asbestos management documentation, including all relevant notifications, licences, clearance certificates and air monitoring reports (additional details In this regard are to be outlined in the AMP);
- Imported materials information (see additional details below in Section 6.4.2 and appendices);
- Survey of top of zinc-contaminated fill;
- Survey of top of capping layer; and
- Photographs of remediation works.

Copies of these documents must be forwarded to the validation consultant for inclusion in the validation report.

6.4.1 Waste

All waste removed from the site is to be appropriately tracked and managed in accordance with the relevant regulations. The remediation contractor (and/or their nominated construction contractor) is to maintain adequate records and retain all documentation for waste disposal activities including:

- A summary register including details such as waste disposal dates, waste materials descriptions, disposal locations (i.e. facility details, including applicable NSW Environmental Protection Licence) and reconciliation of this information with waste disposal docket numbers; and
- Waste tracking records and transport certificates (where waste is required to be tracked/transported in accordance with the regulations); and
- Disposal dockets for the waste.

Any soil waste classification documentation is to be prepared in accordance with the reporting requirements specified by the NSW EPA. Reports are to include:

- The full name, address, Australian Company Number (ACN) or Australian Business Number (ABN) of the organisation and person(s) providing the waste classification;
- Location of the site where the waste was generated, including the source site address;
- History of the material and the processes and activities that have taken place to produce the waste;

- Potential contaminating activities that may have occurred at the site where the waste was generated;
- Description of the waste, including photographs, visible signs of contamination, such as discolouration, staining, odours, etc;
- Quantity of the waste;
- Number of samples collected and analysed;
- Sampling method including pattern, depth, locations, sampling devices, procedures, and photos of the sample locations and samples;
- Contaminants tested;
- Laboratory documentation – chain-of-custody (COC), sample receipt, laboratory report;
- All results regardless of whether they are not used in the classification process;
- Results of sample mean, sample standard deviation and the 95% upper confidence limit (UCL) where relevant;
- Brief summary of findings including discussion of results; and
- A clear statement of the classification of the waste as at the time of the report.

Copies of the documents must be forwarded to the validation consultant on completion of the remediation for inclusion in the validation report.

6.4.2 Imported Materials

The remediation contractor (and/or their nominated construction contractor) is to maintain, for the duration of the project, an imported material register. This must include a register (in Microsoft Excel format) with details of each imported material type, supplier details, summary record of where the imported materials were placed on site, and importation docket numbers and a tally of quantities (separated for each import stream). Dockets for imported materials are to be provided electronically so these can be reconciled with the register.

The above information is to be provided to the validation consultant for inclusion in the validation report. It is recommended that the register be set up at the beginning of the project and provided to the validation consultant regularly so the details can be checked and any rectification of the record keeping process can occur in a timely manner.

7 VALIDATION PLAN

Validation is necessary to demonstrate that remedial measures described in the RAP have been successful and that the site is suitable for the intended land use. The sampling program for the validation is outlined in Section 7.1. This is the minimum requirement based on the remedial strategies provided. Additional validation sampling may be required based on observations made during remediation or in the event of an unexpected find.

7.1 Validation Sampling and Documentation – Soil Media

The table below outlines the validation requirements for the site:

Table 7-1: Validation Requirements for Soil Media

Aspect	Sampling	Analysis	Observations and Documentation
Capping of Asbestos and/or Zinc-Impacted Fill			
Survey of site levels.	NA	NA	Remediation contractor to obtain the pre- and post- capping surveys as required in Section 6.3.6.
Inspections.	NA	NA	Validation consultant to carry out inspections to document the installation of the capping layer. Key hold points for inspections include: - Pre-capping survey inspection; - Geogrid marker inspection (if required); - During importation of materials used to construct the capping layer; and - Finished surface levels. A photographic record is to be maintained by the remediation contractor and validation consultant.
Validation of imported materials.	As indicated below.	As indicated below.	As indicated below.
Excavation and Off-site Disposal of Asbestos Contaminated Fill			
Validation following removal of **ACM and/or AF/FA** contaminated fill (see Figure 5 attached the appendices).	One sample per 25m^2 of the base of the excavation (i.e. 5m x 5m grid), with additional samples targeting any additional areas identified during the inspection where fill removal does not appear adequate.	Bulk (10L) field screening for ACM, asbestos (500ml) and no visible ACM observed within walls or the base of the remedial excavation.	Observations to be recorded to confirm fill removal is acceptable. Photographs to be taken. Air monitoring results to be reviewed. Disposal dockets to be retained and forwarded to validation consultant for inclusion in the validation report.

Aspect	Sampling	Analysis	Observations and Documentation
	Any exposed soil at the excavation walls should be sampled every 5m lineal and every fill profile or no greater than 0.5m vertically.		LAA to provide surface clearance certificate for visible asbestos to cover the base and walls of excavation.
UST, Associated Infrastructure and Impacted Soils			
UST backfill	One sample per 25m^3, collected using hand equipment.	Heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc), TRHs, BTEX, PAHs, OCP/OPPs, PCBs and asbestos (500mL). TCLP testing may be required for waste classification.	Samples to be screened using photo-ionisation detection (PID) meter. Observations of staining and odour to be recorded. Photographs to be taken. Disposal dockets to be retained.
UST pit chase out spoil (if required)	One sample per 25m^3, collected using hand equipment.	As above. Other analytes to be considered based on remediation failures.	As above.
UST pit – excavation base UST pit – excavation walls	Minimum of two samples per UST to be collected using the excavator after removal of the tank. One sample per excavation wall and per vertical metre. Additional sampling is also to target obvious indicators of contamination and changes in soil profile.	Lead, TRH/BTEXN	Samples to be screened using PID. Observations of staining and odour to be recorded. Photographs to be taken.
Pipe trenches	One sample per 5m lineal, obtained from the base of the trench. Additional samples to target any areas of staining or odours.	As above.	As above.

Aspect	Sampling	Analysis	Observations and Documentation
Imported Materials – validation of imported materials is required for any materials imported onto the site during the remediation and to the point in time that the site validation report is prepared (e.g. general fill to raise the site levels or reinstate remedial excavations, imported materials to create piling platform, gravels for site preparation, material used for capping layers etc).			
Imported VENM backfill (if required)	Minimum of three samples per 75m^3 (per source).	Heavy metals (as above), TRHs, BTEX, PAHs, OCP/OPPs, PCBs and asbestos (500ml). Additional analysis may be required depending on the site history of the source property.	**Remediation contractor** to supply existing VENM documentation/report (report to be prepared in accordance with the NSW EPA waste classification reporting requirements). A hold point remains until the **validation consultant** approves the material for importation or advises on the next steps.
Imported garden mix/topsoil and mulches	Minimum of three samples per 75m^3 (per source/material type).	Analysis for CoPC outlined above.	Material is to be inspected upon importation by the **validation consultant** and samples obtained for analysis. Material to be inspected during sampling to confirm it is free of visible/olfactory indicators of contamination and is consistent with documentation. Photographic documentation and an inspection log are to be maintained. Where check sampling occurs by the **validation consultant** due to deficiencies or irregularities in existing VENM documentation, the following is required: - Date of sampling and description of material sampled; - An estimate of the volume of material imported at the time of sampling; - Sample location plan; and - Analytical reports and tabulated results with comparison to the Validation Assessment Criteria (VAC).
Imported engineering materials such as recycled aggregate, road base etc or Excavated Natural Material (ENM)	Minimum of three samples per 75m^3 (per source/material type). Additional testing may be required for ENM to meet the specification within the ENM Order.	Heavy metals (as above), TRHs, BTEX, PAHs, OCPs, PCBs and asbestos (500ml quantification). Additional testing may be required for ENM (e.g. foreign materials, pH and electrical conductivity) depending on available documentation.	**Remediation contractor** to provide product specification and documentation to confirm the material has been classified with reference to a relevant Resource Recovery Order/Exemption. A hold point remains until the **validation consultant** approves the material for importation or advises on the next steps. Review of the facility's Environment Protection Licence (EPL). Material is to be inspected by the **validation consultant** upon importation to confirm it is free of visible/olfactory

Aspect	Sampling	Analysis	Observations and Documentation
			indicators of contamination and is consistent with documentation. Where check sampling occurs by the **validation consultant** due to deficiencies or irregularities in existing documentation, the following is required: - Date of sampling and description of material sampled; - An estimate of the volume of material imported at the time of sampling; - Sample location plan; and - Analytical reports and tabulated results with comparison to the VAC.
Imported engineering materials comprising only natural quarried products.	At the validation consultant's discretion based on robustness of supplier documentation. As a guide minimum of 3 samples per 75m^3 (per source/material type).	At the validation consultant's discretion based on robustness of supplier documentation.	**Remediation contractor** to provide documentation from the supplier confirming the material is a product comprising only VENM (i.e. natural quarried product). A hold point remains until the **validation consultant** approves the material for importation or advises on the next steps. Review of the quarry's EPL. Material is to be inspected by the **validation consultant** upon importation to confirm it is free of anthropogenic materials, visible and olfactory indicators of contamination, and is consistent with documentation. Where check sampling occurs by the **validation consultant** due to deficiencies or irregularities in existing documentation, the following is required: - Date of sampling and description of material sampled; - An estimate of the volume of material imported at the time of sampling; - Sample location plan; and - Analytical reports and tabulated results with comparison to the VAC.

7.2 Validation Assessment Criteria and Data Assessment

The VAC to be adopted for the validation assessment are outlined in the table below:

Table 7-2: VAC

Validation Aspect	VAC
Soil validation	<u>Vicinity of BH1 and BH111 impacted by asbestos:</u> • Analytical results for ACM <0.02%w/w, based on the HSL-B criterion presented in the NEPM 2013; • Analytical results for AF/FA <0.001%w/w, based on the HSL-B criterion presented in the NEPM 2013; and • No visible FCF at the site surface. <u>UST/infrastructure:</u> • TRH/BTEX = HSLs for low/high density residential land use, assuming a depth interval of 0-1m and a 'sand' type soil; • Lead = 1,200mg/kg (based on HIL for 'residential with minimal opportunities for soil access' exposure scenario); and • Free of staining and odours. The presence of odours or exceedances of the VAC may compromise the VENM classification. However, from a risk perspective in the context of the proposed land use, such traces are unlikely to result in an unacceptable risk to future site users. In the event that persistent traces of TRH/BTEXN are reported above the VAC, these concentrations can be assessed in the context of human health risks, in accordance with Schedule B1 of NEPM (2013) and an alternative classification (other than VENM) would need to be pursued for this material if it is to be disposed off-site.
Waste classification (backfill/chase out soils associated with remediation of USTs, and supplementary waste classification of fill	In accordance with the procedures and criteria outlined in Part 1 of the Waste Classification Guidelines 2014 and any other exemptions/approvals as required.
Validation of capping layer	Validation of the capping will occur via a review of survey information and the inspection process. The validation report is to include cross-sections documenting the completed capping details for the landscaped area.
Imported materials	Material imported as general fill must only be VENM or ENM. VENM is defined in the POEO Act 1997 as material: • That has been excavated or quarried from areas that are not contaminated with manufactured chemicals, or with process residues, as a result of industrial, commercial mining or agricultural activities; • That does not contain sulfidic ores or other waste; and • Includes excavated natural material that meets such criteria for virgin excavated natural material as may be approved from time to time by a notice published in the NSW Government Gazette. ENM and recycled materials are to meet the criteria of the relevant exemption/order under which they are produced. Analytical results for VENM and other imported materials will need to be consistent with expectations for those materials. For VENM, it is expected that: - Heavy metal concentrations are to be less than the most conservative Added Contaminant Limit (ACL) concentrations for an urban residential and public open space (URPOS) exposure setting presented in Schedule B1 of the NEPM 2013; and - Organic compounds are to be less than the laboratory PQLs and asbestos to be absent.

Validation Aspect	VAC
	All materials imported onto the site must also be adequately assessed as being appropriate for the final use of the site, including ecological considerations. A risk-based assessment approach is to be adopted with regards to the tier 1 screening criteria presented in Schedule B1 of NEPM 2013. Aesthetics: all imported materials are to be free of staining and odours.

Data should initially be assessed as above or below the VAC. Statistical analysis may be applied if deemed appropriate by the validation consultant and undertaken in accordance with the NEPM 2013.

7.3 Validation Report and LTEMP

As part of the validation process a site validation report will be prepared on completion of remediation and validation by the validation consultant. The report will outline the remediation work undertaken at the site and any deviations to the remediation strategy. The report will present the results of the validation assessment and will be prepared in accordance with the Reporting Guidelines.

The validation report should draw conclusions regarding the success of the remediation/validation and the suitability of the site for the proposed development (from a contamination viewpoint).

In the event that asbestos-impacted fill is retained on-site, an LTEMP will be required to manage the contamination and the LTEMP will be documented as part of the overall validation process. Public notification and enforcement mechanisms for the LTEMP are to be arranged and consultation with the consent authority will be required prior to finalisation of the document.

The LTEMP will include requirements for passive management of the capping system that will focus on maintaining the capping layers to minimise the potential of exposure to the underlying fill. The LTEMP will also include contingencies for managing intrusive works in the event that the capping system is breached.

7.4 Validation Sampling, Analysis and Quality Plan (SAQP)

Data Quality Objectives (DQOs) and Data Quality Indicators (DQIs) must be clearly outlined and assessed as part of the validation process. A framework for the DQO and DQI process is outlined below and should be reflected in the validation report. DQOs should be established for the validation with regards to the seven-step process outlined in the NEPM (2013). The seven steps include the following:

- State the problem;
- Identify the decisions/goal of the study;
- Identify information inputs;
- Define the study boundary;
- Develop the analytical approach/decision rule;
- Specify the performance/acceptance criteria; and
- Optimise the design for obtaining the data.

DQIs are to be assessed based on field and laboratory considerations for precision, accuracy, representativeness, completeness and comparability.

7.4.1 Step 1 - State the Problem

Validation data is required to demonstrate that the remediation is successful and that the site is suitable for the proposed land use described in Section 1.1.

7.4.2 Step 2 - Identify the Decisions of the Study

The remediation goal, aims and objectives are defined in Section 1.2. The decisions to be made reflect these objectives and are as follows:

- Was the remediation undertaken in accordance with the RAP?
- If there were any deviations, what were these and how do they impact the outcome of the validation?
- Are any of the validation results above the VAC?
- Is the site suitable for the proposed development from a contamination viewpoint?

7.4.3 Step 3 - Identify Information Inputs

The primary information inputs required to address the decisions outlined in Step 2 include the following:

- Existing relevant data from previous reports;
- Site information, including site observations and inspections;
- Validation sampling of soil following fill removal, and of imported materials;
- Laboratory analysis of soils; and
- Field and laboratory QA/QC data.

7.4.4 Step 4 - Define the Study Boundary

The remediation and validation will be confined to the site boundaries as shown in Figure 2 in the appendices. The vertical extent will be established based on the DGI and the validation data, however is likely to be to the approximate depth of fill. The horizontal extent will be guided by the DGI and validation process.

7.4.5 Step 5 - Develop an Analytical Approach (or Decision Rule)

7.4.5.1 VAC

The validation data will be collected and assessed in accordance with Sections 7.1 and 7.2. The following decision rules will apply:

- If all concentrations of the contaminants of concern are below the VAC, then the data will be compared directly to the VAC without statistical analysis; and
- If the concentration of a contaminant of concern exceeds the VAC (except for asbestos), then statistical analysis will be undertaken. This will include calculation of the 95% upper confidence limit (UCL) value for the data set, with regards to the NEPM (2013) framework and other relevant guidelines made under

the CLM Act 1997. The UCL will be considered acceptable where the UCL is below the VAC, the standard deviation of the data is less than 50% of the VAC and none of the individual concentrations are more than 250% of the VAC.

Asbestos data will be assessed directly against the VAC. Statistical analysis is not proposed for asbestos data.

7.4.5.2 Field and Laboratory QA/QC

Appropriate QA/QC samples must be obtained during the validation (where applicable) and analysed for the contaminants of concern. As a minimum, QA/QC sampling must include duplicates (5% inter-laboratory and 5% intra-laboratory (with the exception of asbestos)), and one trip blank and one rinsate sample per batch. The contaminants of concern for validating remedial excavations are not volatile and therefore trips spikes are not proposed. One trip spike per sample batch is required when sampling imported materials.

DQIs for field and laboratory QA/QC samples are defined below:

Field Duplicates

Acceptable targets for precision of field duplicates will be 30% or less, consistent with NEPM (2013). RPD failures will be considered qualitatively on a case-by-case basis taking into account factors such as the concentrations used to calculate the RPD (i.e. RPD exceedance where concentrations are close to the PQL are typically not as significant as those where concentrations are reported at least five or 10 times the PQL), sample type, collection methods and the specific analyte where the RPD exceedance was reported.

Trip Blanks, Trip Spikes and Rinsates

Acceptable targets for trip blank and rinsate samples will be less than the PQL for organic analytes. Metals will be considered on a case-by-case basis with regards to the reference material used as the blank medium.

Acceptable targets for the trip spike samples will be 70-130% recovery.

Laboratory QA/QC

The suitability of the laboratory data will be assessed against the laboratory QA/QC criteria. These criteria are developed and implemented in accordance with the laboratory's NATA accreditation and align with the acceptable limits for QA/QC samples as outlined in NEPM (2013) and other relevant guidelines.

A summary of the typical limits is provided below:

RPDs

- Results that are <5 times the PQL, any RPD is acceptable; and
- Results >5 times the PQL, RPDs between 0-50% are acceptable.

Laboratory Control Samples (LCS) and Matrix Spikes

- 70-130% recovery acceptable for metals and inorganics; and
- 60-140% recovery acceptable for organics.

Surrogate Spikes

- 60-140% recovery acceptable for general organics.

Method Blanks

- All results less than PQL.

In the event that acceptable limits are not met by the laboratory analysis, other lines of evidence will be reviewed (e.g. field observations of samples, preservation, handling etc) and, where required, consultation with the laboratory is to be undertaken in an effort to establish the cause of the non-conformance. Where uncertainty exists, the validation consultant is to adopt the most conservative concentration reported.

7.4.5.3 Appropriateness of PQLs

The PQLs of the analytical methods are to be considered in relation to the VAC to confirm that the PQLs are less than the VAC. In cases where the PQLs are greater than the VAC, a discussion of this is to be provided.

7.4.6 Step 6 – Specify Limits on Decision Errors

To limit the potential for decision errors, a range of quality assurance processes are adopted. A quantitative assessment of the potential for false positives and false negatives in the analytical results is to be undertaken with reference to Schedule B(3) of NEPM (2013) using the data quality assurance information collected.

Decision errors can be controlled through the use of hypothesis testing. The test can be used to show either that the baseline condition is false or that there is insufficient evidence to indicate that the baseline condition is false. The null hypothesis is an assumption that is assumed to be true in the absence of contrary evidence. For the validation assessment, the null hypothesis (H_0) is that the 95% UCL for the contaminant of concern is greater than the VAC. The alternative hypothesis (H_A) is that the 95% UCL for the contaminant of concern is less than the VAC.

Potential outcomes include Type I and Type II errors as follows:

- Type I error of determining that the soil is acceptable for the proposed land use when it is not (wrongly rejects true H_0), includes an alpha (α) risk of 0.05; and
- Type II error of determining that the soil is unacceptable for the proposed land use when it is (wrongly accepts false H_0), includes beta (β) risk of 0.2.

7.4.7 Step 7 - Optimise the Design for Obtaining Data

The design is to be optimised via the collection of validation data to demonstrate the success of the key aspects of the remediation.

7.4.8 Sampling Plan

The proposed sampling plan for the validation is described in Section 7.1.

8 CONTINGENCY PLAN

A review of the proposed remediation works has indicated that the greatest risks that may affect the success of the remediation include unexpected finds. A contingency plan for the remediation is provided below:

8.1 Unexpected Finds

Residual hazards that may exist at the site would generally be expected to be detectable through visual or olfactory means. The procedure to be followed in the event of an unexpected find is presented below:

- In the event of an unexpected find, all work in the immediate vicinity should cease and the client, validation consultant and project manager should be contacted immediately;
- Temporary barricades should be erected to isolate the area from access to the public and workers;
- The client should engage the validation consultant to attend the site and assess the extent of remediation that may be required and/or adequately characterise the contamination in order to allow for remediation of the material;
- In the event additional remediation is required, the procedures outlined within this report should be adopted where appropriate. Alternatively, a RWP should be prepared. The RWP should be prepared in consultation with the project stakeholders and submitted to the consent authority (where applicable) prior to undertaking any remediation works;
- An additional sampling and analytical rationale should be established by the validation consultant and should be implemented with reference to the relevant guideline documents; and
- Appropriate validation sampling should be undertaken and the results must be included in the validation report.

This process is summarised in a flow chart attached in the appendices.

8.2 Importation Failure for VENM or other Imported Materials

Where material to be imported onto the site does not meet the importation VAC detailed in Section 7.2, the material should not be imported. Alternative material must be sourced that meets the importation requirements.

8.3 Contingency for Failure of Remediation Strategy

8.3.1 Hydrocarbon Impacted Soil Remaining On-site

In the unexpected event that 'pockets' of hydrocarbon impacted soil/bedrock cannot be excavated and disposed off-site, this material must be validated to assess its suitability to remain on-site and the potential risks posed by this soil in the context of the future land use.

In the event that the soils present a potentially unacceptable risk, there may be a need to implement a 'cap and contain' strategy (i.e. remediation Option 3) or other mitigation measures. The strategy would need to be documented in an addendum RAP and submitted to the consent authority. It is noted that this would result in a LTEMP for the site to manage the contamination.

Alternatively, a site-specific HHRA could be considered to establish whether the risks warrant long-term management via an LTEMP.

9 SITE MANAGEMENT PLAN FOR REMEDIATION WORKS

The information outlined in this section of the RAP is for the remediation work only. The client should make reference to the development consent for specific site management requirements for the overall development of the site.

9.1 Asbestos Management Plan (AMP)

An AMP is to be prepared for the site demolition works. It is anticipated that demolition and remediation will occur concurrently in some areas of the site. On this basis, the AMP is also applicable to the remediation works. The AMP is to document the asbestos-related management requirements for the stages of development. The AMP is to be implemented by the remediation contractor (and their nominated subcontractors where relevant) throughout the remediation.

9.2 Project Contacts

Emergency procedures and contact telephone numbers should be displayed in a prominent position at the site entrance gate and within the main site working areas. The available contact details are summarised in the following table:

Table 9-1: Project Contacts

Role	Company	Contact Details
Client/developer	HammondCare	-
Project Manager	To be appointed	-
Remediation Contractor	To be appointed	-
Validation Consultant	To be appointed	-
Certifier	To be appointed	-
NSW EPA	Pollution Line	131 555
NSW EPA Site Auditor	To be appointed	-
Emergency Services	Ambulance, Police, Fire	000

9.3 Security

Appropriate fencing should be installed as required to secure the site. Warning signs should be erected, which outline the personal protective equipment (PPE) required for remediation work.

9.4 Timing and Sequencing of Remediation Works

The anticipated sequence of remediation works is outlined in Section 6.3. Remediation will occur concurrently with the development works as the excavation for the development, and the built form of the development, form part of the remediation approach.

9.5 Site Soil and Water Management Plan

The remediation contractor should prepare a detailed soil and water management plan prior to the commencement of site works and this should consider the requirements of the AMP. Silt fences should be used to control the surface water runoff at all appropriate locations of the site and appropriate measures are to be implemented to manage soil/water disturbance to the satisfaction of the regulator/determining authority. Reference should be made to the consent conditions for further details.

All stockpiled materials should be placed within an erosion containment boundary with silt fences and sandbags employed to limit sediment movement. The containment area should be located away from drainage lines/low-points, gutters, stormwater pits and inlets and the site boundary. No liquid waste or runoff should be discharged to the stormwater or sewerage system without the approval of the appropriate authorities.

9.6 Noise and Vibration Control Plan

The guidelines for minimisation of noise on construction sites outlined in AS-2460 (2002)[19] should be adopted. Other measures specified in the consent conditions should also be complied with. Noise producing machinery and equipment should only be operated between the hours approved by the determining authority (refer to consent documents).

All practicable measures should be taken to reduce the generation of noise and vibration to within acceptable limits. In the event that short-term noisy operations are necessary, and where these are likely to affect residences, notifications should be provided to the relevant authorities and the residents by the project manager, specifying the expected duration of the noisy works.

9.7 Dust Control Plan

All practicable measures should be taken to reduce dust emanating from the site. Factors that contribute to dust production are:

- Wind over a cleared surface;
- Wind over stockpiled material; and
- Movement of machinery in unpaved areas.

Visible dust should not be present at the site boundary. Measures to minimise the potential for dust generation include:

[19] Australian Standard, (2002). *AS2460: Acoustics - Measurement of the Reverberation Time in Rooms.*

- Use of water sprays on unsealed or exposed soil surfaces;
- Covering of stockpiled materials and excavation faces (particularly during periods of site inactivity and/or during windy conditions) or alternatively the erection of hessian fences around stockpiled soil or large exposed areas of soil;
- Establishment of dust screens consisting of a 2m high shade cloth or similar material secured to a chain wire fence;
- Maintenance of dust control measures to keep the facilities in good operating condition;
- Stopping work during strong winds;
- Loading or unloading of dry soil as close as possible to stockpiles to prevent spreading of loose material around the development area; and
- Geofabric/geotextile could be placed over exposed soils in the event that excavation is staged.

If stockpiles are to remain on-site or soil remains exposed for a period of longer than several days, dust monitoring should be undertaken at the site. If excessive dust is generated all site activities should cease until either wind conditions are more acceptable or a revised method of excavation/remediation is developed. Reference is also to be made to the AMP in this regard.

Dust is also produced during the transfer of material to and from the site. All material should be covered during transport and should be properly disposed of on delivery. No material is to be left in an exposed, un-monitored condition.

All equipment and machinery should be brushed or washed down before leaving the site to limit dust and sediment movement off-site. In the event of prolonged rain and lack of paved areas all vehicles should be washed down prior to exit from the site, and any soil or dirt on the wheels of the vehicles removed. Water used to clean the vehicles should be collected and tested prior to appropriate disposal under the relevant waste classification guidelines.

9.8 Dewatering

Temporary dewatering may be required as part of the remediation works. Based on the information presented in the DSI, minor treatment of seepage water may be required during the development. The seepage water should be managed appropriately on site in accordance with the remediation contractor's soil and water management plan. This water should not be pumped to stormwater or sewer unless a prior application is made and this is approved by the relevant authorities.

9.9 Air Monitoring

Reference is to be made to the AMP for details regarding asbestos air fibre monitoring. Air monitoring must only be carried out by personnel registered and accredited by NATA (National Association of Testing Authorities). Filter analysis must only be carried out within a NATA certified laboratory. The monitoring results must conform to the requirements of the NOHSC Guidance note on the Membrane Filter Method for Estimating Airborne Asbestos Fibres 2nd Edition [NOHSC:3003 (2005)].

A monitoring program will be used to assess whether the control procedures being applied are satisfactory and that criteria for airborne asbestos fibre levels are not being exceeded. The following levels will be used as action criteria during the air monitoring:

- <0.01 Fibres/ml: Work procedures deemed to be successful;
- 0.01 to 0.02 Fibres/ml: Inspection of the site and review of procedures; and
- >0.02 Fibres/ml: Stop work, inspection of the site, review of procedures, clean-up, rectification works where required and notify the relevant regulator.

9.10 Odour Control Plan

All activities undertaken at the site should be completed in a manner that minimises emissions of smoke, fumes and vapour into the atmosphere and any odours arising from the works or stockpiled material should be controlled. Control measures may include:

- Maintenance of construction equipment so that exhaust emissions comply with the Clean Air Regulations issued under the POEO Act 1997;
- Demolition materials and other combustible waste should not be burnt on site;
- The spraying of a suitable proprietary product to suppress any odours that may be generated by excavated materials; and
- Use of protective covers (e.g. builder's plastic).

All practicable measures should be taken to reduce fugitive emissions emanating from the site so that associated odours do not constitute a nuisance and that the ambient air quality is not adversely impacted.

The following odour management plan should be implemented to limit the exposure of site personnel and surrounding residents to unpleasant odours:

- Excavation and stockpiling of material should be scheduled during periods with low winds if possible;
- A suitable proprietary product could be sprayed on material during excavation and following stockpiling to reduce odours (subject to an appropriate assessment of the product by the validation consultant);
- All complaints from workers and neighbours should be logged and a response provided. Work should be rescheduled as necessary to minimise odour problems;
- The site foreman should consider the following odour control measures:
  - reduce the exposed surface of the odorous materials;
  - time excavation activities to reduce off-site nuisance (particularly during strong winds); and
  - cover exposed excavation faces overnight or during periods of low excavation activity.
- If continued complaints are received, alternative odour management strategies should be considered and implemented.

9.11 Work Health and Safety (WHS) Plan

A site specific WHS plan should be prepared by the remediation contractor for all work to be undertaken at the site. The WHS plan should meet all the requirements outlined in SafeWork NSW WHS regulations.

As a minimum requirement, personnel must wear appropriate protective clothing, including long sleeve shirts, long trousers, steel cap boots and hard hats. Additional asbestos-related PPE will be required and this will be specified in the AMP. Washroom and lunchroom facilities should also be provided to allow workers to remove potential contamination from their hands and clothing prior to eating or drinking.

9.12 Waste Management

Prior to commencement of remedial works and excavation for the proposed development, the remediation contractor should develop a waste management or recycling plan to minimise the amount of waste produced by the site. Consideration should be given to re-use material wherever possible.

9.13 Incident Management Contingency

The validation consultant should be contacted if any unexpected conditions are encountered at the site. This should enable the scope of remedial/validation works to be adjusted as required. Similarly, if any incident occurs at the site, the validation consultant should be advised to assess potential impacts on contamination conditions and the remediation/validation timetable.

9.14 Hours of Operation

Hours of operation should be between those approved by the determining authority under the development approval process.

9.15 Community Consultation and Complaints

The remediation contractor should provide details for managing community consultation and complaints within their construction environment management plan (CEMP).

10 CONCLUSIONS

Previous investigations by JKE have identified asbestos impacts (in the form of ACM and AF/FA) to fill in two locations in the east and central sections of the site, zinc impacts to fill in one location in the east of the site, and TRH impacts to fill in the west of the site. The source of the impacts to fill were considered likely associated with impacted fill historically imported to the site. The source of the TRH may also be attributed to localised surficial leaks/spills. The previous investigations also identified at least one UST and associated infrastructure on-site. The investigations concluded the potential for extensive impacts from hydrocarbons associated with the UST/s and infrastructure was low. However, localised impacts may be encountered in the vicinity of the UST/s and associated infrastructure. The UST/s and infrastructure will be removed during the remediation process, and the residual risks assessed by the validation process.

The groundwater has been impacted by heavy metals and PFAS. The heavy metal impacts were considered likely a regional/background issue. The concentrations were assessed to not pose a risk to on-site receptors in the context of the proposed development.

The remediation strategy for soil includes excavation and off-site disposal of the UST, UST backfill and associated infrastructure, and asbestos-impacted fill in the vicinity of BH1 and BH111, and long-term management strategies for asbestos and/or zinc-impacted fill within the TPZ in the vicinity of BH106.

The remediation methods outlined in the RAP are assessed to be sustainable, economically viable, commensurate with the level of risk posed by the contaminants and technically achievable to implement concurrently with the proposed development works. On this basis, JKE is of the opinion that the site can be made suitable for the proposed development provided this RAP (and any addendums or revisions) and any requirements under a RWP is implemented should a RWP be prepared.

A site validation report is to be prepared on completion of remediation activities and submitted to the consent authority to demonstrate that the site is suitable for the proposed development. An LTEMP may be required in the event that asbestos-impacted fill is retained within the TPZ. The LTEMP (if required) will provide a passive management approach which would not impose major constraints on the proposed development scenario.

The RAP has met the objectives outlined in Section 1.2.

10.1 Regulatory Requirements

The regulatory requirements applicable for the remediation are discussed in the following table:

Table 10-1: Regulatory Requirement

Guideline / Legislation / Policy	Applicability
Resilience and Hazards SEPP	Due to the identified heritage items within the site, JKE is of the opinion that the remediation is classed as Category 1 remediation work. Approval is required from the consent authority for Category 1 remediation work. JKE recommend the client to clarify the remediation category with the project planner or consent authority prior to the commencement of remediation works. Prior notification to the consent authority may be required prior to the commencement of remediation work. Under Section 4.14 of Resilience and Hazards SEPP, a notice of completion of remediation work is to be given to council within 30 days of completion of the work regardless of whether the remediation is classed as Category 1 or Category 2 remediation work. The notice of completion of remediation works must be in accordance with Section 4.15 of Resilience and Hazards SEPP.
POEO Act 1997	Section 143 of the POEO Act 1997 states that if waste is transported to a place that cannot lawfully be used as a waste facility for that waste, then the transporter and owner of the waste are each guilty of an offence. The transporter and owner of the waste have a duty to ensure that the waste is disposed of in an appropriate manner. Appropriate waste tracking is required for all waste that is disposed off-site. Activities should be carried out in a manner which does not result in the pollution of waters.
POEO (Waste) Regulation 2014	Part 7 of the POEO Waste Regulation 2014 set outs the requirements for the transportation and management of asbestos waste and Clause 79 of the POEO Waste Regulation requires waste transporters to provide information to the NSW EPA regarding the movement of any load in NSW of more than 10 square meters of asbestos sheeting, or 100 kilograms of asbestos waste. To fulfil these legal obligations, asbestos waste transporters must use WasteLocate.
SafeWork NSW Code of Practice: How to manage and control asbestos in the workplace (2019)	Sites with asbestos become a 'workplace' when work is carried out there and require a register and AMP. Appropriate SafeWork NSW notification will be required for licensed (e.g. Class A) asbestos removal works or handling.

11 LIMITATIONS

The report limitations are outlined below:

- JKE accepts no responsibility for any unidentified contamination issues at the site. Any unexpected problems/subsurface features that may be encountered during development works should be inspected by an environmental consultant as soon as possible;
- Previous use of this site may have involved excavation for the foundations of buildings, services, and similar facilities. In addition, unrecorded excavation and burial of material may have occurred on the site. Backfilling of excavations could have been undertaken with potentially contaminated material that may be discovered in discrete, isolated locations across the site during construction work;
- This report has been prepared based on site conditions which existed at the time of the investigation; scope of work and limitation outlined in the JKE proposal; and terms of contract between JKE and the client (as applicable);
- The conclusions presented in this report are based on investigation of conditions at specific locations, chosen to be as representative as possible under the given circumstances, visual observations of the site and immediate surrounds and documents reviewed as described in the report;
- Subsurface soil and rock conditions encountered between investigation locations may be found to be different from those expected. Groundwater conditions may also vary, especially after climatic changes;
- The investigation and preparation of this report have been undertaken in accordance with accepted practice for environmental consultants, with reference to applicable environmental regulatory authority and industry standards, guidelines and the assessment criteria outlined in the report;
- Where information has been provided by third parties, JKE has not undertaken any verification process, except where specifically stated in the report;
- JKE has not undertaken any assessment of off-site areas that may be potential contamination sources or may have been impacted by site contamination, except where specifically stated in the report;
- JKE accept no responsibility for potentially asbestos containing materials that may exist at the site. These materials may be associated with demolition of pre-1990 constructed buildings or fill material at the site;
- JKE have not and will not make any determination regarding finances associated with the site;
- Additional investigation work may be required in the event of changes to the proposed development or land use. JKE should be contacted immediately in such circumstances;
- Material considered to be suitable from a geotechnical point of view may be unsatisfactory from a soil contamination viewpoint, and vice versa; and
- This report has been prepared for the particular project described and no responsibility is accepted for the use of any part of this report in any other context or for any other purpose.

Important Information About This Report

These notes have been prepared by JKE to assist with the assessment and interpretation of this report.

The Report is based on a Unique Set of Project Specific Factors
This report has been prepared in response to specific project requirements as stated in the JKE proposal document which may have been limited by instructions from the client. This report should be reviewed, and if necessary, revised if any of the following occur:

- The proposed land use is altered;
- The defined subject site is increased or sub-divided;
- The proposed development details including size, configuration, location, orientation of the structures or landscaped areas are modified;
- The proposed development levels are altered, eg addition of basement levels; or
- Ownership of the site changes.

JKE will not accept any responsibility whatsoever for situations where one or more of the above factors have changed since completion of the assessment. If the subject site is sold, ownership of the assessment report should be transferred by JKE to the new site owners who will be informed of the conditions and limitations under which the assessment was undertaken. No person should apply an assessment for any purpose other than that originally intended without first conferring with the consultant.

Changes in Subsurface Conditions
Subsurface conditions are influenced by natural geological and hydrogeological process and human activities. Groundwater conditions are likely to vary over time with changes in climatic conditions and human activities within the catchment (e.g. water extraction for irrigation or industrial uses, subsurface waste water disposal, construction related dewatering). Soil and groundwater contaminant concentrations may also vary over time through contaminant migration, natural attenuation of organic contaminants, ongoing contaminating activities and placement or removal of fill material. The conclusions of an assessment report may have been affected by the above factors if a significant period of time has elapsed prior to commencement of the proposed development.

This Report is based on Professional Interpretations of Factual Data
Site assessments identify actual subsurface conditions at the actual sampling locations at the time of the investigation. Data obtained from the sampling and subsequent laboratory analyses, available site history information and published regional information is interpreted by geologists, engineers or environmental scientists and opinions are drawn about the overall subsurface conditions, the nature and extent of contamination, the likely impact on the proposed development and appropriate remediation measures.

Actual conditions may differ from those inferred, because no professional, no matter how qualified, and no subsurface exploration program, no matter how comprehensive, can reveal what is hidden by earth, rock and time. The actual interface between materials may be far more gradual or abrupt than an assessment indicates. Actual conditions in areas not sampled may differ from predictions. Nothing can be done to prevent the unanticipated, but steps can be taken to help minimise the impact. For this reason, site owners should retain the services of their consultants throughout the development stage of the project, to identify variances, conduct additional tests which may be needed, and to recommend solutions to problems encountered on site.

Assessment Limitations
Although information provided by a site assessment can reduce exposure to the risk of the presence of contamination, no environmental site assessment can eliminate the risk. Even a rigorous professional assessment may not detect all contamination on a site. Contaminants may be present in areas that were not surveyed or sampled, or may migrate to areas which showed no signs of contamination when sampled. Contaminant analysis cannot possibly cover every type of contaminant which may occur; only the most likely contaminants are screened.

Misinterpretation of Site Assessments by Design Professionals

Costly problems can occur when other design professionals develop plans based on misinterpretation of an assessment report. To minimise problems associated with misinterpretations, the environmental consultant should be retained to work with appropriate professionals to explain relevant findings and to review the adequacy of plans and specifications relevant to contamination issues.

Logs Should not be Separated from the Assessment Report

Borehole and test pit logs are prepared by environmental scientists, engineers or geologists based upon interpretation of field conditions and laboratory evaluation of field samples. Logs are normally provided in our reports and these should not be re-drawn for inclusion in site remediation or other design drawings, as subtle but significant drafting errors or omissions may occur in the transfer process. Photographic reproduction can eliminate this problem, however contractors can still misinterpret the logs during bid preparation if separated from the text of the assessment. If this occurs, delays, disputes and unanticipated costs may result. In all cases it is necessary to refer to the rest of the report to obtain a proper understanding of the assessment. Please note that logs with the 'Environmental Log' header are not suitable for geotechnical purposes as they have not been peer reviewed by a Senior Geotechnical Engineer.

To reduce the likelihood of borehole and test pit log misinterpretation, the complete assessment should be available to persons or organisations involved in the project, such as contractors, for their use. Denial of such access and disclaiming responsibility for the accuracy of subsurface information does not insulate an owner from the attendant liability. It is critical that the site owner provides all available site information to persons and organisations such as contractors.

Read Responsibility Clauses Closely

Because an environmental site assessment is based extensively on judgement and opinion, it is necessarily less exact than other disciplines. This situation has resulted in wholly unwarranted claims being lodged against consultants. To help prevent this problem, model clauses have been developed for use in written transmittals. These are definitive clauses designed to indicate consultant responsibility. Their use helps all parties involved recognise individual responsibilities and formulate appropriate action. Some of these definitive clauses are likely to appear in the environmental site assessment, and you are encouraged to read them closely. Your consultant will be pleased to give full and frank answers to any questions.

Appendix A: Report Figures

AERIAL IMAGE SOURCE: MAPS.AU.NEARMAP.COM

This plan should be read in conjunction with the Environmental report.

Title: **SITE LOCATION PLAN**

Location: NERINGAH HOSPITAL, 4-12 NERINGAH AVENUE SOUTH, WAHROONGA, NSW

Project No: E35312BR

Figure No: 1

JKEnvironments

PLOT DATE: 25/07/2022 2:59:44 PM DWG FILE: K:\SC EIS \JOBS\35000\SIE35312BR WAHROONGA\CAD\E35312BR.DWG

LEGEND

	APPROXIMATE SITE BOUNDARY
	APPROXIMATE DEVELOPMENT AREA BOUNDARY
BH(Fill Depth)	BOREHOLE LOCATION, NUMBER AND DEPTH OF FILL (m) (JKE, 2022)
BH/MW(Fill Depth)	BOREHOLE AND GROUNDWATER MONITORING WELL LOCATION, NUMBER AND DEPTH OF FILL (m) (JKE, 2022)
BH(Fill Depth)	BOREHOLE LOCATION, NUMBER AND DEPTH OF FILL (m) (EIS, 2010)
	APPROXIMATE LOCATION OF SUSPECTED UNDERGROUND STORAGE TANK (UST)
	APPROXIMATE ALIGNMENT OF SEWER

AERIAL IMAGE SOURCE: MAPS.AU.NEARMAP.COM

0 6 12 18 24 30
SCALE 1:600 @A3 METRES

This plan should be read in conjunction with the Environmental report.

Title: **SAMPLE LOCATION PLAN**

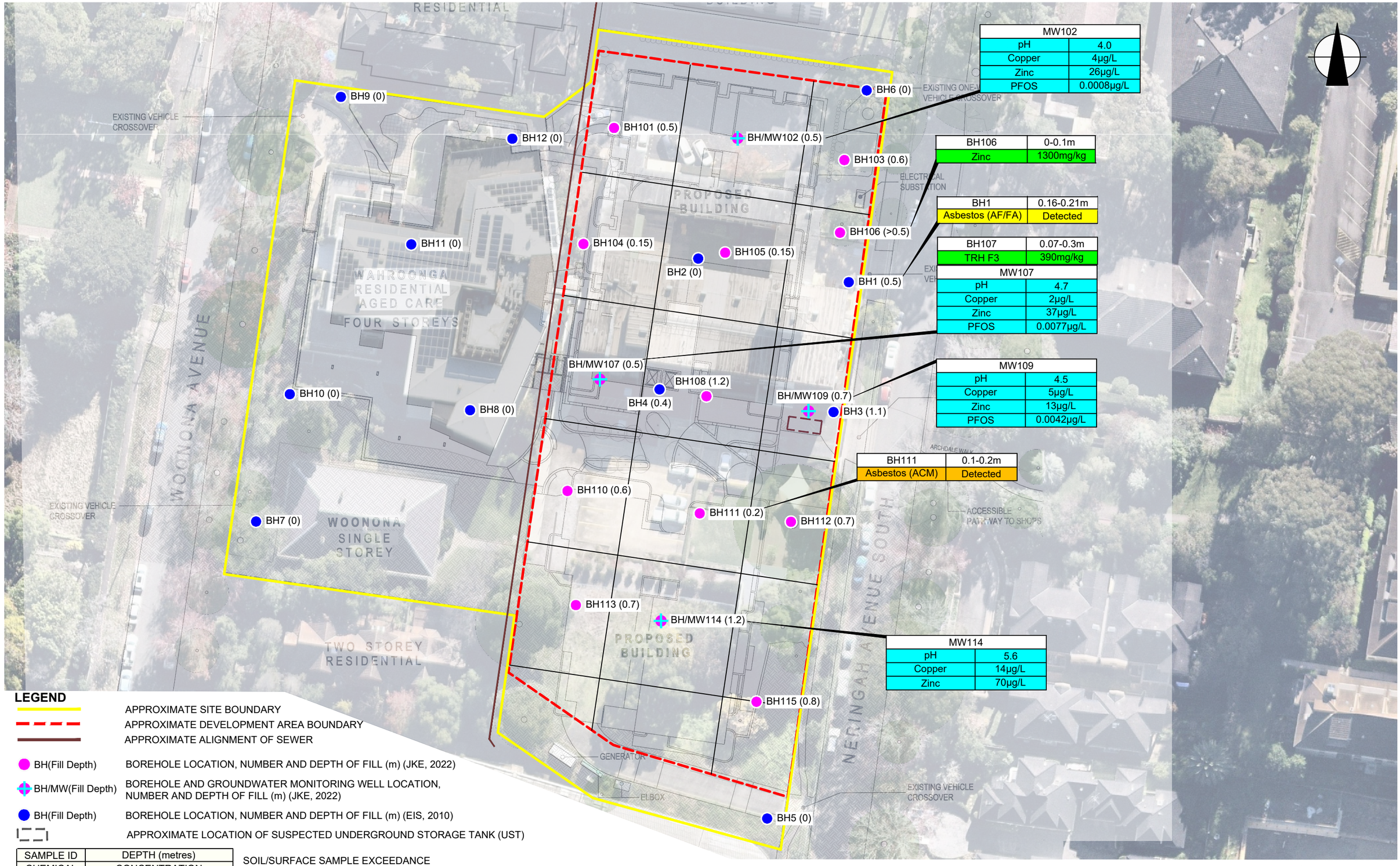
Location: NERINGAH HOSPITAL, 4-12 NERINGAH AVENUE SOUTH, WAHROONGA, NSW

Project No: E35312BR

Figure No: 2

JKEnvironments

PLOT DATE: 23/08/2022 9:02:42 AM DWG FILE: K:\5C EIS JOBS\35000'S\E35312BR WAHROONGA\CAD\E35312BR.DWG



MW102	
pH	4.0
Copper	4µg/L
Zinc	26µg/L
PFOS	0.0008µg/L

BH106	0-0.1m
Zinc	1300mg/kg

BH1	0.16-0.21m
Asbestos (AF/FA)	Detected

BH107	0.07-0.3m
TRH F3	390mg/kg

MW107	
pH	4.7
Copper	2µg/L
Zinc	37µg/L
PFOS	0.0077µg/L

MW109	
pH	4.5
Copper	5µg/L
Zinc	13µg/L
PFOS	0.0042µg/L

BH111	0.1-0.2m
Asbestos (ACM)	Detected

MW114	
pH	5.6
Copper	14µg/L
Zinc	70µg/L

LEGEND

- APPROXIMATE SITE BOUNDARY
- APPROXIMATE DEVELOPMENT AREA BOUNDARY
- APPROXIMATE ALIGNMENT OF SEWER
- BH(Fill Depth) — BOREHOLE LOCATION, NUMBER AND DEPTH OF FILL (m) (JKE, 2022)
- BH/MW(Fill Depth) — BOREHOLE AND GROUNDWATER MONITORING WELL LOCATION, NUMBER AND DEPTH OF FILL (m) (JKE, 2022)
- BH(Fill Depth) — BOREHOLE LOCATION, NUMBER AND DEPTH OF FILL (m) (EIS, 2010)
- APPROXIMATE LOCATION OF SUSPECTED UNDERGROUND STORAGE TANK (UST)

SAMPLE ID	DEPTH (metres)
CHEMICAL	CONCENTRATION

SOIL/SURFACE SAMPLE EXCEEDANCE

SAMPLE ID	-
CHEMICAL	CONCENTRATION (µg/L)

GROUNDWATER SAMPLE EXCEEDANCE

- SOIL/SURFACE CONTAMINATION ABOVE SAC FOR HUMAN HEALTH RISK
- SOIL/SURFACE CONTAMINATION ABOVE SAC FOR ECOLOGICAL RISK
- GROUNDWATER CONTAMINATION ABOVE SAC

AERIAL IMAGE SOURCE: MAPS.AU.NEARMAP.COM

0 6 12 18 24 30
SCALE 1:600 @A3 METRES

This plan should be read in conjunction with the Environmental report.

Title: **SAC EXCEEDANCE PLAN**

Location: NERINGAH HOSPITAL, 4-12 NERINGAH AVENUE SOUTH, WAHROONGA, NSW

Project No: E35312BR

Figure No: 3

JKEnvironments

PLOT DATE: 5/09/2022 9:01:41 AM DWG FILE: K:\SC EIS JOBS\35000'S\E35312BR WAHROONGA\CAD\E35312BR.DWG

LEGEND

	APPROXIMATE SITE BOUNDARY
	APPROXIMATE DEVELOPMENT AREA BOUNDARY
BH(Fill Depth)	BOREHOLE LOCATION, NUMBER AND DEPTH OF FILL (m) (JKE, 2022)
BH/MW(Fill Depth)	BOREHOLE AND GROUNDWATER MONITORING WELL LOCATION, NUMBER AND DEPTH OF FILL (m) (JKE, 2022)
BH(Fill Depth)	BOREHOLE LOCATION, NUMBER AND DEPTH OF FILL (m) (EIS, 2010)
	APPROXIMATE LOCATION OF SUSPECTED UNDERGROUND STORAGE TANK (UST)
	APPROXIMATE ALIGNMENT OF SEWER
200.5	GROUNDWATER CONTOUR INTERVALS (m)
	INFERRED GROUNDWATER FLOW DIRECTION

AERIAL IMAGE SOURCE: MAPS.AU.NEARMAP.COM

0 6 12 18 24 30

SCALE 1:600 @A3 METRES

This plan should be read in conjunction with the Environmental report.

Title: **GROUNDWATER CONTOUR PLOT**

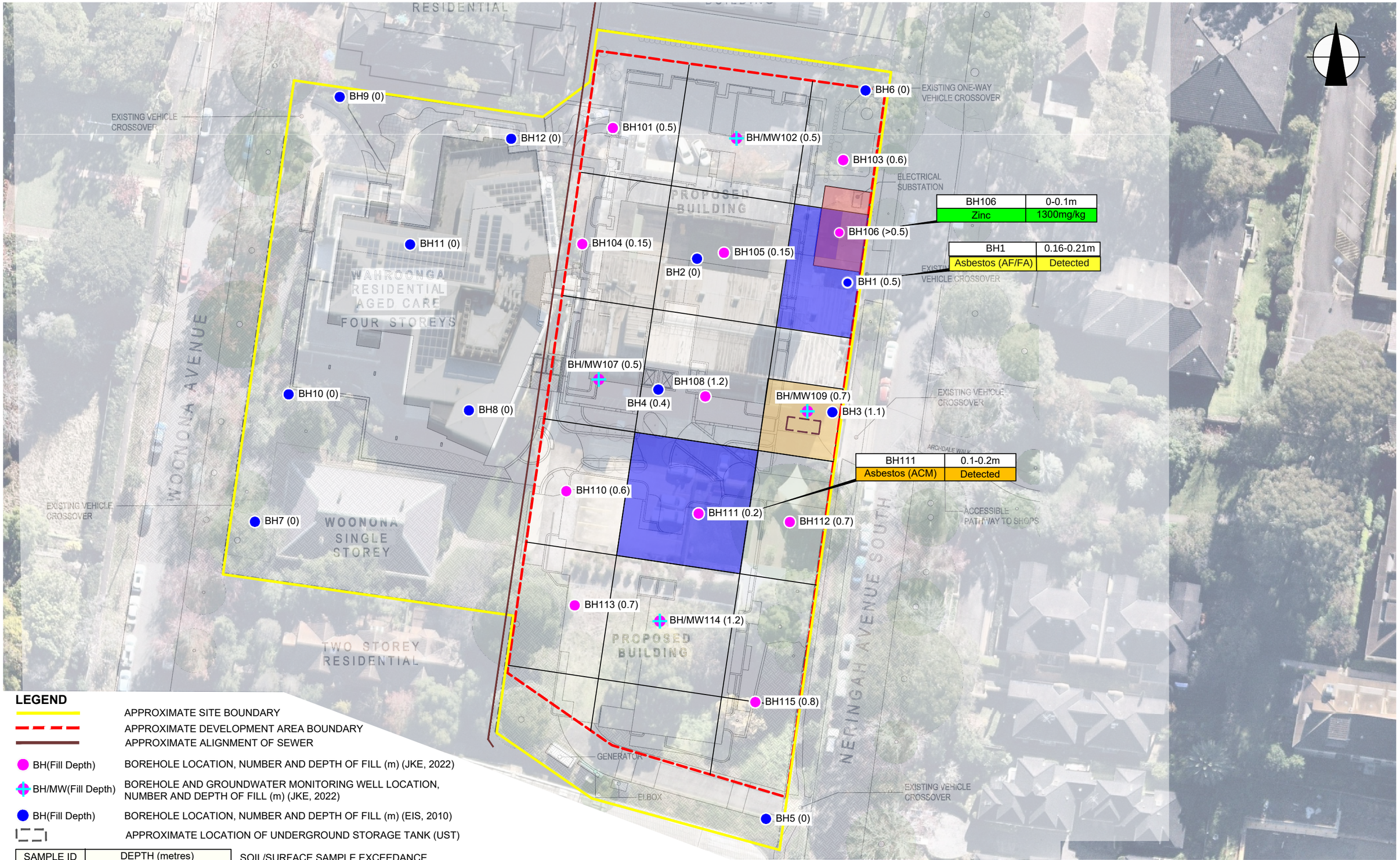
Location: NERINGAH HOSPITAL, 4-12 NERINGAH AVENUE SOUTH, WAHROONGA, NSW

Project No: E35312BR

Figure No: 4

JKEnvironments

PLOT DATE: 2/09/2022 1:56:19 PM DWG FILE: K:\SC EIS JOBS\35000'S\E35312BR WAHROONGA\CAD\E35312BR.DWG



LEGEND

- APPROXIMATE SITE BOUNDARY
- APPROXIMATE DEVELOPMENT AREA BOUNDARY
- APPROXIMATE ALIGNMENT OF SEWER
- BH(Fill Depth) — BOREHOLE LOCATION, NUMBER AND DEPTH OF FILL (m) (JKE, 2022)
- BH/MW(Fill Depth) — BOREHOLE AND GROUNDWATER MONITORING WELL LOCATION, NUMBER AND DEPTH OF FILL (m) (JKE, 2022)
- BH(Fill Depth) — BOREHOLE LOCATION, NUMBER AND DEPTH OF FILL (m) (EIS, 2010)
- APPROXIMATE LOCATION OF UNDERGROUND STORAGE TANK (UST)

SAMPLE ID	DEPTH (metres)
CHEMICAL	CONCENTRATION

SOIL/SURFACE SAMPLE EXCEEDANCE

- SOIL/SURFACE CONTAMINATION ABOVE SAC FOR HUMAN HEALTH RISK
- SOIL/SURFACE CONTAMINATION ABOVE SAC FOR ECOLOGICAL RISK
- ZINC REMEDIATION AREA
- ASBESTOS REMEDIATION AREA
- UST REMEDIATION AREA

AERIAL IMAGE SOURCE: MAPS.AU.NEARMAP.COM

0 6 12 18 24 30
SCALE 1:600 @A3 METRES

This plan should be read in conjunction with the Environmental report.

Title: **CONTAMINATION DATA AND REMEDIATION AREA PLAN**

Location: NERINGAH HOSPITAL, 4-12 NERINGAH AVENUE SOUTH, WAHROONGA, NSW

Project No: E35312BR

Figure No: 5

JKEnvironments

PLOT DATE: 8/09/2022 2:48:42 PM DWG FILE: K:\5C EIS JOBS\35000'S\E35312BR WAHROONGA\CAD\E35312BR.DWG

LEGEND

	APPROXIMATE SITE BOUNDARY
	APPROXIMATE DEVELOPMENT AREA BOUNDARY
BH	PROPOSED BOREHOLE LOCATION
BH(Fill Depth)	BOREHOLE LOCATION, NUMBER AND DEPTH OF FILL (m) (JKE, 2022)
BH/MW(Fill Depth)	BOREHOLE AND GROUNDWATER MONITORING WELL LOCATION, NUMBER AND DEPTH OF FILL (m) (JKE, 2022)
BH(Fill Depth)	BOREHOLE LOCATION, NUMBER AND DEPTH OF FILL (m) (EIS, 2010)
	APPROXIMATE LOCATION OF SUSPECTED UNDERGROUND STORAGE TANK (UST)
	APPROXIMATE ALIGNMENT OF SEWER

AERIAL IMAGE SOURCE: MAPS.AU.NEARMAP.COM

0 6 12 18 24 30

SCALE 1:600 @A3 METRES

This plan should be read in conjunction with the Environmental report.

Title: **PROPOSED DGI SAMPLE LOCATION PLAN**

Location: NERINGAH HOSPITAL, 4-12 NERINGAH AVENUE SOUTH, WAHROONGA, NSW

Project No: E35312BR

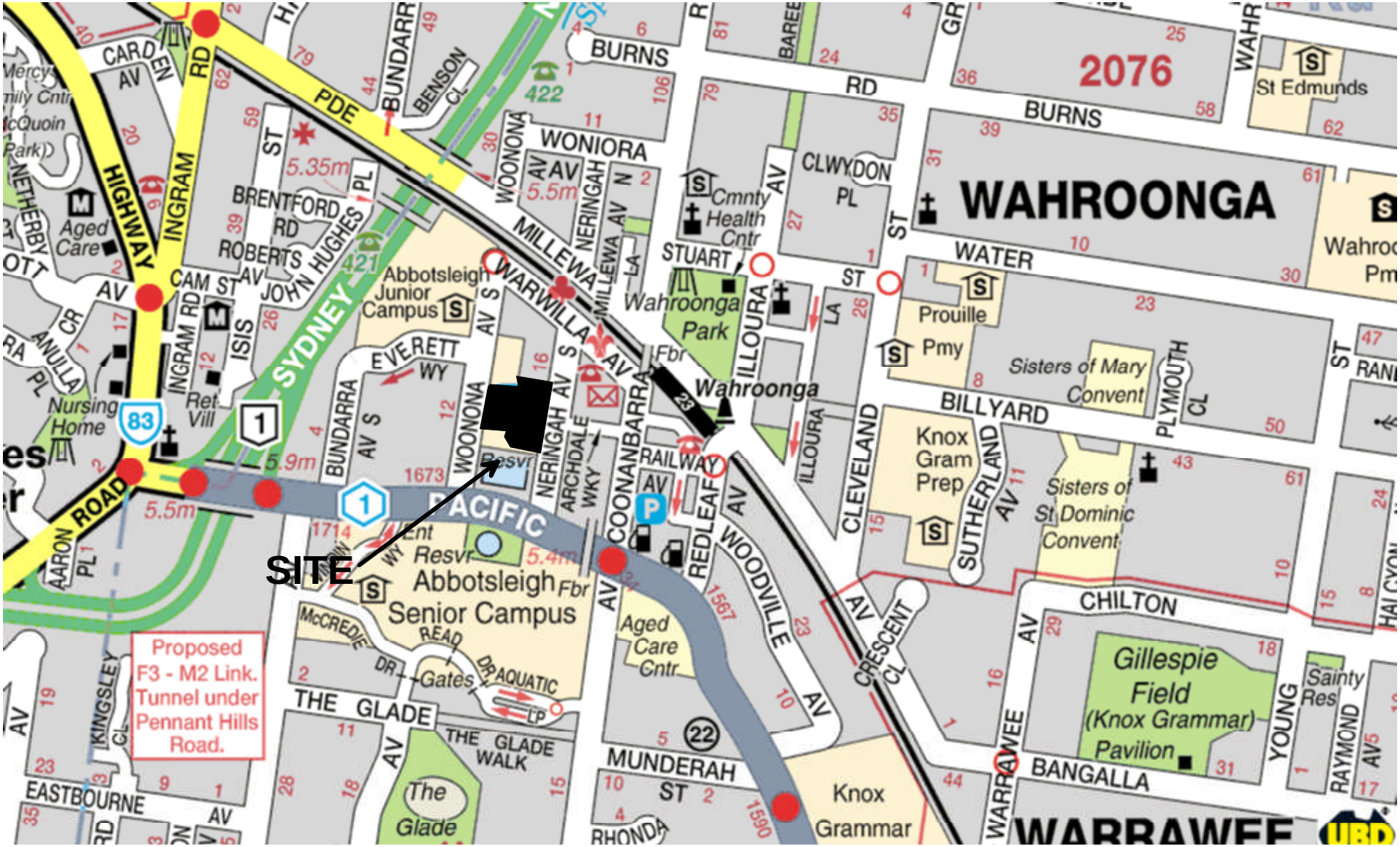
Figure No: 6

JKEnvironments

PLOT DATE: 23/08/2022 9:02:42 AM DWG FILE: K:\5C EIS JOBS\35000'S\E35312BR WAHROONGA\CAD\E35312BR.DWG

Appendix B: Site Information

EIS Report Figures



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Map Ref: 153 N7 (not to scale)

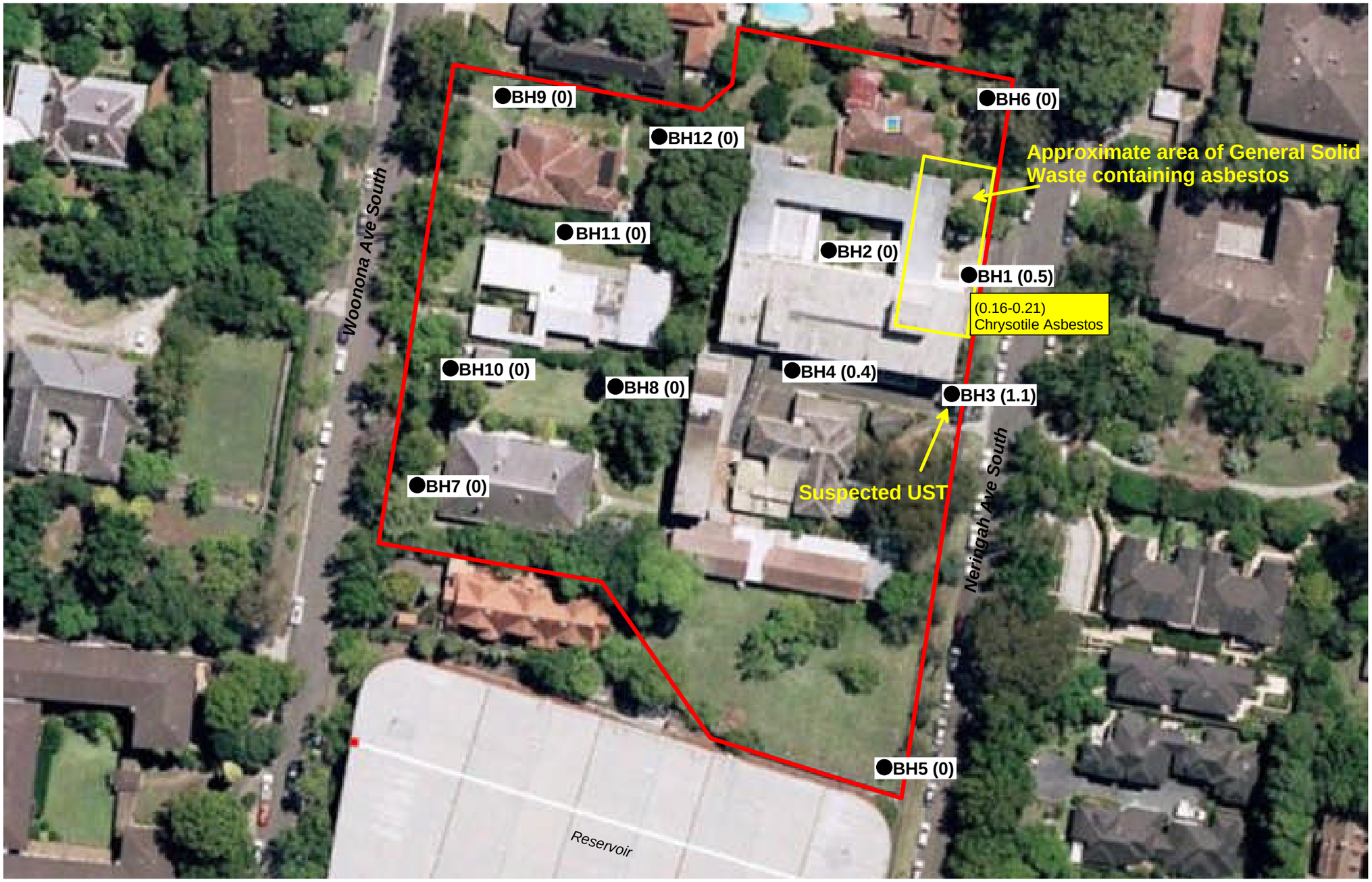
SITE LOCATION PLAN

Neringah Hospital, 3-9 Woonona Avenue South and 2-12 Neringah Avenue South , Wahroonga, NSW

Job No: E24031Krpt
Figure: 1

ENVIRONMENTAL INVESTIGATION SERVICES

Note: Reference should be made to the text for a full understanding of this plan



LEGEND:

● **BH1 (0.7)** **BOREHOLE LOCATION, NUMBER AND DEPTH OF FILL (m)**

APPROXIMATE SITE BOUNDARY

(0.16-0.21)
Chrysotile Asbestos **SAMPLE DEPTH (m) CONTAMINANT**

Approximate Scale (m)

0 7.5 15 22.5 30 37.5

Note: Reference should be made to the text for a full understanding of this plan

BOREHOLE LOCATION PLAN AND SOIL CONTAMINATION DATA

Neringah Hospital, 3-9 Woonona Avenue South and 2-12 Neringah Avenue South , Wahroonga, NSW

EIS

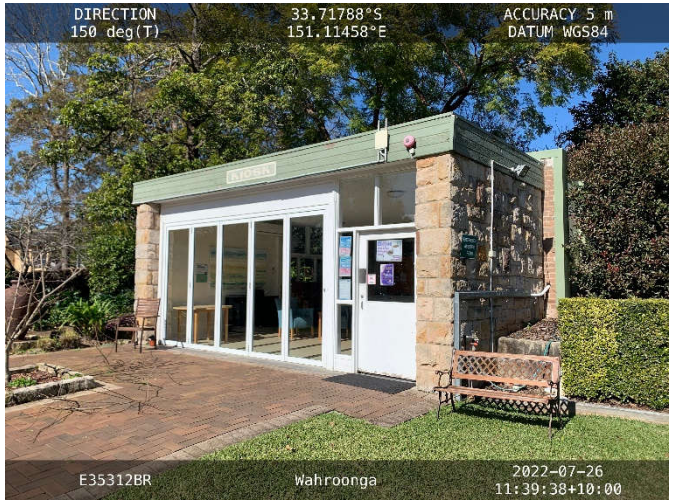
ENVIRONMENTAL INVESTIGATION SERVICES

Job No: E24031Krpt
Figure: 2

Selected Site Photographs

Photograph 1: Suspected UST

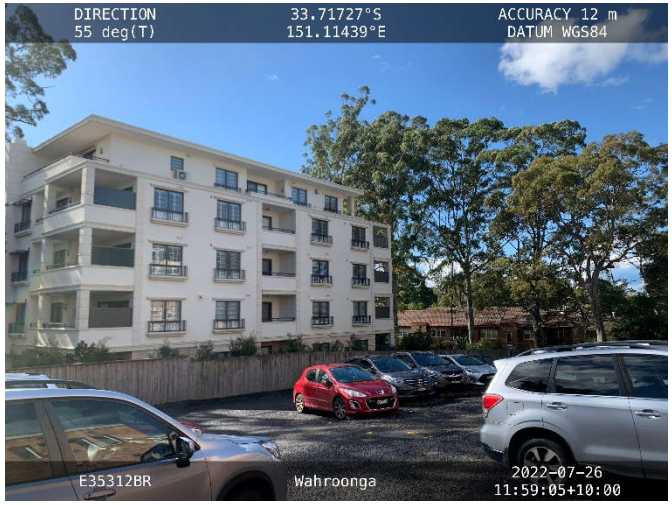
Photograph 2: Driveway and carpark south of the main hospital building



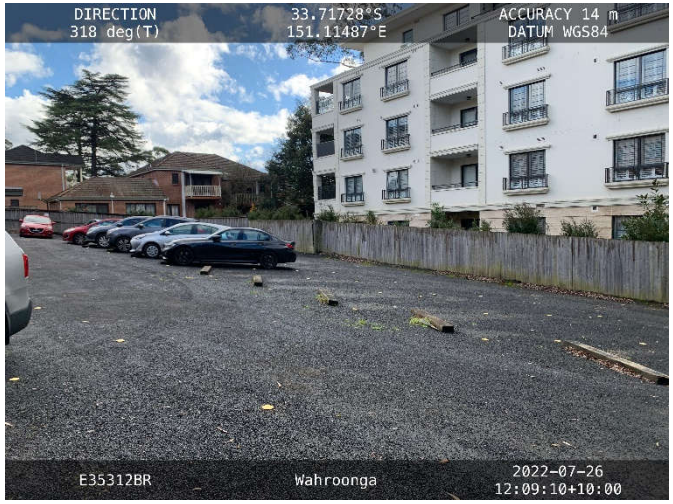
Photograph 3: Kiosk building

Photograph 4: Courtyard to the east of the Kiosk

Photograph 5: Main hospital building



Photograph 6: Northern carpark



Photograph 7: Northern carpark

Photograph 8: Northern portion of main hospital building

Photograph 9: Eastern portion of main hospital building

Photograph 10: Southern carpark

Photograph 11: Southern section of site

Photograph 12: Fill material from BH110.

Selected Development Plans

STATE SIGNIFICANT DA: WAHROONGA STAGE 2

FOR HAMMONDCARE

PALLIATIVE CARE AND RESIDENTIAL CARE FACILITY AND SELF-CONTAINED DWELLINGS
AT 4-12 NERINGAH AVE S, WAHROONGA NSW 2076

DEVELOPMENT SUMMARY	
SITE AREA	**10,770m²**
WOONONA COTTAGE AREA (R2 ZONE)	*1,794m²*
DEVELOPMENT AREA (R4 ZONE)	**8,976m²**
MAXIMUM FSR FOR R4 ZONE	1:1.3
MAXIMUM FSR (INCL. VERTICAL VILLAGE BONUS)	**1:1.8**
MAXIMUM GFA FOR DEVELOPMENT AREA (BASED ON FSR)	16,157m²
EXISTING GFA (WAHROONGA RAC)	3,736m²
MAXIMUM NEW GFA	**12,421m²**
TOTAL NEW GFA	**11,015m²**
GFA - PALLIATIVE CARE	1,600m²
GFA - RESIDENTIAL CARE	950m²
GFA - SELF-CONTAINED DWELLINGS	6,600m²
GFA - AMENITY (COMMUNITY + NEIGHBOURHOOD)	1,215m²
GFA - CIRCULATION + SERVICES	650m²
FSR (INCL. EXISTING GFA)	**1.64**
DEEP SOIL PLANTING AREA *INDICATED ON LANDSCAPE DEEP SOIL PLAN*	1,616m² (15.1%)

ACCOMMODATION SUMMARY	
PALLIATIVE CARE	18 BEDS (2 HOUSES OF 9 BEDS)
RESIDENTIAL CARE	12 BEDS (1 HOUSE OF 12 BEDS)
SELF-CONTAINED DWELLINGS	57 DWELLINGS
NORTH BUILDING	22
SOUTH BUILDING	35

CAR PARK SUMMARY	
SITE TOTAL	130
BASEMENT 02	56
BASEMENT 01	50
LOWER GROUND	26

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CLIENT: HammondCare Champion Life

PROJECT: 01368
WAHROONGA STAGE 2
4-12 NERINGAH AVE S,
WAHROONGA NSW 2076

DRAWING TITLE:
COVER PAGE

DATE: OCT. 2022 **SCALE:** 1 : 200 @ A1
CHECKED: BF **DRAWING:** **REVISION:**
DRAWN: RW, JC, SB DG-00-00 P11

VIEW OF NERINGAH HOSPITAL FROM PARK ACROSS NERINGAH AVENUE SOUTH

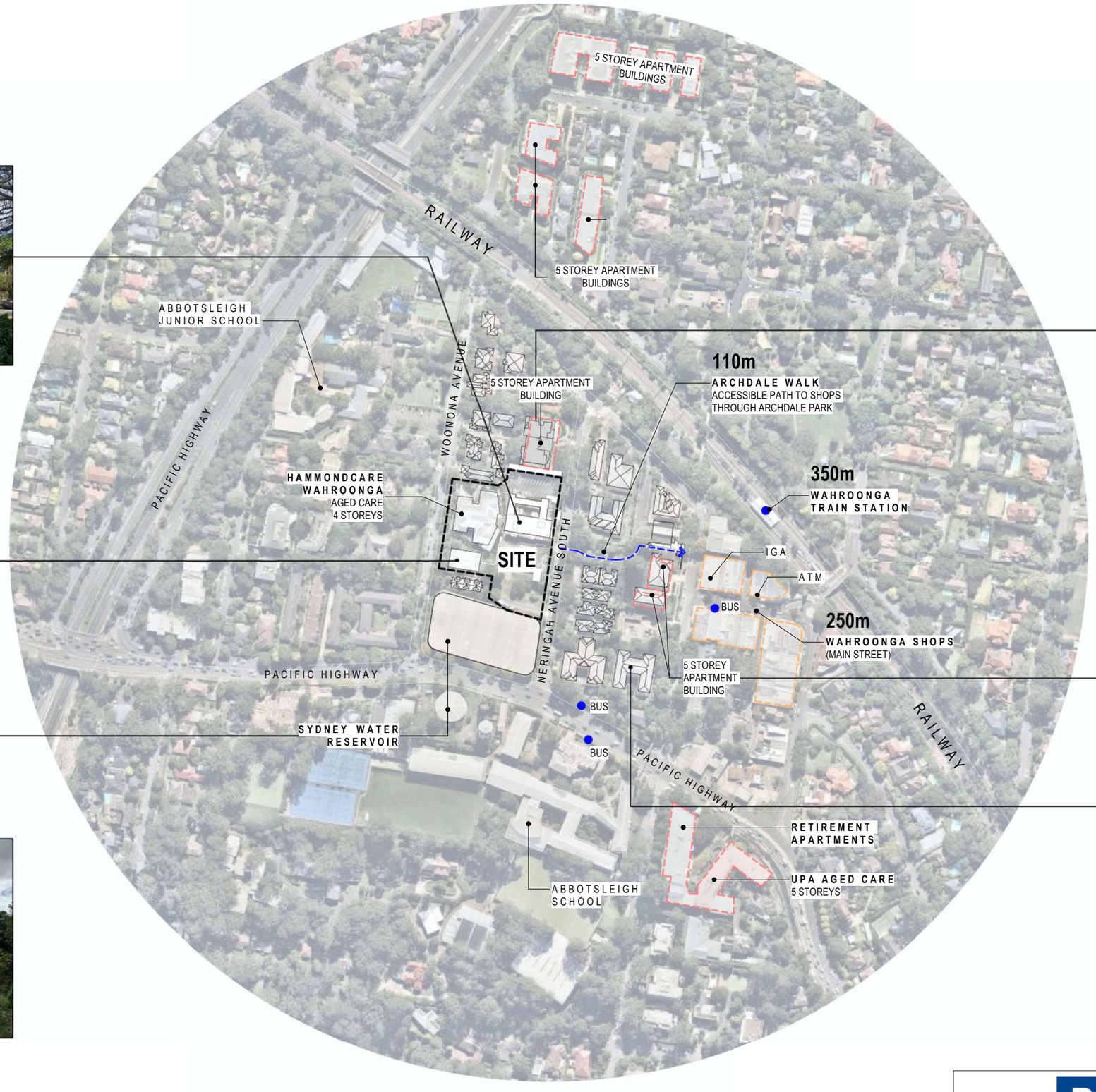
WOONONA HOUSE

SYDNEY WATER RESERVOIR BRICK WALL

5 STOREY APARTMENT BUILDING

5 STOREY APARTMENT BUILDING (FIRST THREE SHOWN IN IMAGE)

4 STOREY APARTMENT BUILDING



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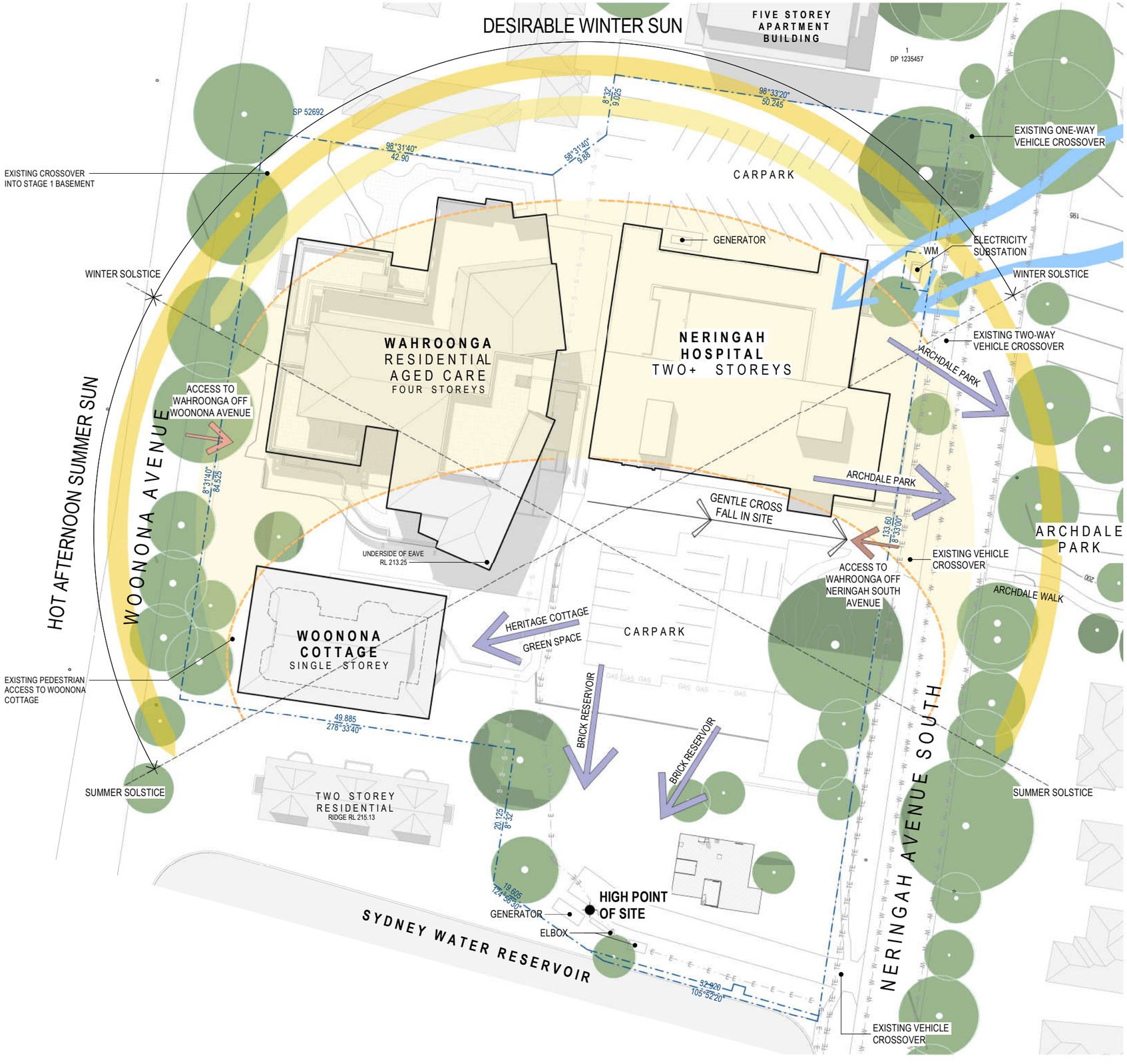
DRAWING TITLE: CONTEXT PLAN

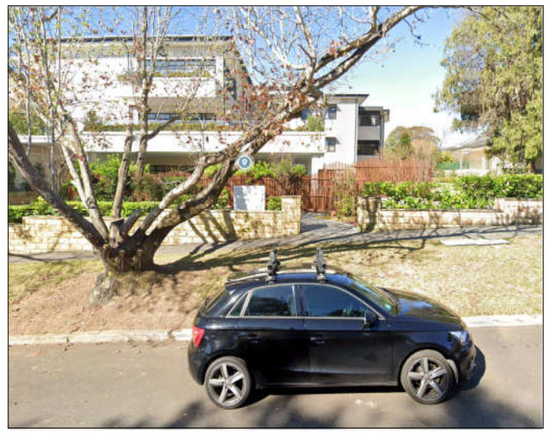
DATE: OCT. 2022 SCALE:

CHECKED: BF DRAWING: DG-00-01 REVISION: P11

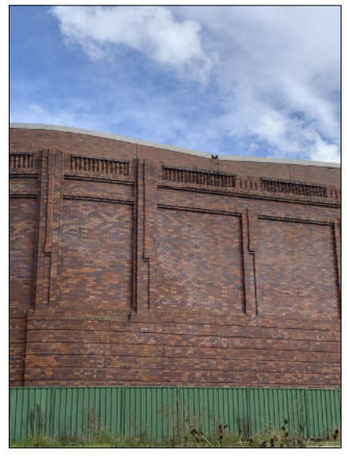
DRAWN: RW, JC, MIL



VIEW FROM SITE TO ARCHDALE PARK



ACCESS TO WAHROONGA STAGE 1 OFF WOONONA AVENUE



VIEW FROM SITE TO SYDNEY WATER RESERVOIR

LEGEND - SITE ANALYSIS

SYMBOL	DESCRIPTION
	VIEWS
	BEST SOLAR ASPECT
	PREVAILING BREEZE

ABBREVIATIONS	
GAS	GAS LINE
S	SEWER LINE
WM	WATER MAIN
TEL	TELSTRA

NORTH

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WAHROONGA STAGE 2
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DRAWING TITLE: EXISTING SITE PLAN & SITE ANALYSIS

DATE: OCT. 2022 SCALE: 1 : 300 @ A1
CHECKED: BF DRAWING: DG-01-01 REVISION: P10
DRAWN: RW, JC, MIL

LEGEND - SITE & LANDSCAPE PLAN

SYMBOL	DESCRIPTION
	SITE BOUNDARY
	EXISTING TREE
	PROPOSED TREE/ LANDSCAPE PLANTING

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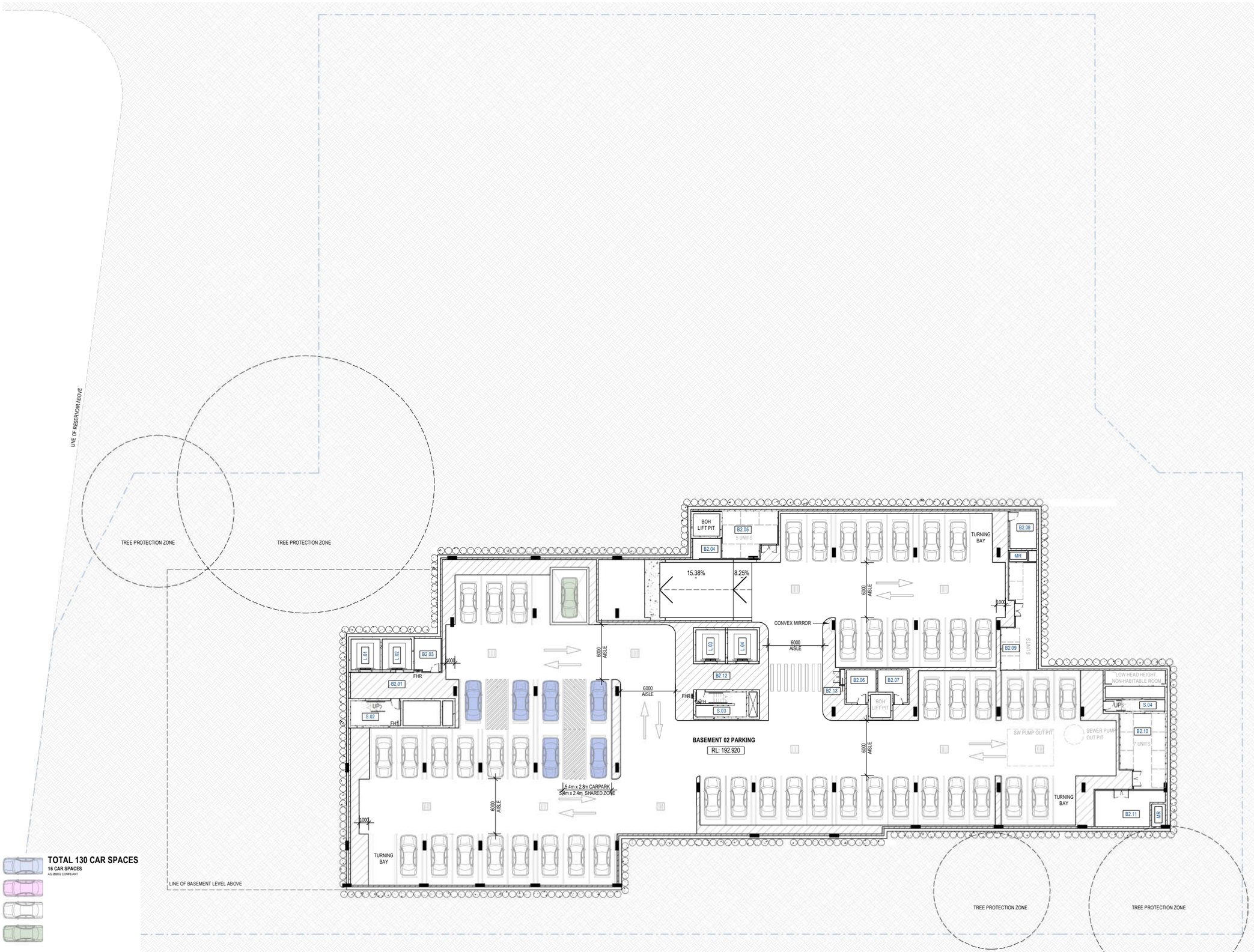
DRAWING TITLE: PROPOSED SITE PLAN

DATE: OCT. 2022 SCALE: 1 : 300 @ A1

CHECKED: BF DRAWING: DG-02-01 REVISION: P15

DRAWN: RW, JC, SB

Number	Name
B2.01	LIFT LOBBY
B2.03	STORE
B2.04	SPARE
B2.05	STORAGE
B2.06	PUMP ROOM
B2.07	COMMS
B2.08	MECH PLANT
B2.09	STORE
B2.10	STORE
B2.11	EXHAUST FAN ROOM
B2.12	LIFT LOBBY
B2.13	DB
L.01	LIFT 01
L.02	LIFT 02
L.03	LIFT 03
L.04	LIFT 04
MR	MECH RISER
S.02	STAIR 02
S.03	STAIR 03
S.04	STAIR 04



12 x SENIORS LIVING — AS 2890.6 COMPLIANT CAR SPACES

26 x VISITOR CAR SPACES

91 x HAMMOND CARE/ STAFF CAR SPACES

1 x CAR WASH SPACE

TOTAL 130 CAR SPACES
16 CAR SPACES — AS 2890.6 COMPLIANT

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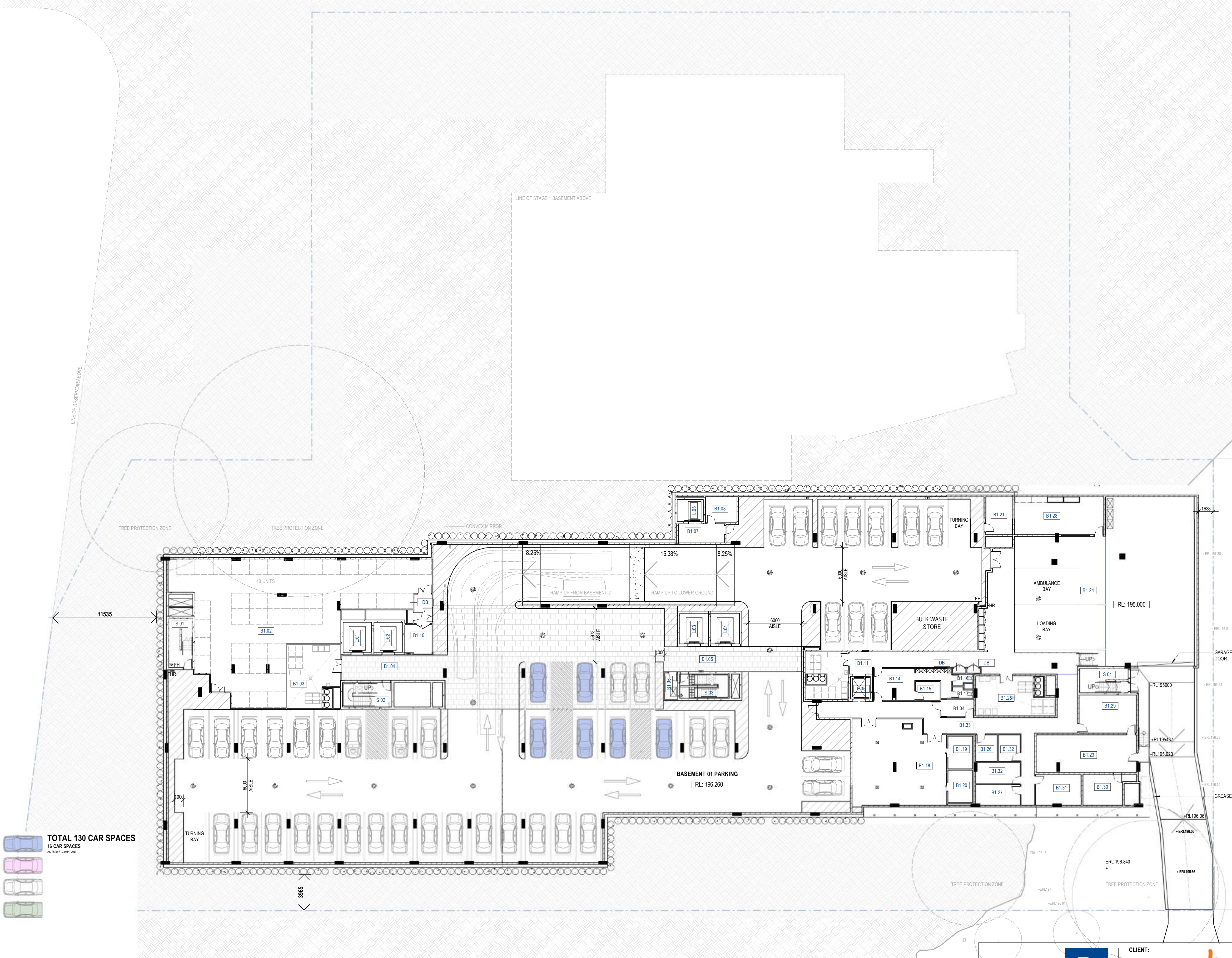
DRAWING TITLE: FLOOR PLAN - BASEMENT 2

PROJECT: 01368
WAHROONGA STAGE 2
4-12 NERINGAH AVE S,
WAHROONGA NSW 2076

DATE: OCT 2022 **SCALE:** 1 : 200 @ A1
CHECKED: BF **DRAWING:** DG-03-01 **REVISION:** P8
DRAWN: RW, JC, SB



Number	Name
B1.02	STORAGE
B1.03	BIN STORE - APT
B1.04	LIFT LOBBY
B1.05	LIFT LOBBY
B1.06	MSSB
B1.07	BACK OF HOUSE
B1.08	STORAGE
B1.10	CENTRAL UPS ROOM
B1.11	BOH LOBBY
B1.14	STAFF ROOM
B1.15	ACC WC
B1.16	AMB WC
B1.17	AMB WC
B1.18	COMMERCIAL KITCHEN
B1.19	COLD ROOM
B1.20	COLD ROOM
B1.21	SA FAN ROOM
B1.23	SPRINKLER PUMP ROOM
B1.24	LOADING DOCK
B1.25	BIN STORE
B1.26	PALL CARE STORE
B1.27	RESI CARE STORE
B1.28	MAINT. W'SHOP
B1.29	BACKUP GENERATOR
B1.30	EXHAUST FAN ROOM
B1.31	RESI CARE STORE
B1.32	PALL CARE STORE
B1.33	BOH LOBBY
B1.34	CLEAN STORE
B1.35	STORE
CHUTE	CHUTES
DB	DB
HR	HYD RISER
L.05	BOH LIFT
L.06	BOH LIFT
MR	MECH RISER
S.01	STAIR 01

12 x SENIORS LIVING
AS 2890.6 COMPLIANT CAR SPACES

26 x VISITOR CAR SPACES

91 x HAMMOND CARE/ STAFF CAR SPACES

1 x CAR WASH SPACE

TOTAL 130 CAR SPACES
16 CAR SPACES
AS 2890.6 COMPLIANT

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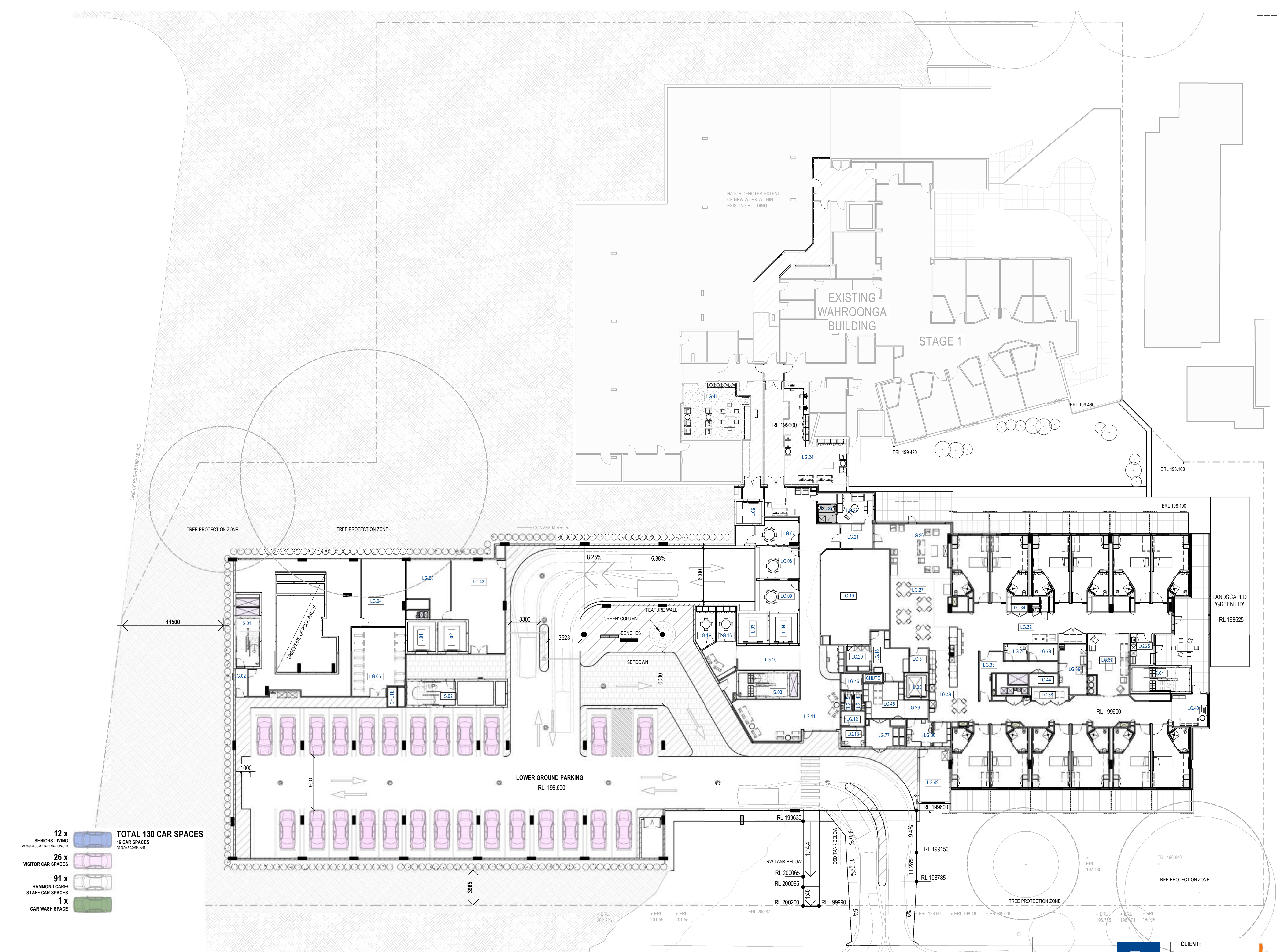
DRAWING TITLE:
FLOOR PLAN - BASEMENT 1

DATE: OCT 2022 SCALE: 1 : 200 @ A1
CHECKED: BF DRAWING: DG-03-02 REVISION: P11
DRAWN: RW, JC

C:_Revit Projects\1368_Wahroonga Stage 2_RVT2020_Central_rachaelwDZ2L8.rvt
9/11/2022 5:47:10 PM
NSW NOMINATED ARCHITECT: ANDREW MASTERS (9037)



N E R I N G A H   A V E N U E   S O U T H

Number	Name
DB	DB
HR	HYD RISER
LG.01	BOH STORE
LG.02	STAFF ROOM
LG.03	SITTING
LG.04	POOL PLANT
LG.05	BIKE STORE
LG.06	MAIN COMMS ROOM
LG.07	FUNCTION ROOM
LG.08	FUNCTION ROOM
LG.09	FUNCTION ROOM
LG.10	LIFT LOBBY
LG.11	RECEPTION & WAITING
LG.12	AIRLOCK
LG.13	ACC WC
LG.14	AMB
LG.15	AMB
LG.16	FAMILY RM
LG.17	MTG
LG.18	DEBOXING
LG.19	SHOP
LG.20	COLD ROOM
LG.21	VEST.
LG.22	PARLOUR
LG.23	PARL. WC
LG.24	LIBRARY
LG.25	LAUNDRY
LG.26	LOUNGE
LG.27	DINING
LG.29	BOH CORRIDOR
LG.30	PANTRY
LG.31	DIN WC
LG.32	CORRIDOR
LG.33	BOH
LG.34	LINEN
LG.36	DIRTY
LG.37	TV RM
LG.38	LIFTER BAY
LG.39	LINEN
LG.40	SITTING
LG.41	STAFF ROOM
LG.42	FAN ROOM
LG.43	MAIN SWITCH ROOM
LG.44	COMMS
LG.45	CLEAN STORE
LG.46	STORE
LG.47	STORE
LG.48	STORE
LG.49	KITCHEN
LG.50	BEDROOM
LG.51	BEDROOM
LG.52	BEDROOM
LG.53	BEDROOM
LG.54	BEDROOM
LG.55	BEDROOM
LG.56	BEDROOM
LG.57	BEDROOM
LG.58	BEDROOM
LG.59	BEDROOM
LG.60	BEDROOM
LG.61	BEDROOM
LG.62	ENSUITE
LG.63	ENSUITE
LG.64	ENSUITE
LG.65	ENSUITE
LG.66	ENSUITE
LG.67	ENSUITE
LG.68	ENSUITE
LG.69	ENSUITE
LG.70	ENSUITE
LG.71	ENSUITE
LG.72	ENSUITE
LG.73	ENSUITE
LG.74	STORE
LG.75	LIFTER BAY
LG.76	STAFF WC
LG.77	BIN STORE
LG.78	STORE
LG.79	LIFTER BAY
MR	

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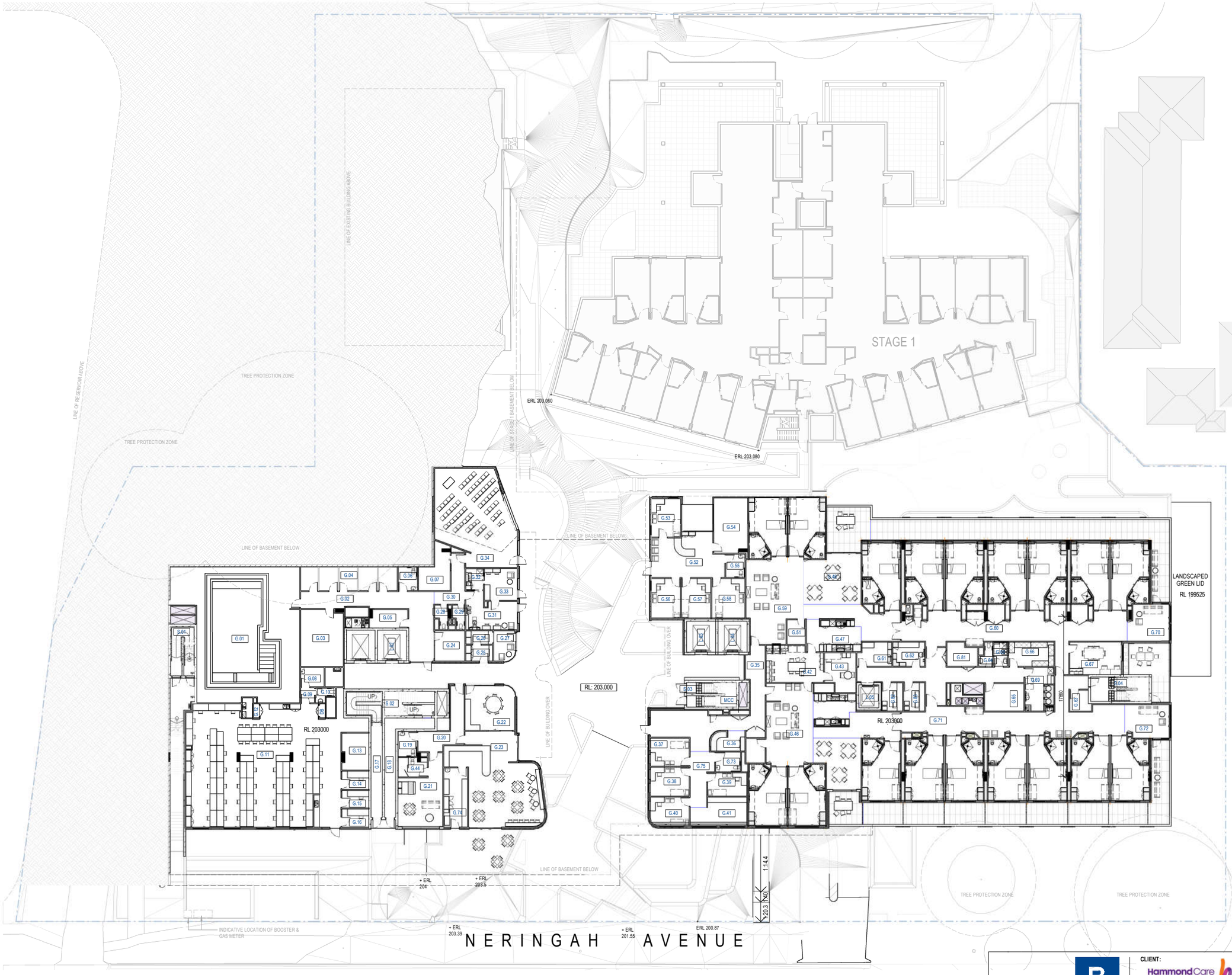
DRAWING TITLE:
FLOOR PLAN - LOWER GROUND

DATE: OCT 2022 SCALE: 1 : 200 @ A1
CHECKED: BF DRAWING: DG-03-03 REVISION: P10
DRAWN: RW, JC

NSW NOMINATED ARCHITECT: ANDREW MASTERS (9037)



Number	Name
B	BEDROOM
DB	DB
E	ENS
G.01	POOL
G.02	COMMUNITY
G.03	GYM
G.04	CHANGE ROOM
G.05	COMMS
G.06	ACC WC
G.07	CLEANER / STORE
G.08	ACC WC
G.09	AIRLOCK
G.10	AMB WC
G.11	ADMIN
G.12	MCC CPD
G.13	MTG
G.14	QUIET
G.15	QUIET
G.16	QUIET
G.17	FIRE TUNNEL
G.18	FIRE TUNNEL
G.19	FIRE TUNNEL
G.20	BOH CORRIDOR
G.21	OVERNIGHT STAY
G.22	MTG
G.23	CAFE
G.24	GROUP THERAPY
G.25	MAIL
G.26	STAFF ROOM
G.27	CONCIERGE
G.28	WC
G.29	WC
G.30	BOH
G.31	SALON
G.32	STORE
G.33	BARBER
G.34	CHAPEL
G.35	ENTRY LOBBY
G.36	CONCIERGE
G.37	CONS
G.38	CONS
G.39	CONS
G.40	CONS
G.41	KITCHENETTE & LOUNGE
G.42	HUDDLE
G.43	N.U.M.
G.44	OVERNIGHT STAY - BATHROOM
G.45	KITCHEN
G.46	LIVING
G.47	KITCHEN
G.48	DINING
G.49	BEDROOM
G.50	ENS
G.51	DIN. WC
G.52	RECEPTION & WAITING
G.53	CONS
G.54	GROUP THERAPY
G.55	ACC WC
G.56	CONS
G.57	CONS
G.58	CONS
G.59	LIVING
G.60	CORRIDOR
G.61	CLEAN
G.62	MEDS
G.63	COMMS
G.64	STAFF WC
G.65	PHARMACY
G.66	GENERAL STORE
G.67	STAFF (MDT)
G.68	CLEANER
G.69	DIRTY
G.70	SITTING
G.71	CORRIDOR
G.72	SITTING
G.73	ACC WC
G.74	BOX ST.
G.75	CORRIDOR
G.76	BOH
G.77	DINING WC
G.78	DINING
G.79	STORAGE
G.80	STORAGE
G.81	EQUIPMENT STORE
G.82	JR DR
G.83	DR
G.84	KITCHEN
G.85	STORE
HR	HYD RISER
MCC	MCC CPD
MR	MECH RISER
S	STORAGE

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DRAWING TITLE: FLOOR PLAN - GROUND

DATE: OCT 2022 SCALE: 1 : 200 @ A1
CHECKED: BF DRAWING: DG-03-04 REVISION: P10
DRAWN: RW, JC

C:_Revit Projects\1368_Wahroonga Stage 2_RVT2020_Central_rachaelwDZ2L8.rvt

9/11/2022 5:47:41 PM

NSW NOMINATED ARCHITECT: ANDREW MASTERS (9037)

Number	Name
H1	H1
H2	H2
L1.01	LIFT LOBBY
L1.02	CORRIDOR
L1.03	LIFT LOBBY
L1.04	CORRIDOR 1
L1.05	SHOWER TROLLEY
L1.06	HOIST
L1.07	
L1.08	REFUSE
L1.09	HWB
L1.10	DIRTY
L1.11	LIFTER BAY
L1.12	SHR T BAY
L1.13	ST. HWB
L1.14	SAFE ZONE
L1.15	DB
L1.16	DIRTY
L1.17	REFUSE
L1.18	COMMS
MCC	MCC CPD
MR	MECH RISER

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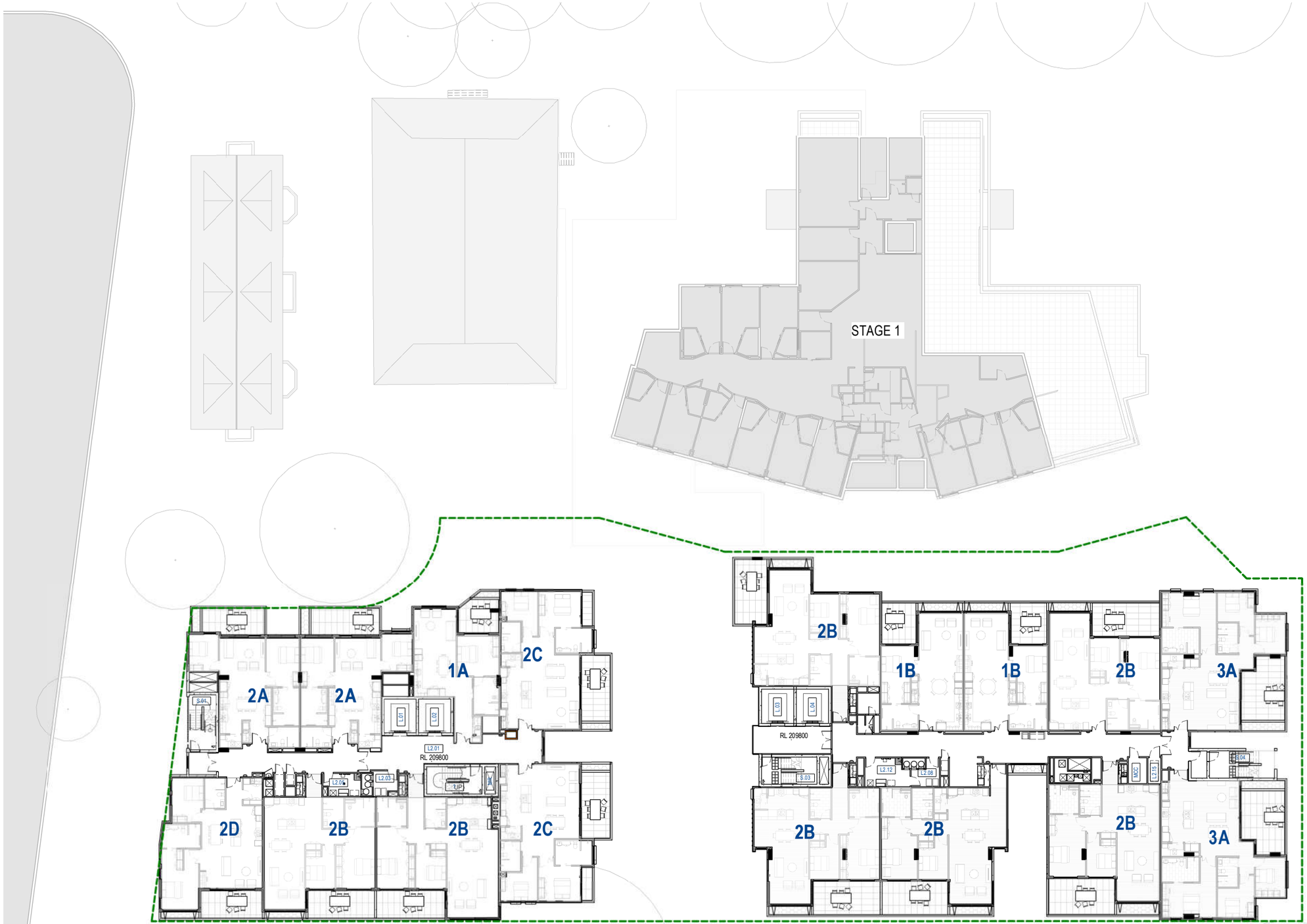
PROJECT: 01368
WAHROONGA STAGE 2
4-12 NERINGAH AVE S,
WAHROONGA NSW 2076

DRAWING TITLE: FLOOR PLAN - LEVEL 1

DATE: OCT 2022 SCALE: 1 : 200 @ A1
CHECKED: BF DRAWING: DG-03-05 REVISION: P10
DRAWN: RW, JC

Number	Name
L2.01	LIFT LOBBY
L2.02	CORRIDOR 1
L2.03	REFUSE
L2.04	HWB
L2.05	DIRTY
L2.06	LIFTER BAY
L2.07	SHR T BAY
L2.08	REFUSE
L2.09	SAFE ZONE
L2.10	DB
L2.11	SERVICES
L2.12	DIRTY
L2.13	HOIST
L2.14	SAFE ZONE
L2.15	SHOWER TROLLEY
L2.16	LIFT LOBBY
L2.17	COMMS
MR	MECH RISER



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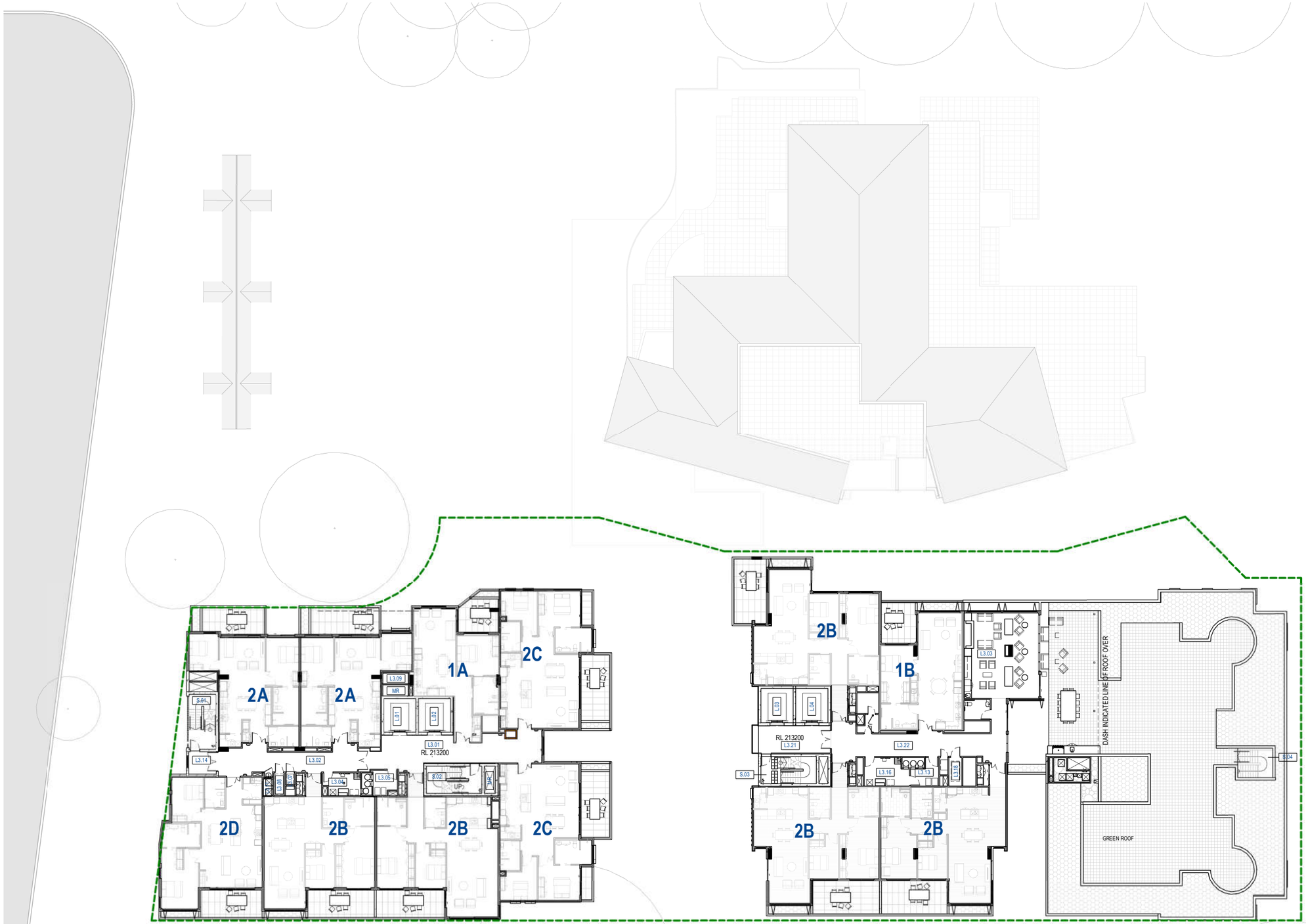
PROJECT: 01368
WAHROONGA STAGE 2
4-12 NERINGAH AVE S,
WAHROONGA NSW 2076

DRAWING TITLE: FLOOR PLAN - LEVEL 2

DATE: OCT 2022 SCALE: 1 : 200 @ A1
CHECKED: BF DRAWING: DG-03-06 REVISION: P10
DRAWN: RW, JC

Number	Name
L3.01	LIFT LOBBY
L3.02	CORRIDOR 1
L3.03	COMMUNITY
L3.04	DIRTY
L3.05	REFUSE
L3.06	HWB
L3.07	LIFTER BAY
L3.08	SHR T BAY
L3.09	MECH RISER
L3.10	MECH RISER
L3.11	MECH RISER
L3.12	MECH PLANT
L3.13	REFUSE
L3.14	SAFE ZONE
L3.15	HOIST
L3.16	DIRTY
L3.17	DB
L3.18	SHOWER TROLLEY
L3.19	ACC WC
L3.20	AMB WC
L3.21	LIFT LOBBY
L3.22	CORRIDOR
MR	REF. PIPE RISER



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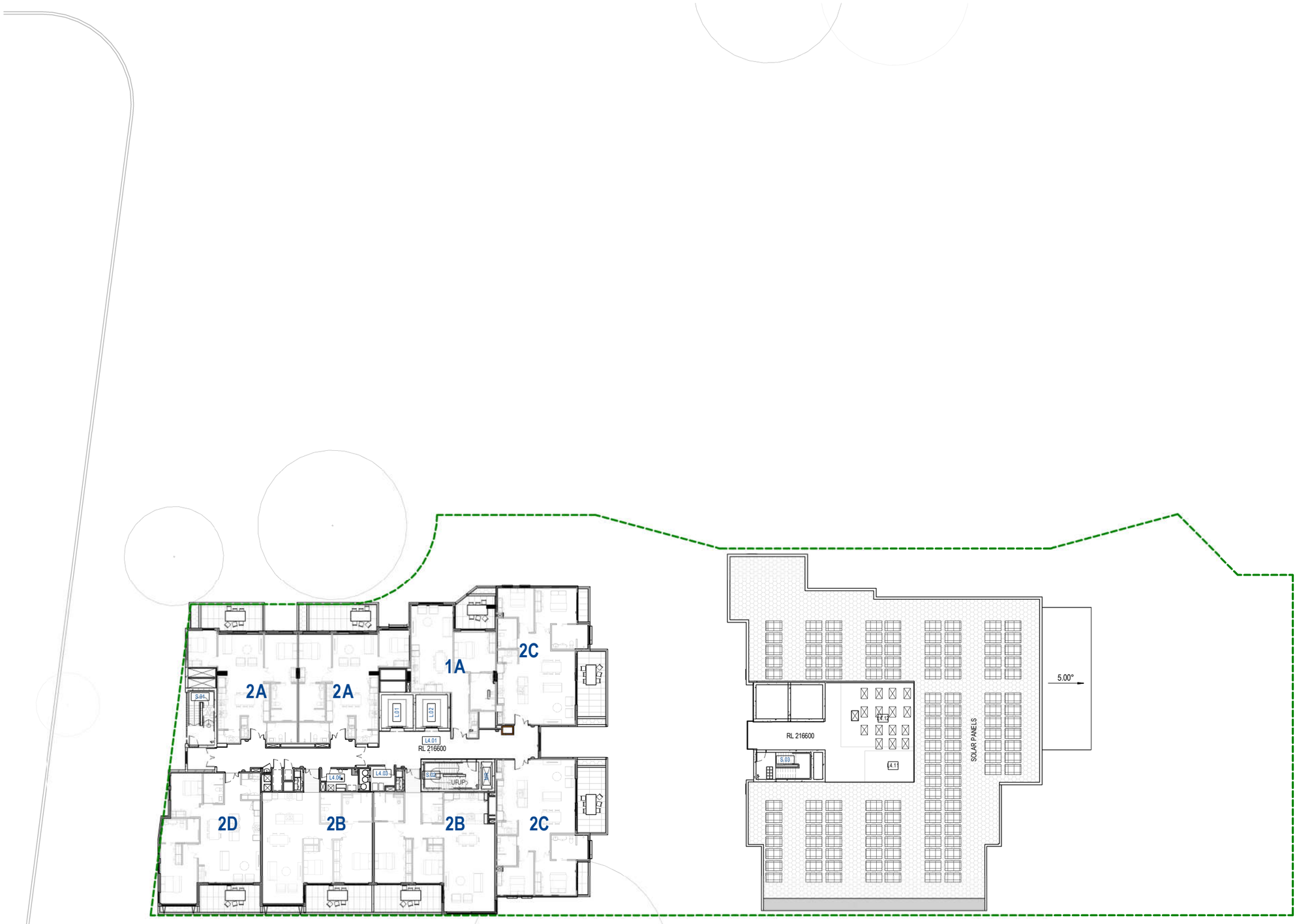
WAHROONGA STAGE 2
4-12 NERINGAH AVE S,
WAHROONGA NSW 2076

DRAWING TITLE: FLOOR PLAN - LEVEL 3

DATE: OCT 2022 SCALE: 1 : 200 @ A1
CHECKED: BF DRAWING: DG-03-07 REVISION: P10
DRAWN: RW, JC

Number	Name
L4.01	LIFT LOBBY
L4.02	CORRIDOR 1
L4.03	REFUSE
L4.04	HWB
L4.05	SHR T BAY
L4.06	DIRTY
L4.07	MECH RISER
L4.08	LIFTER BAY
L4.09	SAFE ZONE
L4.10	VERT. CIRCULATION
L4.11	HOT WATER PLANT
L4.12	PLANT
MR	MECH RISER



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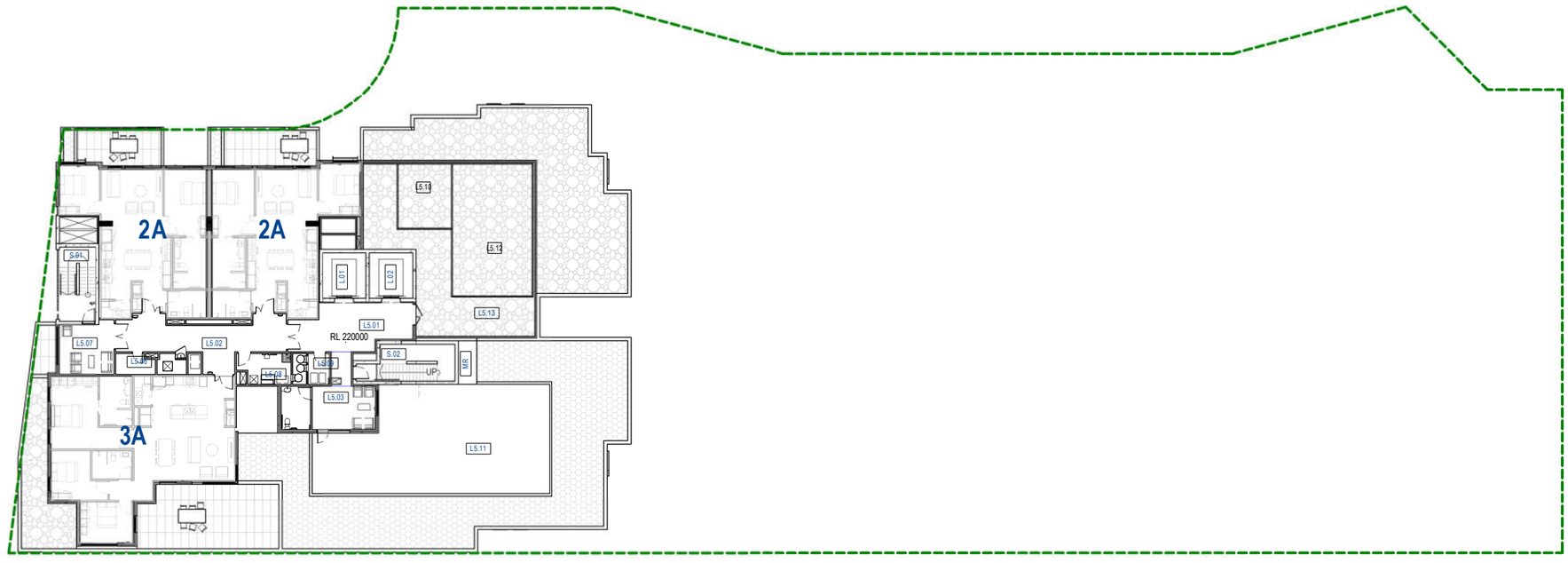
DRAWING TITLE: FLOOR PLAN - LEVEL 4

DATE: OCT 2022 SCALE: 1 : 200 @ A1
CHECKED: BF DRAWING: DG-03-08 REVISION: P10
DRAWN: RW, JC

L5.01	LIFT LOBBY
L5.02	CORRIDOR 1
L5.03	OPEN LOUNGE
L5.04	ACC WC
L5.05	LIFTER BAY
L5.06	AMB WC
L5.07	FIREWORK LOUNGE
L5.08	DIRTY
L5.09	REFUSE
L5.10	HOT WATER PLANT
L5.11	GREEN ROOF
L5.12	MECH PLANT
L5.13	PLANT AREA
MR	MECH RISER



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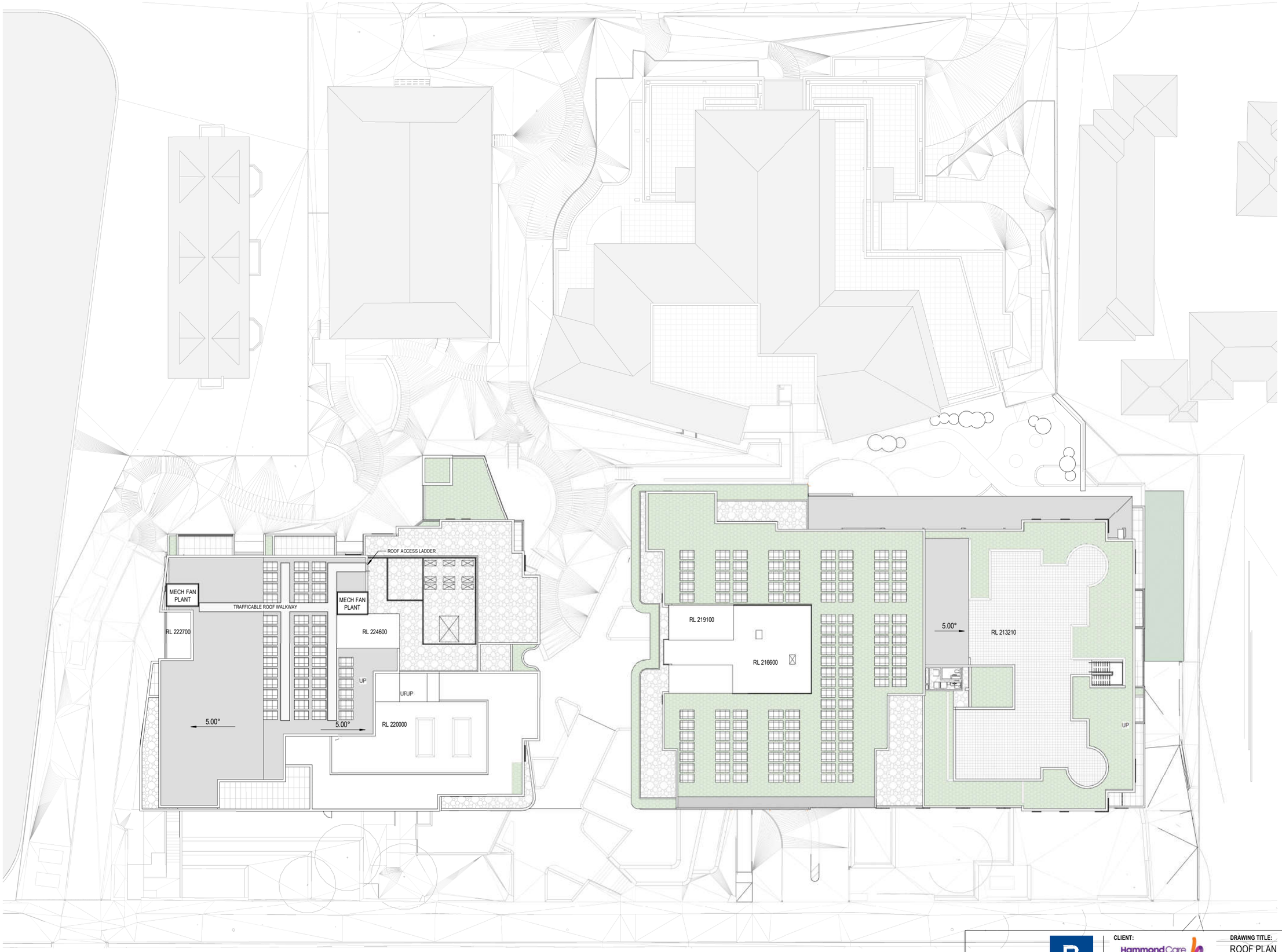
DRAWING TITLE:
FLOOR PLAN - LEVEL 5

DATE: OCT 2022 SCALE: 1 : 200 @ A1
CHECKED: BF DRAWING: DG-03-09 REVISION: P10
DRAWN: RW, JC



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DRAWING TITLE:
ROOF PLAN

DATE: OCT 2022 **SCALE:**
CHECKED: BF **DRAWING:** DG-03-10 **REVISION:** P4
DRAWN: RW, JC, SB

C:_Revit Projects\1368_Wahroonga Stage 2_RVT2020_Central_rachaelwDZ2L8.rvt

9/11/2022 5:48:51 PM

NSW NOMINATED ARCHITECT: ANDREW MASTERS (9037)

LEGEND - EXISTING & DEMOLITION PLAN

SYMBOL	DESCRIPTION
	ITEM TO BE DEMOLISHED
	SITE BOUNDARY
	TREE PROTECTION ZONE
	EXISTING TREE (LOW IMPORTANCE) - TO BE RETAINED
	EXISTING TREE (MODERATE IMPORTANCE) - TO BE RETAINED
	EXISTING TREE (HIGH IMPORTANCE) - TO BE RETAINED
	EXISTING TREE - TO BE REMOVED

NORTH

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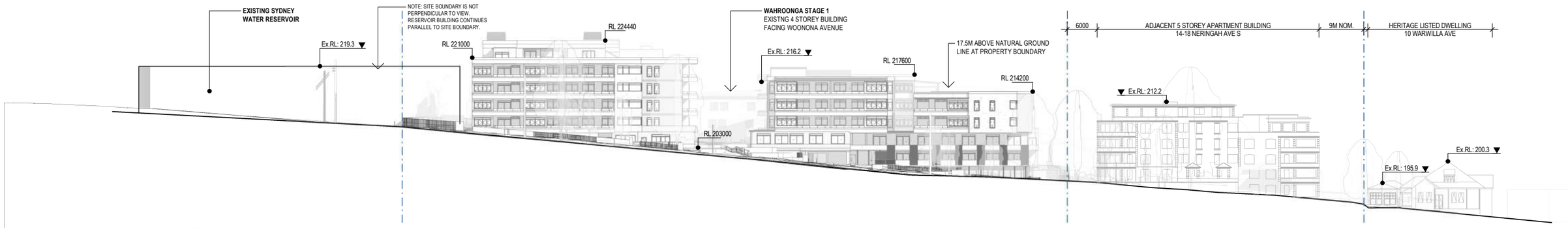
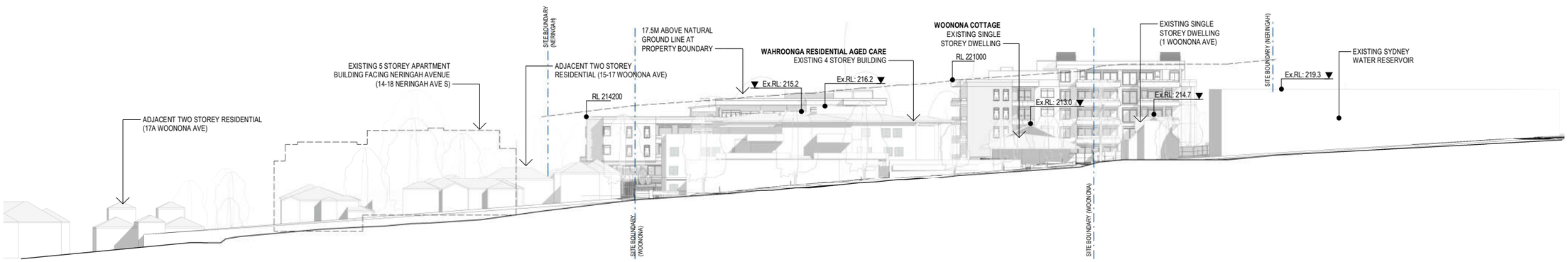
DRAWING TITLE:
EXISTING & DEMOLITION SITE PLAN

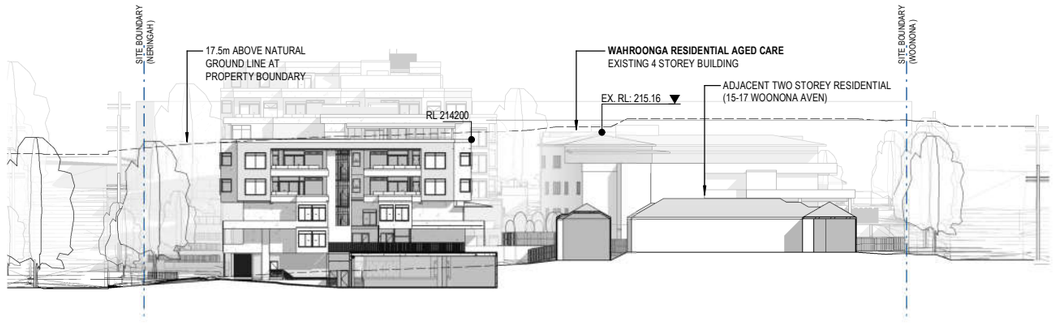
DATE: OCT. 2022 SCALE: 1 : 300 @ A1
CHECKED: BF DRAWING: DG-04-01 REVISION: P12
DRAWN: RW, JC



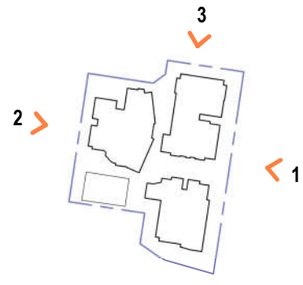
1 **SITE ELEVATION - NERINGAH AVENUE SOUTH**
1 : 400



2 **SITE ELEVATION - WOONONA AVENUE**
1 : 400



3 **SITE ELEVATION - NORTH**
1 : 400



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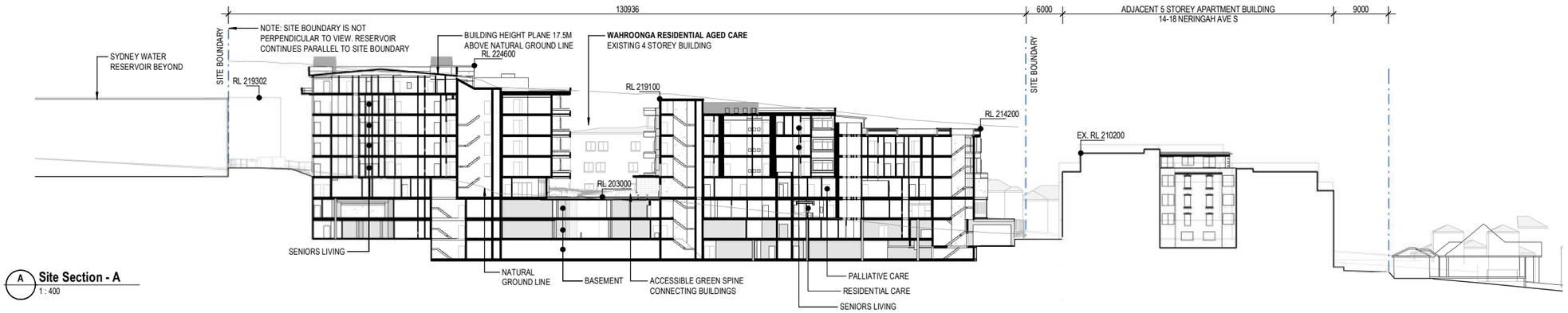
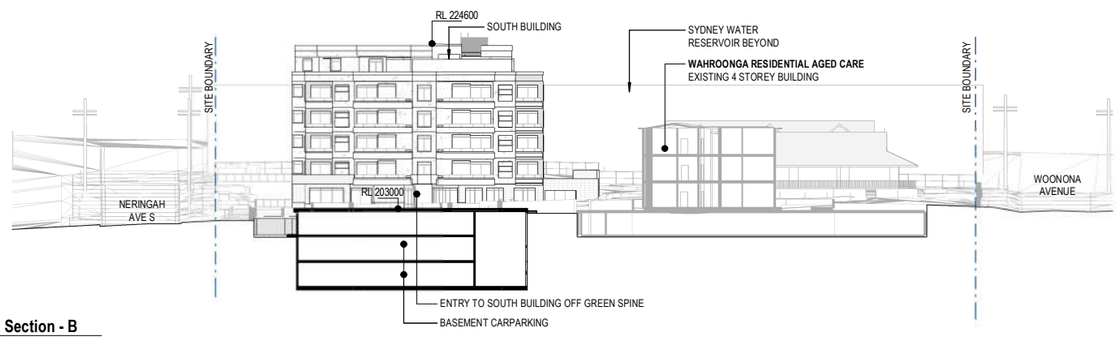
WAHROONGA STAGE 2
4-12 NERINGAH AVE S,
WAHROONGA NSW 2076

DRAWING TITLE:
SITE ELEVATIONS

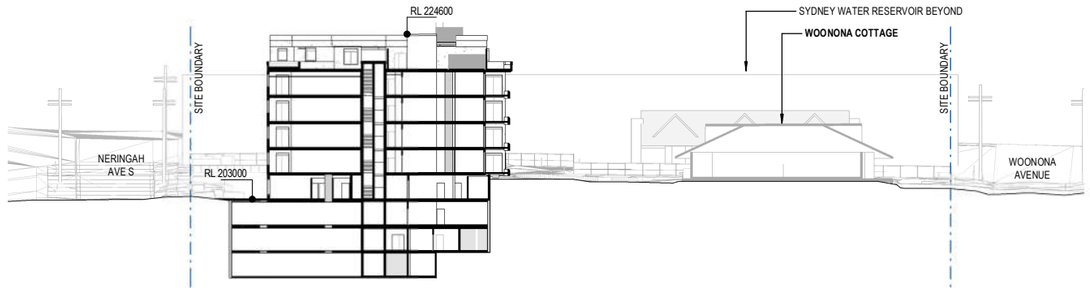
DATE: OCT. 2022 SCALE: As indicated @ A1
CHECKED: BF DRAWING: DG-20-00 REVISION: P12
DRAWN: RW, JC



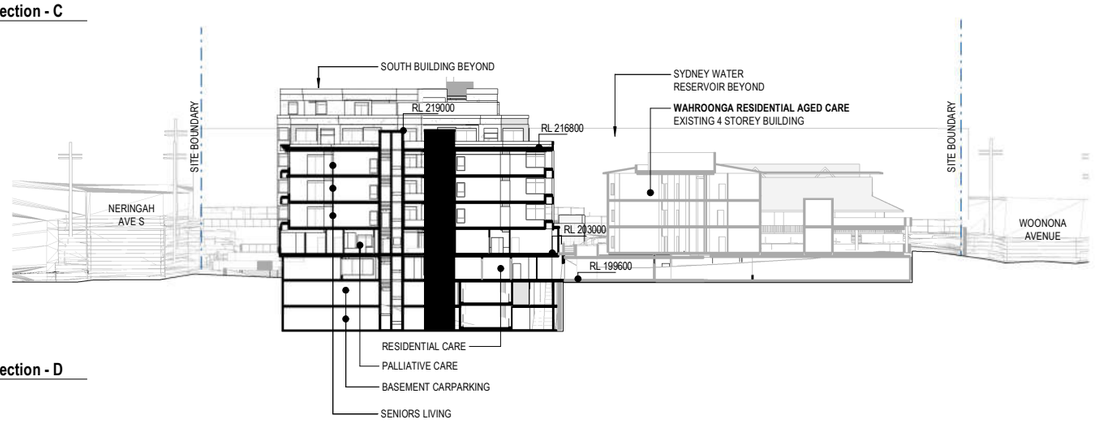
A **Site Section - A**
1 : 400



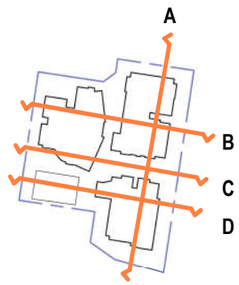
B **Site Section - B**
1 : 400



C **Site Section - C**
1 : 400



D **Site Section - D**
1 : 400



LEGEND - SECTION / ELEVATION

SYMBOL	DESCRIPTION
WW.##	Window Wall Number: Refer to 1:50 Window Wall Elevations for Setout Window Assemblies, Glazed Walls & Partitions.
W.R.##	Window Number (Room Number) - Refer Elevations & Schedules.
D.R.##	Door Number (Room Number) - Refer Schedules.
000 SIMILAR / 00000	Number of Detail / Sheet Number of Detail
000 SIMILAR / 00000	Detail Number of Section / Elevation / Sheet Number of Section / Elevation

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DRAWING TITLE:
SITE SECTIONS

DATE: OCT. 2022 SCALE: As indicated @ A1
CHECKED: BF DRAWING: DG-30-00 REVISION: P13
DRAWN: RW, JC

Appendix C: DSI Data Summary Tables

ABBREVIATIONS AND EXPLANATIONS

Abbreviations used in the Tables:

ABC:	Ambient Background Concentration
ACM:	Asbestos Containing Material
ADWG:	AustralianDrinking Water Guidelines
AF:	Asbestos Fines
ANZG	Australian and New Zealand Guidelines
B(a)P:	Benzo(a)pyrene
CEC:	Cation Exchange Capacity
CRC:	Cooperative Research Centre
CT:	Contaminant Threshold
EILs:	Ecological Investigation Levels
ESLs:	Ecological Screening Levels
FA:	Fibrous Asbestos
FTS:	Fluorotelomer sulfonic acid
GIL:	Groundwater Investigation Levels
GSW:	General Solid Waste
HILs:	Health Investigation Levels
HSLs:	Health Screening Levels
HSL-SSA:	Health Screening Level-SiteSpecific Assessment
kg/L	kilograms per litre
NA:	Not Analysed
NC:	Not Calculated
NEPM:	National Environmental Protection Measure
NHMRC:	National Health and Medical Research Council
NL:	Not Limiting
NSL:	No Set Limit
OCP:	Organochlorine Pesticides
OPP:	Organophosphorus Pesticides
PAHs:	Polycyclic Aromatic Hydrocarbons
%w/w:	weight per weight
ppm:	Parts per million
PCBs:	Polychlorinated Biphenyls
PCE:	Perchloroethylene (Tetrachloroethylene or Teterachloroethene)
PFAS	Per- and polyfluoroalkyl substances
PFHxS	Perfluorohexanesulfonic acid
PFOA	Perfluorooctanoic acid
PFOS	Perfluorooctanesulfonic acid
pHKCL :	pH of filtered 1:20, 1M KCL extract, shaken overnight
pHox :	pH of filtered 1:20 1M KCl after peroxide digestion
PQL:	Practical Quantitation Limit
RS:	Rinsate Sample
RSL:	Regional Screening Levels
RSW:	Restricted Solid Waste
SAC:	Site Assessment Criteria
SCC:	Specific Contaminant Concentration
SCr:	Chromium reducible sulfur
SPOS:	Peroxide oxidisable Sulfur
SSA:	Site Specific Assessment
SSHSLs:	Site Specific Health Screening Levels
TAA:	Total Actual Acidity in 1M KCL extract titrated to pH6.5
TB:	Trip Blank
TCA:	1,1,1 Trichloroethane (methyl chloroform)
TCE:	Trichloroethylene (Trichloroethene)
TCLP:	Toxicity Characteristics Leaching Procedure
TPA:	Total Potential Acidity, 1M KCL peroxide digest
TS:	Trip Spike
TRH:	Total Recoverable Hydrocarbons
TSA:	Total Sulfide Acidity (TPA-TAA)
UCL:	Upper Level Confidence Limit on Mean Value
USEPA	United States Environmental Protection Agency
VOCC:	Volatile Organic Chlorinated Compounds
WHO:	World Health Organisation

Table Specific Explanations:

HIL Tables:

- The chromium results are for Total Chromium which includes Chromium III and VI. For initial screening purposes, we have assumed that the samples contain only Chromium VI unless demonstrated otherwise by additional analysis.
- Carcinogenic PAHs is a toxicity weighted sum of analyte concentrations for a specific list of PAH compounds relative to B(a)P. It is also refered to as the B(a)P Toxic Equivalence Quotient (TEQ).
- Statistical calculations are undertaken using ProUCL (USEPA). Statistical calculation is usually undertaken using data from fill samples.

EIL/ESL Table:

- ABC Values for selected metals have been adopted from the published background concentrations presented in Olszowy et. al., (1995), Trace Element Concentrations in Soils from Rural and Urban New South Wales (the 25th percentile values for old suburbs with low traffic have been quoted).

Waste Classification and TCLP Table:

- Data assessed using the NSW EPA Waste Classification Guidelines, Part 1: Classifying Waste (2014).
- The assessment of Total Moderately Harmful pesticides includes: Dichlorovos, Dimethoate, Fenitrothion, Ethion, Malathion and Parathion.
- Assessment of Total Scheduled pesticides include: HBC, alpha-BHC, gamma-BHC, beta-BHC, Heptachlor, Aldrin, Heptachlor Epoxide, gamma-Chlordane, alpha-chlordane, pp-DDE, Dieldrin, Endrin, pp-DDD, pp-DDT, Endrin Aldehyde.

QA/QC Table:

- Field blank, Inter and Intra laboratory duplicate results are reported in mg/kg.
- Trip spike results are reported as percentage recovery.
- Field rinsate results are reported in µg/L.

Groundwater Ecology Tables:

- 95% refers to a concentration that has been derived to protect 95% of aquatic species
- Statistical calculations are undertaken using ProUCL (USEPA). Statistical calculation is usually undertaken using data from fill samples.

TABLE S1
SOIL LABORATORY RESULTS COMPARED TO NEPM 2013.
HIL-B: 'Residential with minimal opportunities for soil access; including dwellings with fully/permanently paved yards like high-rise buildings'

All data in mg/kg unless stated otherwise			HEAVY METALS								PAHs		ORGANOCHLORINE PESTICIDES (OCPs)							OP PESTICIDES (OPPs)	TOTAL PCBs	ASBESTOS FIBRES
			Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Zinc	Total PAHs	Carcinogenic PAHs	HCB	Endosulfan	Methoxychlor	Aldrin & Dieldrin	Chlordane	DDT, DDD & DDE	Heptachlor	Chlorpyrifos		
PQL - Envirolab Services			4	0.4	1	1	1	0.1	1	1	-	0.5	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	100
Site Assessment Criteria (SAC)			500	150	500	30000	1200	120	1200	60000	400	4	15	400	500	10	90	600	10	340	1	Detected/Not Detected
Sample Reference	**Sample Depth**	**Sample Description**																				
BH101	0.05-0.2	F: Clayey Sand	<4	<0.4	**9**	**11**	**16**	<0.1	**6**	**27**	**0.76**	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA
BH101 [LAB_DUP]	0.05-0.2	Laboratory Duplicate	<4	<0.4	**8**	**14**	**11**	<0.1	**5**	**24**	**0.52**	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA
BH101	0.2-0.5	F: Silty Clay	<4	<0.4	**11**	**1**	**13**	<0.1	**1**	**14**	<0.05	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	Not Detected
BH102	0.01-0.1	F: Silty Sand	<4	<0.4	**24**	**12**	**23**	<0.1	**17**	**64**	**0.05**	<0.5	<0.1	<0.1	<0.1	**0.2**	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
BH102	0.1-0.5	F: Silty Clay	<4	<0.4	**17**	**1**	**18**	<0.1	**3**	**11**	<0.05	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH103	0.05-0.2	F: Clayey Sand	<4	<0.4	**14**	**11**	**12**	<0.1	**9**	**19**	**0.77**	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
BH103 [LAB_DUP]	0.05-0.2	Laboratory Duplicate	<4	<0.4	**14**	**9**	**13**	<0.1	**10**	**20**	**0.62**	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA
BH103	0.2-0.5	F: Silty Clay	<4	<0.4	**14**	**3**	**13**	<0.1	**3**	**11**	**0.4**	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH103	0.8-1.0	Silty Clay	**4**	<0.4	**22**	<1	**13**	<0.1	**1**	**2**	<0.05	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH104	0-0.15	F: Silty Clay	<4	<0.4	**3**	**8**	**6**	<0.1	**1**	**21**	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
BH104	0.2-0.5	Silty Clay	**4**	<0.4	**14**	**5**	**19**	<0.1	**2**	**17**	<0.05	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH105	0-0.1	F: Silty Clay	<4	<0.4	**9**	**16**	**19**	**0.4**	**6**	**34**	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
BH106	0-0.1	F: Silty Sandy Clay	**13**	**0.5**	**12**	**20**	**46**	**0.1**	**7**	**1300**	**0.2**	<0.5	<0.1	<0.1	<0.1	**0.8**	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
BH106 [LAB_DUP]	0-0.1	Laboratory Duplicate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.1	<0.1	<0.1	**0.8**	<0.1	<0.1	<0.1	NA	NA	NA
BH107	0.07-0.3	F: Silty Sand	<4	<0.4	**47**	**39**	**9**	<0.1	**15**	**47**	**0.61**	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
BH107	0.3-0.5	F: Silty Sandy Clay	**5**	<0.4	**19**	<1	**13**	<0.1	**1**	**3**	<0.05	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH108	0.1-0.2	F: Silty Sand	<4	<0.4	**4**	**4**	**2**	<0.1	**2**	**2**	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
BH108	0.2-0.3	F: Silty Sand	<4	<0.4	**7**	**5**	**8**	<0.1	**3**	**15**	<0.05	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH109	0.04-0.1	F: Silty Sand	<4	<0.4	**15**	**17**	**7**	<0.1	**7**	**25**	**0.8**	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
BH109	0.5-0.7	F: Silty Clay	<4	<0.4	**20**	**2**	**15**	<0.1	**3**	**7**	<0.05	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH109	3.8-4.0	XW Siltstone	<4	<0.4	**5**	**7**	**18**	<0.1	<1	<1	<0.05	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH110	0-0.1	F: Silty Clay	<4	<0.4	**14**	**16**	**22**	<0.1	**2**	**18**	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
BH111	0-0.1	F: Silty Clay	**10**	<0.4	**16**	**9**	**160**	<0.1	**2**	**82**	**0.4**	<0.5	<0.1	<0.1	<0.1	**1**	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
BH111	0.2-0.6	Silty Clay	**6**	<0.4	**17**	<1	**23**	<0.1	**1**	**5**	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA	NA	Not Detected
BH112	0-0.1	F: Silty Clay	**5**	<0.4	**17**	**72**	**110**	<0.1	**10**	**150**	**1.4**	<0.5	<0.1	<0.1	<0.1	**0.1**	<0.1	<0.1	<0.1	<0.1	**0.3**	Not Detected
BH112	0.7-1.0	Silty Clay	**4**	<0.4	**21**	<1	**19**	<0.1	**2**	**6**	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA	NA	NA
BH113	0-0.1	F: Silty Sandy Clay	**4**	<0.4	**15**	**10**	**32**	<0.1	**2**	**60**	**1**	<0.5	<0.1	<0.1	<0.1	**0.4**	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
BH113	0.7-1.0	Silty Clay	**5**	<0.4	**13**	<1	**20**	<0.1	<1	**1**	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA	NA	NA
BH114	0-0.1	F: Silty Clay	**4**	<0.4	**14**	**23**	**71**	<0.1	**3**	**140**	**0.95**	<0.5	<0.1	<0.1	<0.1	**1.3**	<0.1	<0.1	<0.1	<0.1	**0.6**	Not Detected
BH114	0.5-0.95	F: Silty Clay	**4**	<0.4	**15**	**37**	**71**	**0.1**	**4**	**140**	**0.09**	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH114	1.3-1.5	Silty Clay	**5**	<0.4	**11**	<1	**20**	<0.1	<1	**2**	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA	NA	NA
BH115	0-0.1	F: Silty Clay	<4	<0.4	**14**	**21**	**80**	**0.1**	**3**	**150**	**0.77**	<0.5	<0.1	<0.1	<0.1	**0.2**	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
BH115	0.8-1.0	Silty Clay	<4	<0.4	**14**	<1	**17**	<0.1	<1	**2**	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA	NA	NA
BH115 [LAB_DUP]	0.8-1.0	Laboratory Duplicate	<4	<0.4	**11**	<1	**16**	<0.1	<1	**2**	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA	NA	NA
SDUP1	0-0.1	Duplicate of BH115	<4	<0.4	**11**	**15**	**61**	**0.1**	**3**	**92**	**0.86**	<0.5	<0.1	<0.1	<0.1	**0.3**	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
SDUP2	0-0.1	Duplicate of BH113	**6**	<0.4	**19**	**15**	**55**	<0.1	**5**	**71**	**3.9**	**0.8**	<0.1	<0.1	<0.1	**0.2**	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
SDUP5	0-0.15	Duplicate of BH104	<4	<0.4	**3**	**8**	**6**	<0.1	**1**	**24**	<0.05	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
SDUP6	0-0.1	Duplicate of BH111	**14**	<0.4	**11**	**12**	**190**	**0.2**	**2**	**150**	**0.05**	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH111-FCF1	0.1-0.2	Fragment	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Detected
Total Number of Samples			37	37	37	37	37	37	37	37	37	37	26	26	26	26	26	26	26	19	19	19
Maximum Value			14	0.5	47	72	190	0.4	17	1300	3.9	0.8	<PQL	<PQL	<PQL	1.3	<PQL	<PQL	<PQL	<PQL	0.6	Detected

Concentration above the SAC **VALUE**
Concentration above the PQL **Bold**

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TABLE S2
SOIL LABORATORY RESULTS COMPARED TO HSLs
All data in mg/kg unless stated otherwise

					C_6-C_{10} (F1)	>C_{10}-C_{16} (F2)	Benzene	Toluene	Ethylbenzene	Xylenes	Naphthalene	Field PID Measurement
PQL - Envirolab Services					25	50	0.2	0.5	1	1	1	ppm
NEPM 2013 HSL Land Use Category					HSL-A/B: LOW/HIGH DENSITY RESIDENTIAL							
Sample Reference	**Sample Depth**	**Sample Description**	**Depth Category**	**Soil Category**								
BH101	0.05-0.2	F: Clayey Sand	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0
BH101 [LAB_DUP]	0.05-0.2	Laboratory Duplicate	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0
BH101	0.2-0.5	F: Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0
BH102	0.01-0.1	F: Silty Sand	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0
BH102	0.1-0.5	F: Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0
BH103	0.05-0.2	F: Clayey Sand	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0
BH103 [LAB_DUP]	0.05-0.2	Laboratory Duplicate	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0
BH103	0.2-0.5	F: Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0
BH103	0.8-1.0	Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0
BH104	0-0.15	F: Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0
BH104	0.2-0.5	Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0
BH105	0-0.1	F: Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0
BH106	0-0.1	F: Silty Sandy Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0
BH107	0.07-0.3	F: Silty Sand	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0
BH107 - [Silica Gel]	0.07-0.3	F: Silty Sand	0m to <1m	Sand	NA	<50	NA	NA	NA	NA	NA	NA
BH107	0.3-0.5	F: Silty Sandy Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0
BH108	0.1-0.2	F: Silty Sand	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0
BH108	0.2-0.3	F: Silty Sand	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0
BH109	0.04-0.1	F: Silty Sand	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0
BH109	0.5-0.7	F: Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0
BH109	3.8-4.0	XW Siltstone	2m to <4m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0
BH110	0-0.1	F: Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0
BH111	0-0.1	F: Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0
BH111	0.2-0.6	Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0
BH112	0-0.1	F: Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0
BH112	0.7-1.0	Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0
BH113	0-0.1	F: Silty Sandy Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0
BH113	0.7-1.0	Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0
BH114	0-0.1	F: Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0
BH114	0.5-0.95	F: Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0
BH114	1.3-1.5	Silty Clay	1m to <2m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0
BH115	0-0.1	F: Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0
BH115	0.8-1.0	Silty Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0
BH115 [LAB_DUP]	0.8-1.0	Laboratory Duplicate	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	0
SDUP1	0-0.1	Duplicate of BH115	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	NA
SDUP2	0-0.1	Duplicate of BH113	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	NA
SDUP5	0-0.15	Duplicate of BH104	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	NA
SDUP6	0-0.1	Duplicate of BH111	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	NA
Total Number of Samples					37	37	37	37	37	37	37	33
Maximum Value					<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL

Concentration above the SAC — **VALUE**
Concentration above the PQL — **Bold**
The guideline corresponding to the concentration above the SAC is highlighted in grey in the Site Assessment Criteria Table below

HSL SOIL ASSESSMENT CRITERIA

Sample Reference	**Sample Depth**	**Sample Description**	**Depth Category**	**Soil Category**	C_6-C_{10} (F1)	>C_{10}-C_{16} (F2)	Benzene	Toluene	Ethylbenzene	Xylenes	Naphthalene
BH101	0.05-0.2	F: Clayey Sand	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH101 [LAB_DUP]	0.05-0.2	Laboratory Duplicate	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH101	0.2-0.5	F: Silty Clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH102	0.01-0.1	F: Silty Sand	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH102	0.1-0.5	F: Silty Clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH103	0.05-0.2	F: Clayey Sand	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH103 [LAB_DUP]	0.05-0.2	Laboratory Duplicate	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH103	0.2-0.5	F: Silty Clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH103	0.8-1.0	Silty Clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH104	0-0.15	F: Silty Clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH104	0.2-0.5	Silty Clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH105	0-0.1	F: Silty Clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH106	0-0.1	F: Silty Sandy Clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH107	0.07-0.3	F: Silty Sand	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH107	0.3-0.5	F: Silty Sandy Clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH108	0.1-0.2	F: Silty Sand	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH108	0.2-0.3	F: Silty Sand	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH109	0.04-0.1	F: Silty Sand	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH109	0.5-0.7	F: Silty Clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH109	3.8-4.0	XW Siltstone	2m to <4m	Sand	110	440	0.5	310	NL	95	NL
BH110	0-0.1	F: Silty Clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH111	0-0.1	F: Silty Clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH111	0.2-0.6	Silty Clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH112	0-0.1	F: Silty Clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH112	0.7-1.0	Silty Clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH113	0-0.1	F: Silty Sandy Clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH113	0.7-1.0	Silty Clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH114	0-0.1	F: Silty Clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH114	0.5-0.95	F: Silty Clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH114	1.3-1.5	Silty Clay	1m to <2m	Sand	70	240	0.5	220	NL	60	NL
BH115	0-0.1	F: Silty Clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH115	0.8-1.0	Silty Clay	0m to <1m	Sand	45	110	0.5	160	55	40	3
BH115 [LAB-DUP]	0.8-1.0	Laboratory Duplicate	0m to <1m	Sand	45	110	0.5	160	55	40	3
SDUP1	0-0.1	Duplicate of BH115	0m to <1m	Sand	45	110	0.5	160	55	40	3
SDUP2	0-0.1	Duplicate of BH113	0m to <1m	Sand	45	110	0.5	160	55	40	3
SDUP5	0-0.15	Duplicate of BH104	0m to <1m	Sand	45	110	0.5	160	55	40	3
SDUP6	0-0.1	Duplicate of BH111	0m to <1m	Sand	45	110	0.5	160	55	40	3

TABLE S3
SOIL LABORATORY RESULTS COMPARED TO MANAGEMENT LIMITS
All data in mg/kg unless stated otherwise

			C_6-C_{10} (F1) plus BTEX	>C_{10}-C_{16} (F2) plus napthalene	>C_{16}-C_{34} (F3)	>C_{34}-C_{40} (F4)
PQL - Envirolab Services			25	50	100	100
NEPM 2013 Land Use Category			RESIDENTIAL, PARKLAND & PUBLIC OPEN SPACE			
Sample Reference	**Sample Depth**	**Soil Texture**				
BH101	0.05-0.2	Coarse	<25	<50	<100	<100
BH101 [LAB_DUP]	0.05-0.2	Coarse	<25	<50	<100	<100
BH101	0.2-0.5	Coarse	<25	<50	<100	<100
BH102	0.01-0.1	Coarse	<25	<50	<100	**110**
BH102	0.1-0.5	Coarse	<25	<50	<100	<100
BH103	0.05-0.2	Coarse	<25	<50	<100	**130**
BH103 [LAB_DUP]	0.05-0.2	Coarse	<25	<50	**120**	**170**
BH103	0.2-0.5	Coarse	<25	<50	<100	<100
BH103	0.8-1.0	Coarse	<25	<50	<100	<100
BH104	0-0.15	Coarse	<25	<50	<100	<100
BH104	0.2-0.5	Coarse	<25	<50	<100	<100
BH105	0-0.1	Coarse	<25	<50	<100	<100
BH106	0-0.1	Coarse	<25	<50	<100	<100
BH107	0.07-0.3	Coarse	<25	<50	**390**	**520**
BH107	0.3-0.5	Coarse	<25	<50	<100	<100
BH108	0.1-0.2	Coarse	<25	<50	<100	**130**
BH108	0.2-0.3	Coarse	<25	<50	<100	<100
BH109	0.04-0.1	Coarse	<25	<50	**230**	**370**
BH109	0.5-0.7	Coarse	<25	<50	<100	<100
BH109	3.8-4.0	Coarse	<25	<50	<100	<100
BH110	0-0.1	Coarse	<25	<50	<100	<100
BH111	0-0.1	Coarse	<25	<50	<100	<100
BH111	0.2-0.6	Coarse	<25	<50	<100	<100
BH112	0-0.1	Coarse	<25	<50	**140**	<100
BH112	0.7-1.0	Coarse	<25	<50	<100	<100
BH113	0-0.1	Coarse	<25	<50	<100	<100
BH113	0.7-1.0	Coarse	<25	<50	<100	<100
BH114	0-0.1	Coarse	<25	<50	<100	<100
BH114	0.5-0.95	Coarse	<25	<50	<100	<100
BH114	1.3-1.5	Coarse	<25	<50	<100	<100
BH115	0-0.1	Coarse	<25	<50	<100	<100
BH115	0.8-1.0	Coarse	<25	<50	<100	<100
BH115 [LAB_DUP]	0.8-1.0	Coarse	<25	<50	<100	<100
SDUP1	0-0.1	Coarse	<25	<50	<100	<100
SDUP2	0-0.1	Coarse	<25	<50	<100	<100
SDUP5	0-0.15	Coarse	<25	<50	<100	<100
SDUP6	0-0.1	Coarse	<25	<50	<100	<100
Total Number of Samples			37	37	37	37
Maximum Value			<PQL	<PQL	390	520

Concentration above the SAC — **VALUE**
Concentration above the PQL — **Bold**

MANAGEMENT LIMIT ASSESSMENT CRITERIA

Sample Reference	**Sample Depth**	**Soil Texture**	C_6-C_{10} (F1) plus BTEX	>C_{10}-C_{16} (F2) plus napthalene	>C_{16}-C_{34} (F3)	>C_{34}-C_{40} (F4)
BH101	0.05-0.2	Coarse	700	1000	2500	10000
BH101 [LAB_DUP]	0.05-0.2	Coarse	700	1000	2500	10000
BH101	0.2-0.5	Coarse	700	1000	2500	10000
BH102	0.01-0.1	Coarse	700	1000	2500	10000
BH102	0.1-0.5	Coarse	700	1000	2500	10000
BH103	0.05-0.2	Coarse	700	1000	2500	10000
BH103 [LAB_DUP]	0.05-0.2	Coarse	700	1000	2500	10000
BH103	0.2-0.5	Coarse	700	1000	2500	10000
BH103	0.8-1.0	Coarse	700	1000	2500	10000
BH104	0-0.15	Coarse	700	1000	2500	10000
BH104	0.2-0.5	Coarse	700	1000	2500	10000
BH105	0-0.1	Coarse	700	1000	2500	10000
BH106	0-0.1	Coarse	700	1000	2500	10000
BH107	0.07-0.3	Coarse	700	1000	2500	10000
BH107	0.3-0.5	Coarse	700	1000	2500	10000
BH108	0.1-0.2	Coarse	700	1000	2500	10000
BH108	0.2-0.3	Coarse	700	1000	2500	10000
BH109	0.04-0.1	Coarse	700	1000	2500	10000
BH109	0.5-0.7	Coarse	700	1000	2500	10000
BH109	3.8-4.0	Coarse	700	1000	2500	10000
BH110	0-0.1	Coarse	700	1000	2500	10000
BH111	0-0.1	Coarse	700	1000	2500	10000
BH111	0.2-0.6	Coarse	700	1000	2500	10000
BH112	0-0.1	Coarse	700	1000	2500	10000
BH112	0.7-1.0	Coarse	700	1000	2500	10000
BH113	0-0.1	Coarse	700	1000	2500	10000
BH113	0.7-1.0	Coarse	700	1000	2500	10000
BH114	0-0.1	Coarse	700	1000	2500	10000
BH114	0.5-0.95	Coarse	700	1000	2500	10000
BH114	1.3-1.5	Coarse	700	1000	2500	10000
BH115	0-0.1	Coarse	700	1000	2500	10000
BH115	0.8-1.0	Coarse	700	1000	2500	10000
BH115 [LAB-DUP]	0.8-1.0	Coarse	700	1000	2500	10000
SDUP1	0-0.1	Coarse	700	1000	2500	10000
SDUP2	0-0.1	Coarse	700	1000	2500	10000
SDUP5	0-0.15	Coarse	700	1000	2500	10000
SDUP6	0-0.1	Coarse	700	1000	2500	10000

TABLE S4
SOIL LABORATORY RESULTS COMPARED T0 DIRECT CONTACT CRITERIA
All data in mg/kg unless stated otherwise

Analyte		C_6-C_{10}	>C_{10}-C_{16}	>C_{16}-C_{34}	>C_{34}-C_{40}	Benzene	Toluene	Ethylbenzene	Xylenes	Naphthalene	PID
PQL - Envirolab Services		25	50	100	100	0.2	0.5	1	1	1	
CRC 2011 -Direct contact Criteria		5,600	4,200	5,800	8,100	140	21,000	5,900	17,000	2,200	
Site Use		HIGH DENSITY RESIDENTIAL - DIRECT SOIL CONTACT									
Sample Reference	**Sample Depth**										
BH101	0.05-0.2	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<1	0
BH101 [LAB_DUP]	0.05-0.2	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<1	0
BH101	0.2-0.5	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<1	0
BH102	0.01-0.1	<25	<50	<100	**110**	<0.2	<0.5	<1	<1	<1	0
BH102	0.1-0.5	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<1	0
BH103	0.05-0.2	<25	<50	<100	**130**	<0.2	<0.5	<1	<1	<1	0
BH103 [LAB_DUP]	0.05-0.2	<25	<50	**120**	**170**	<0.2	<0.5	<1	<1	<1	0
BH103	0.2-0.5	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<1	0
BH103	0.8-1.0	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<1	0
BH104	0-0.15	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<1	0
BH104	0.2-0.5	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<1	0
BH105	0-0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<1	0
BH106	0-0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<1	0
BH107	0.07-0.3	<25	<50	**390**	**520**	<0.2	<0.5	<1	<1	<1	0
BH107	0.3-0.5	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<1	0
BH108	0.1-0.2	<25	<50	<100	**130**	<0.2	<0.5	<1	<1	<1	0
BH108	0.2-0.3	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<1	0
BH109	0.04-0.1	<25	<50	**230**	**370**	<0.2	<0.5	<1	<1	<1	0
BH109	0.5-0.7	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<1	0
BH109	3.8-4.0	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<1	0
BH110	0-0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<1	0
BH111	0-0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<1	0
BH111	0.2-0.6	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<1	0
BH112	0-0.1	<25	<50	**140**	<100	<0.2	<0.5	<1	<1	<1	0
BH112	0.7-1.0	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<1	0
BH113	0-0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<1	0
BH113	0.7-1.0	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<1	0
BH114	0-0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<1	0
BH114	0.5-0.95	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<1	0
BH114	1.3-1.5	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<1	0
BH115	0-0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<1	0
BH115	0.8-1.0	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<1	0
BH115 [LAB_DUP]	0.8-1.0	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<1	0
SDUP1	0-0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<1	NA
SDUP2	0-0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<1	NA
SDUP5	0-0.15	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<1	NA
SDUP6	0-0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<1	NA
Total Number of Samples		37	37	37	37	37	37	37	37	37	33
Maximum Value		<PQL	<PQL	390	520	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL

Concentration above the SAC **VALUE**
Concentration above the PQL **Bold**

TABLE S5
ASBESTOS QUANTIFICATION - FIELD OBSERVATIONS AND LABORATORY RESULTS
HSL-B: Residential with minimal opportunities for soil access

FIELD DATA															LABORATORY DATA										
Date Sampled	Sample reference	Sample Depth	Visible ACM in top 100mm	Approx. Volume of Soil (L)	Soil Mass (g)	Mass ACM (g)	Mass Asbestos in ACM (g)	[Asbestos from ACM in soil] (%w/w)	Mass ACM <7mm (g)	Mass Asbestos in ACM <7mm (g)	[Asbestos from ACM <7mm in soil] (%w/w)	Mass FA (g)	Mass Asbestos in FA (g)	[Asbestos from FA in soil] (%w/w)	Lab Report Number	Sample refeference	Sample Depth	Sample Mass (g)	Asbestos ID in soil (AS4964) >0.1g/kg	Trace Analysis	Total Asbestos (g/kg)	Asbestos ID in soil <0.1g/kg	ACM >7mm Estimation (g)	FA and AF Estimation (g)	ACM >7mm Estimation %(w/w)	FA and AF Estimation %(w/w)
SAC			**No**					**0.04**			**0.001**			**0.001**											**0.04**	**0.001**
28/07/2022	BH101	0.05-0.2	No	--	3,003	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	--	--	--	--	--	--	--	--	--	--	--	--
28/07/2022	BH101	0.2-0.5	NA	--	3,980	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	302203	BH101	0.2-0.5	347.33	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
1/08/2022	BH102	0.01-0.1	No	--	5,400	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	302333	BH102	0.01-0.1	794.82	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
1/08/2022	BH102	0.1-0.5	NA	--	3,400	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	--	--	--	--	--	--	--	--	--	--	--	--
28/07/2022	BH103	0.05-0.2	No	--	14,300	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	302203	BH103	0.05-0.2	639.05	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
28/07/2022	BH103	0.2-0.6	NA	--	12,130	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	--	--	--	--	--	--	--	--	--	--	--	--
28/07/2022	BH104	0-0.15	No	--	10,500	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	302203	BH104	0-0.15	260	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
28/07/2022	BH105	0-0.15	No	--	11,520	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	302203	BH105	0-0.1	620	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
31/07/2022	BH106	0-0.2	No	--	10,460	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	302333	BH106	0-0.1	486.03	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
1/08/2022	BH107	0.07-0.3	No	--	2,510	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	302333	BH107	0.07-0.3	506.34	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
1/08/2022	BH107	0.2-0.5	NA	--	4,770	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	--	--	--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	302203	BH108	0.1-0.2	205.9	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
28/07/2022	BH108	0.3-1.2	NA	--	4,030	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1/08/2022	BH109	0.04-0.1	No	--	2,020	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	302333	BH109	0.04-0.1	716.62	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
1/08/2022	BH109	0.1-0.3	NA	--	5,250	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1/08/2022	BH109	0.3-0.7	NA	--	4,750	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	--	--	--	--	--	--	--	--	--	--	--	--
28/07/2022	BH110	0-0.1	No	--	10,300	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	302203	BH110	0-0.1	554.83	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
28/07/2022	BH110	0.1-0.6	NA	--	11,050	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	--	--	--	--	--	--	--	--	--	--	--	--
28/07/2022	BH111	0-0.1	No	--	10,200	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	302203	BH111	0-0.1	617.37	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
28/07/2022	BH111	0.1-0.2	NA	--	10,110	3.7	0.5505	0.0054	No ACM <7mm observed	--	--	No FA observed	--	--	--	--	--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	302203	BH111	0.2-0.6	593.83	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
28/07/2022	BH112	0-0.1	No	--	10,640	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	302203	BH112	0-0.1	662.52	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
28/07/2022	BH112	0.1-0.7	NA	--	10,300	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	--	--	--	--	--	--	--	--	--	--	--	--
28/07/2022	BH113	0-0.1	No	--	10,100	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	302203	BH113	0-0.1	659.13	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
28/07/2022	BH113	0.1-0.7	NA	--	14,600	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	--	--	--	--	--	--	--	--	--	--	--	--
29/07/2022	BH114	0-0.1	No	--	11,520	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	302333	BH114	0-0.1	626.97	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
29/07/2022	BH114	0.1-1.0	NA	--	10,220	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	--	--	--	--	--	--	--	--	--	--	--	--
28/07/2022	BH115	0-0.1	No	--	11,400	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	302203	BH115	0-0.1	628.46	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
28/07/2022	BH115	0.1-0.8	NA	--	9,800	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	--	--	--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	302203	SDUP1	--	464	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	–	–	<0.01	<0.001
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	32924	SDUP2	--	585	No Asbestos Detected >0.1g/kg	No trace fibres detected	<0.1	--	--	--	<0.01	<0.001

Concentration above the SAC **VALUE**

JKEnvironments

TABLE S6
SOIL LABORATORY RESULTS COMPARED TO NEPM 2013 EILs AND ESLs
All data in mg/kg unless stated otherwise

Land Use Category				URBAN RESIDENTIAL AND PUBLIC OPEN SPACE																	
							AGED HEAVY METALS-EILs						EILs		ESLs							
				pH	CEC (cmolc/kg)	Clay Content (% clay)	Arsenic	Chromium	Copper	Lead	Nickel	Zinc	Naphthalene	DDT	C_6-C_{10} (F1)	$>C_{10}$-C_{16} (F2)	$>C_{16}$-C_{34} (F3)	$>C_{34}$-C_{40} (F4)	Benzene	Toluene	Ethylbenzene	Total Xylenes	B(a)P
PQL - Envirolab Services				-	1	-	4	1	1	1	1	1	1	0.1	25	50	100	100	0.2	0.5	1	1	0.05
Ambient Background Concentration (ABC)				-	-	-	NSL	8	18	104	5	77	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL
Sample Reference	**Sample Depth**	**Sample Description**	**Soil Texture**																				
BH101	0.05-0.2	F: Clayey Sand	Coarse	NA	NA	NA	<4	**9**	**11**	**16**	**6**	**27**	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	**0.1**
BH101 [LAB_DUP]	0.05-0.2	Laboratory Duplicate	Coarse	NA	NA	NA	<4	**8**	**14**	**11**	**5**	**24**	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	**0.1**
BH101	0.2-0.5	F: Silty Clay	Coarse	NA	NA	NA	<4	**11**	**1**	**13**	**1**	**14**	<1	NA	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
BH102	0.01-0.1	F: Silty Sand	Coarse	NA	NA	NA	<4	**24**	**12**	**23**	**17**	**64**	<1	<0.1	<25	<50	<100	**110**	<0.2	<0.5	<1	<1	**0.05**
BH102	0.1-0.5	F: Silty Clay	Coarse	NA	NA	NA	<4	**17**	**1**	**18**	**3**	**11**	<1	NA	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
BH103	0.05-0.2	F: Clayey Sand	Coarse	NA	NA	NA	<4	**14**	**11**	**12**	**9**	**19**	<1	<0.1	<25	<50	<100	**130**	<0.2	<0.5	<1	<1	**0.1**
BH103 [LAB_DUP]	0.05-0.2	Laboratory Duplicate	Coarse	NA	NA	NA	<4	**14**	**9**	**13**	**10**	**20**	<1	<0.1	<25	<50	**120**	**170**	<0.2	<0.5	<1	<1	**0.1**
BH103	0.2-0.5	F: Silty Clay	Coarse	NA	NA	NA	<4	**14**	**3**	**13**	**3**	**11**	<1	NA	<25	<50	<100	<100	<0.2	<0.5	<1	<1	**0.08**
BH103	0.8-1.0	Silty Clay	Coarse	NA	NA	NA	**4**	**22**	<1	**13**	**1**	**2**	<1	NA	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
BH104	0-0.15	F: Silty Clay	Coarse	NA	NA	NA	<4	**3**	**8**	**6**	**1**	**21**	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
BH104	0.2-0.5	Silty Clay	Coarse	NA	NA	NA	**4**	**14**	**5**	**19**	**2**	**17**	<1	NA	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
BH105	0-0.1	F: Silty Clay	Coarse	NA	NA	NA	<4	**9**	**16**	**19**	**6**	**34**	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
BH106	0-0.1	F: Silty Sandy Clay	Coarse	**6.2**	**19**	NA	**13**	**12**	**20**	**46**	**7**	**1300**	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
BH106 [LAB_DUP]	0-0.1	Laboratory Duplicate	Coarse	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.1	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH107	0.07-0.3	F: Silty Sand	Coarse	NA	NA	NA	<4	**47**	**39**	**9**	**15**	**47**	<1	<0.1	<25	<50	**390**	**520**	<0.2	<0.5	<1	<1	**0.09**
BH107 - [Silica Gel]	0.07-0.3	F: Silty Sand	Coarse	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<50	**270**	**350**	NA	NA	NA	NA	NA
BH107	0.3-0.5	F: Silty Sandy Clay	Coarse	NA	NA	NA	**5**	**19**	<1	**13**	**1**	**3**	<1	NA	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
BH108	0.1-0.2	F: Silty Sand	Coarse	NA	NA	NA	<4	**4**	**4**	**2**	**2**	**2**	<1	<0.1	<25	<50	<100	**130**	<0.2	<0.5	<1	<1	<0.05
BH108	0.2-0.3	F: Silty Sand	Coarse	NA	NA	NA	<4	**7**	**5**	**8**	**3**	**15**	<1	NA	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
BH109	0.04-0.1	F: Silty Sand	Coarse	NA	NA	NA	<4	**15**	**17**	**7**	**7**	**25**	<1	<0.1	<25	<50	**230**	**370**	<0.2	<0.5	<1	<1	**0.08**
BH109	0.5-0.7	F: Silty Clay	Coarse	NA	NA	NA	<4	**20**	**2**	**15**	**3**	**7**	<1	NA	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
BH109	3.8-4.0	XW Siltstone	Coarse	NA	NA	NA	<4	**5**	**7**	**18**	<1	<1	<1	NA	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
BH110	0-0.1	F: Silty Clay	Coarse	NA	NA	NA	<4	**14**	**16**	**22**	**2**	**18**	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
BH111	0-0.1	F: Silty Clay	Coarse	NA	NA	NA	**10**	**16**	**9**	**160**	**2**	**82**	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	**0.09**
BH111	0.2-0.6	Silty Clay	Coarse	NA	NA	NA	**6**	**17**	<1	**23**	**1**	**5**	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
BH112	0-0.1	F: Silty Clay	Coarse	NA	NA	NA	**5**	**17**	**72**	**110**	**10**	**150**	<1	<0.1	<25	<50	**140**	<100	<0.2	<0.5	<1	<1	**0.2**
BH112	0.7-1.0	Silty Clay	Coarse	NA	NA	NA	**4**	**21**	<1	**19**	**2**	**6**	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
BH113	0-0.1	F: Silty Sandy Clay	Coarse	NA	NA	NA	**4**	**15**	**10**	**32**	**2**	**60**	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	**0.2**
BH113	0.7-1.0	Silty Clay	Coarse	NA	NA	NA	**5**	**13**	<1	**20**	<1	**1**	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
BH114	0-0.1	F: Silty Clay	Coarse	NA	NA	NA	**4**	**14**	**23**	**71**	**3**	**140**	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	**0.2**
BH114	0.5-0.95	F: Silty Clay	Coarse	NA	NA	NA	**4**	**15**	**37**	**71**	**4**	**140**	<1	NA	<25	<50	<100	<100	<0.2	<0.5	<1	<1	**0.09**
BH114	1.3-1.5	Silty Clay	Coarse	NA	NA	NA	**5**	**11**	<1	**20**	<1	**2**	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
BH115	0-0.1	F: Silty Clay	Coarse	NA	NA	NA	<4	**14**	**21**	**80**	**3**	**150**	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	**0.1**
BH115	0.8-1.0	Silty Clay	Coarse	NA	NA	NA	<4	**14**	<1	**17**	<1	**2**	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
BH115 [LAB-DUP]	0.8-1.0	Laboratory Duplicate	Coarse	NA	NA	NA	<4	**11**	<1	**16**	<1	**2**	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
SDUP1	0-0.1	Duplicate of BH115	Coarse	NA	NA	NA	<4	**11**	**15**	**61**	**3**	**92**	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	**0.2**
SDUP2	0-0.1	Duplicate of BH113	Coarse	NA	NA	NA	**6**	**19**	**15**	**55**	**5**	**71**	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<1	**0.58**
SDUP5	0-0.15	Duplicate of BH104	Coarse	NA	NA	NA	<4	**3**	**8**	**6**	**1**	**24**	<1	NA	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05
SDUP6	0-0.1	Duplicate of BH111	Coarse	NA	NA	NA	**14**	**11**	**12**	**190**	**2**	**150**	<1	NA	<25	<50	<100	<100	<0.2	<0.5	<1	<1	**0.05**
Total Number of Samples				2	2	1	38	38	38	38	38	38	38	27	37	38	38	38	38	38	38	38	38
Maximum Value				6.2	19	<PQL	14	47	72	190	17	1300	<PQL	<PQL	<PQL	<PQL	390	520	<PQL	<PQL	<PQL	<PQL	0.58

Concentration above the SAC **VALUE**
Concentration above the PQL **Bold**
The guideline corresponding to the elevated value is highlighted in grey in the EIL and ESL Assessment Criteria Table below

EIL AND ESL ASSESSMENT CRITERIA

Sample Reference	**Sample Depth**	**Sample Description**	**Soil Texture**	pH	CEC (cmolc/kg)	Clay Content (% clay)	Arsenic	Chromium	Copper	Lead	Nickel	Zinc	Naphthalene	DDT	C_6-C_{10} (F1)	$>C_{10}$-C_{16} (F2)	$>C_{16}$-C_{34} (F3)	$>C_{34}$-C_{40} (F4)	Benzene	Toluene	Ethylbenzene	Total Xylenes	B(a)P
BH101	0.05-0.2	F: Clayey Sand	Coarse	NA	NA	NA	100	200	80	1200	35	150	170	180	180	120	300	2800	50	85	70	105	20
BH101 [LAB_DUP]	0.05-0.2	Laboratory Duplicate	Coarse	NA	NA	NA	100	200	80	1200	35	150	170	180	180	120	300	2800	50	85	70	105	20
BH101	0.2-0.5	F: Silty Clay	Coarse	NA	NA	NA	100	200	80	1200	35	150	170	--	180	120	300	2800	50	85	70	105	20
BH102	0.01-0.1	F: Silty Sand	Coarse	NA	NA	NA	100	200	80	1200	35	150	170	180	180	120	300	2800	50	85	70	105	20
BH102	0.1-0.5	F: Silty Clay	Coarse	NA	NA	NA	100	200	80	1200	35	150	170	--	180	120	300	2800	50	85	70	105	20
BH103	0.05-0.2	F: Clayey Sand	Coarse	NA	NA	NA	100	200	80	1200	35	150	170	180	180	120	300	2800	50	85	70	105	20
BH103 [LAB_DUP]	0.05-0.2	Laboratory Duplicate	Coarse	NA	NA	NA	100	200	80	1200	35	150	170	180	180	120	300	2800	50	85	70	105	20
BH103	0.2-0.5	F: Silty Clay	Coarse	NA	NA	NA	100	200	80	1200	35	150	170	--	180	120	300	2800	50	85	70	105	20
BH103	0.8-1.0	Silty Clay	Coarse	NA	NA	NA	100	200	80	1200	35	150	170	--	180	120	300	2800	50	85	70	105	20
BH104	0-0.15	F: Silty Clay	Coarse	NA	NA	NA	100	200	80	1200	35	150	170	180	180	120	300	2800	50	85	70	105	20
BH104	0.2-0.5	Silty Clay	Coarse	NA	NA	NA	100	200	80	1200	35	150	170	--	180	120	300	2800	50	85	70	105	20
BH105	0-0.1	F: Silty Clay	Coarse	NA	NA	NA	100	200	80	1200	35	150	170	180	180	120	300	2800	50	85	70	105	20
BH106	0-0.1	F: Silty Sandy Clay	Coarse	**6.2**	**19**	NA	100	200	230	1200	280	670	170	180	180	120	300	2800	50	85	70	105	20
BH106 [LAB_DUP]	0-0.1	Laboratory Duplicate	Coarse	NA	NA	NA	--	--	--	--	--	--	--	180	--	--	--	--	--	--	--	--	--
BH107	0.07-0.3	F: Silty Sand	Coarse	NA	NA	NA	100	200	80	1200	35	150	170	180	180	120	300	2800	50	85	70	105	20
BH107 - [Silica Gel]	0.07-0.3	F: Silty Sand	Coarse				100	200	80	1200	35	150	170	180	--	120	300	2800	50	85	70	105	20
BH107	0.3-0.5	F: Silty Sandy Clay	Coarse	NA	NA	NA	100	200	80	1200	35	150	170	--	180	120	300	2800	50	85	70	105	20
BH108	0.1-0.2	F: Silty Sand	Coarse	NA	NA	NA	100	200	80	1200	35	150	170	180	180	120	300	2800	50	85	70	105	20
BH108	0.2-0.3	F: Silty Sand	Coarse	NA	NA	NA	100	200	80	1200	35	150	170	--	180	120	300	2800	50	85	70	105	20
BH109	0.04-0.1	F: Silty Sand	Coarse	NA	NA	NA	100	200	80	1200	35	150	170	180	180	120	300	2800	50	85	70	105	20
BH109	0.5-0.7	F: Silty Clay	Coarse	NA	NA	NA	100	200	80	1200	35	150	170	--	180	120	300	2800	50	85	70	105	20
BH109	3.8-4.0	XW Siltstone	Coarse	NA	NA	NA	100	200	80	1200	35	150	170	--	180	120	300	2800	50	85	70	105	20
BH110	0-0.1	F: Silty Clay	Coarse	NA	NA	NA	100	200	80	1200	35	150	170	180	180	120	300	2800	50	85	70	105	20
BH111	0-0.1	F: Silty Clay	Coarse	NA	NA	NA	100	200	80	1200	35	150	170	180	180	120	300	2800	50	85	70	105	20
BH111	0.2-0.6	Silty Clay	Coarse	NA	NA	NA	100	200	80	1200	35	150	170	180	180	120	300	2800	50	85	70	105	20
BH112	0-0.1	F: Silty Clay	Coarse	NA	NA	NA	100	200	80	1200	35	150	170	180	180	120	300	2800	50	85	70	105	20
BH112	0.7-1.0	Silty Clay	Coarse	NA	NA	NA	100	200	80	1200	35	150	170	180	180	120	300	2800	50	85	70	105	20
BH113	0-0.1	F: Silty Sandy Clay	Coarse	NA	NA	NA	100	200	80	1200	35	150	170	180	180	120	300	2800	50	85	70	105	20
BH113	0.7-1.0	Silty Clay	Coarse	NA	NA	NA	100	200	80	1200	35	150	170	180	180	120	300	2800	50	85	70	105	20
BH114	0-0.1	F: Silty Clay	Coarse	NA	NA	NA	100	200	80	1200	35	150	170	180	180	120	300	2800	50	85	70	105	20
BH114	0.5-0.95	F: Silty Clay	Coarse	NA	NA	NA	100	200	80	1200	35	150	170	--	180	120	300	2800	50	85	70	105	20
BH114	1.3-1.5	Silty Clay	Coarse	NA	NA	NA	100	200	80	1200	35	150	170	180	180	120	300	2800	50	85	70	105	20
BH115	0-0.1	F: Silty Clay	Coarse	NA	NA	NA	100	200	80	1200	35	150	170	180	180	120	300	2800	50	85	70	105	20
BH115	0.8-1.0	Silty Clay	Coarse	NA	NA	NA	100	200	80	1200	35	150	170	180	180	120	300	2800	50	85	70	105	20
BH115 [LAB-DUP]	0.8-1.0	Laboratory Duplicate	Coarse	NA	NA	NA	100	200	80	1200	35	150	170	180	180	120	300	2800	50	85	70	105	20
SDUP1	0-0.1	Duplicate of BH115	Coarse	NA	NA	NA	100	200	80	1200	35	150	170	180	180	120	300	2800	50	85	70	105	20
SDUP2	0-0.1	Duplicate of BH113	Coarse	NA	NA	NA	100	200	80	1200	35	150	170	180	180	120	300	2800	50	85	70	105	20
SDUP5	0-0.15	Duplicate of BH104	Coarse	NA	NA	NA	100	200	80	1200	35	150	170	--	180	120	300	2800	50	85	70	105	20
SDUP6	0-0.1	Duplicate of BH111	Coarse	NA	NA	NA	100	200	80	1200	35	150	170	--	180	120	300	2800	50	85	70	105	20

TABLE S7
SOIL LABORATORY RESULTS COMPARED TO WASTE CLASSIFICATION GUIDELINES
All data in mg/kg unless stated otherwise

			HEAVY METALS								PAHs		OC/OP PESTICIDES				Total PCBs	TRH					BTEX COMPOUNDS				ASBESTOS FIBRES
			Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Zinc	Total PAHs	B(a)P	Total Endosulfans	Chloropyrifos	Total Moderately Harmful	Total Scheduled		C_6-C_9	C_{10}-C_{14}	C_{15}-C_{28}	C_{29}-C_{36}	Total C_{10}-C_{36}	Benzene	Toluene	Ethyl benzene	Total Xylenes	
PQL - Envirolab Services			4	0.4	1	1	1	0.1	1	1	-	0.05	0.1	0.1	0.1	0.1	0.1	25	50	100	100	50	0.2	0.5	1	1	100
General Solid Waste CT1			100	20	100	NSL	100	4	40	NSL	200	0.8	60	4	250	50	50	650		NSL		10,000	10	288	600	1,000	-
General Solid Waste SCC1			500	100	1900	NSL	1500	50	1050	NSL	200	10	108	7.5	250	50	50	650		NSL		10,000	18	518	1,080	1,800	-
Restricted Solid Waste CT2			400	80	400	NSL	400	16	160	NSL	800	3.2	240	16	1000	50	50	2600		NSL		40,000	40	1,152	2,400	4,000	-
Restricted Solid Waste SCC2			2000	400	7600	NSL	6000	200	4200	NSL	800	23	432	30	1000	50	50	2600		NSL		40,000	72	2,073	4,320	7,200	-
Sample Reference	**Sample Depth**	**Sample Description**																									
BH101	0.05-0.2	F: Clayey Sand	<4	<0.4	**9**	**11**	**16**	<0.1	**6**	**27**	**0.76**	**0.1**	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<1	NA
BH101 [LAB_DUP]	0.05-0.2	Laboratory Duplicate	<4	<0.4	**8**	**14**	**11**	<0.1	**5**	**24**	**0.52**	**0.1**	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<1	NA
BH101	0.2-0.5	F: Silty Clay	<4	<0.4	**11**	**1**	**13**	<0.1	**1**	**14**	<0.05	<0.05	NA	NA	NA	NA	NA	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<1	Not Detected
BH102	0.01-0.1	F: Silty Sand	<4	<0.4	**24**	**12**	**23**	<0.1	**17**	**64**	**0.05**	**0.05**	<0.1	<0.1	<0.1	**0.2**	<0.1	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<1	Not Detected
BH102	0.1-0.5	F: Silty Clay	<4	<0.4	**17**	**1**	**18**	<0.1	**3**	**11**	<0.05	<0.05	NA	NA	NA	NA	NA	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<1	NA
BH103	0.05-0.2	F: Clayey Sand	<4	<0.4	**14**	**11**	**12**	<0.1	**9**	**19**	**0.77**	**0.1**	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<1	Not Detected
BH103 [LAB_DUP]	0.05-0.2	Laboratory Duplicate	<4	<0.4	**14**	**9**	**13**	<0.1	**10**	**20**	**0.62**	**0.1**	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	**110**	**110**	<0.2	<0.5	<1	<1	NA
BH103	0.2-0.5	F: Silty Clay	<4	<0.4	**14**	**3**	**13**	<0.1	**3**	**11**	**0.4**	**0.08**	NA	NA	NA	NA	NA	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<1	NA
BH103	0.8-1.0	Silty Clay	**4**	<0.4	**22**	<1	**13**	<0.1	**1**	**2**	<0.05	<0.05	NA	NA	NA	NA	NA	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<1	NA
BH104	0-0.15	F: Silty Clay	<4	<0.4	**3**	**8**	**6**	<0.1	**1**	**21**	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<1	Not Detected
BH104	0.2-0.5	Silty Clay	**4**	<0.4	**14**	**5**	**19**	<0.1	**2**	**17**	<0.05	<0.05	NA	NA	NA	NA	NA	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<1	NA
BH105	0-0.1	F: Silty Clay	<4	<0.4	**9**	**16**	**19**	**0.4**	**6**	**34**	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<1	Not Detected
BH106	0-0.1	F: Silty Sandy Clay	**13**	**0.5**	**12**	**20**	**46**	**0.1**	**7**	**1300**	**0.2**	<0.05	<0.1	<0.1	<0.1	**0.8**	<0.1	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<1	Not Detected
BH106 [LAB_DUP]	0-0.1	Laboratory Duplicate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.1	NA	NA	**0.8**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH107	0.07-0.3	F: Silty Sand	<4	<0.4	**47**	**39**	**9**	<0.1	**15**	**47**	**0.61**	**0.09**	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	**130**	**410**	**540**	<0.2	<0.5	<1	<1	Not Detected
BH107	0.3-0.5	F: Silty Sandy Clay	**5**	<0.4	**19**	<1	**13**	<0.1	**1**	**3**	<0.05	<0.05	NA	NA	NA	NA	NA	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<1	NA
BH108	0.1-0.2	F: Silty Sand	<4	<0.4	**4**	**4**	**2**	<0.1	**2**	**2**	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<1	Not Detected
BH108	0.2-0.3	F: Silty Sand	<4	<0.4	**7**	**5**	**8**	<0.1	**3**	**15**	<0.05	<0.05	NA	NA	NA	NA	NA	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<1	NA
BH109	0.04-0.1	F: Silty Sand	<4	<0.4	**15**	**17**	**7**	<0.1	**7**	**25**	**0.8**	**0.08**	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	**260**	**260**	<0.2	<0.5	<1	<1	Not Detected
BH109	0.5-0.7	F: Silty Clay	<4	<0.4	**20**	**2**	**15**	<0.1	**3**	**7**	<0.05	<0.05	NA	NA	NA	NA	NA	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<1	NA
BH109	3.8-4.0	XW Siltstone	<4	<0.4	**5**	**7**	**18**	<0.1	<1	<1	<0.05	<0.05	NA	NA	NA	NA	NA	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<1	NA
BH110	0-0.1	F: Silty Clay	<4	<0.4	**14**	**16**	**22**	<0.1	**2**	**18**	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<1	Not Detected
BH111	0-0.1	F: Silty Clay	**10**	<0.4	**16**	**9**	**160**	<0.1	**2**	**82**	**0.4**	**0.09**	<0.1	<0.1	<0.1	**1**	<0.1	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<1	Not Detected
BH111	0.2-0.6	Silty Clay	**6**	<0.4	**17**	<1	**23**	<0.1	**1**	**5**	<0.05	<0.05	<0.1	NA	NA	<0.1	NA	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<1	Not Detected
BH112	0-0.1	F: Silty Clay	**5**	<0.4	**17**	**72**	**110**	<0.1	**10**	**150**	**1.4**	**0.2**	<0.1	<0.1	<0.1	**0.1**	**0.3**	<25	<50	**100**	<100	**100**	<0.2	<0.5	<1	<1	Not Detected
BH112	0.7-1.0	Silty Clay	**4**	<0.4	**21**	<1	**19**	<0.1	**2**	**6**	<0.05	<0.05	<0.1	NA	NA	<0.1	NA	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<1	NA
BH113	0-0.1	F: Silty Sandy Clay	**4**	<0.4	**15**	**10**	**32**	<0.1	**2**	**60**	**1**	**0.2**	<0.1	<0.1	<0.1	**0.4**	<0.1	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<1	Not Detected
BH113	0.7-1.0	Silty Clay	**5**	<0.4	**13**	<1	**20**	<0.1	<1	**1**	<0.05	<0.05	<0.1	NA	NA	<0.1	NA	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<1	NA
BH114	0-0.1	F: Silty Clay	**4**	<0.4	**14**	**23**	**71**	<0.1	**3**	**140**	**0.95**	**0.2**	<0.1	<0.1	<0.1	**1.3**	**0.6**	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<1	Not Detected
BH114	0.5-0.95	F: Silty Clay	**4**	<0.4	**15**	**37**	**71**	**0.1**	**4**	**140**	**0.09**	**0.09**	NA	NA	NA	NA	NA	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<1	NA
BH114	1.3-1.5	Silty Clay	**5**	<0.4	**11**	<1	**20**	<0.1	<1	**2**	<0.05	<0.05	<0.1	NA	NA	<0.1	NA	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<1	NA
BH115	0-0.1	F: Silty Clay	<4	<0.4	**14**	**21**	**80**	**0.1**	**3**	**150**	**0.77**	**0.1**	<0.1	<0.1	<0.1	**0.2**	<0.1	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<1	Not Detected
BH115	0.8-1.0	Silty Clay	<4	<0.4	**14**	<1	**17**	<0.1	<1	**2**	<0.05	<0.05	<0.1	NA	NA	<0.1	NA	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<1	NA
BH115 [LAB_DUP]	0.8-1.0	Laboratory Duplicate	<4	<0.4	**11**	<1	**16**	<0.1	<1	**2**	<0.05	<0.05	<0.1	NA	NA	<0.1	NA	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<1	NA
SDUP1	0-0.1	Duplicate of BH115	<4	<0.4	**11**	**15**	**61**	**0.1**	**3**	**92**	**0.86**	**0.2**	<0.1	<0.1	<0.1	**0.3**	<0.1	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<1	Not Detected
SDUP2	0-0.1	Duplicate of BH113	**6**	<0.4	**19**	**15**	**55**	<0.1	**5**	**71**	**3.9**	**0.58**	<0.1	<0.1	<0.1	**0.2**	<0.1	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<1	Not Detected
SDUP5	0-0.15	Duplicate of BH104	<4	<0.4	**3**	**8**	**6**	<0.1	**1**	**24**	<0.05	<0.05	NA	NA	NA	NA	NA	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<1	NA
SDUP6	0-0.1	Duplicate of BH111	**14**	<0.4	**11**	**12**	**190**	**0.2**	**2**	**150**	**0.05**	**0.05**	NA	NA	NA	NA	NA	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<1	NA
BH111-FCF1	0.1-0.2	Fragment	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Detected
Total Number of Samples			37	37	37	37	37	37	37	37	37	37	26	19	19	26	19	37	37	37	37	37	37	37	37	37	19
Maximum Value			14	0.5	47	72	190	0.4	17	1300	3.9	0.58	<PQL	<PQL	<PQL	1.3	0.6	<PQL	<PQL	130	410	540	<PQL	<PQL	<PQL	<PQL	Detected

Concentration above the CT1 — **VALUE**
Concentration above SCC1 — **VALUE**
Concentration above the SCC2 — **VALUE**
Concentration above PQL — **Bold**

TABLE S8
SOIL LABORATORY TCLP RESULTS
All data in mg/L unless stated otherwise

			Arsenic	Cadmium	Chromium	Lead	Mercury	Nickel	B(a)P
PQL - Envirolab Services			0.05	0.01	0.01	0.03	0.0005	0.02	0.001
TCLP1 - General Solid Waste			5	1	5	5	0.2	2	0.04
TCLP2 - Restricted Solid Waste			20	4	20	20	0.8	8	0.16
TCLP3 - Hazardous Waste			>20	>4	>20	>20	>0.8	>8	>0.16
Sample Reference	**Sample Depth**	**Sample Description**							
BH111	0-0.1	F: Silty Clay	NA	NA	NA	**0.1**	NA	NA	NA
BH112	0-0.1	F: Silty Clay	NA	NA	NA	<0.03	NA	NA	NA
SDUP6	0-0.1	Duplicate of BH111	NA	NA	NA	**0.2**	NA	NA	NA
Total Number of samples			0	0	0	3	0	0	0
Maximum Value			NA	NA	NA	0.2	NA	NA	NA

General Solid Waste	**VALUE**
Restricted Solid Waste	**VALUE**
Hazardous Waste	**VALUE**
Concentration above PQL	**Bold**

TABLE S9
SUMMARY OF PFAS CONCENTRATIONS IN SOIL - ECOLOGY
Units are µg/Kg unless stated otherwise.

	PQL	NEMP 2020	BH101	BH101 [LAB_DUP]	BH102	BH103	BH103 [LAB_DUP]	BH104	BH105	BH106	BH107	BH108	BH109	BH110	BH111	BH112	BH113	BH114	BH115	SDUP1	SDUP2
	Envirolab	Indirect exposure	0.05-0.2	0.05-0.2	0.01-0.1	0.05-0.2	0.05-0.2	0-0.15	0-0.1	0-0.1	0.07-0.3	0.1-0.2	0.04-0.1	0-0.1	0-0.1	0-0.1	0-0.1	0-0.1	0-0.1	0-0.1	0-0.1
	Services	All land use	F: Clayey Sand	Laboratory Duplicate	F: Silty Sand	F: Clayey Sand	Laboratory Duplicate	F: Silty Clay	F: Silty Clay	F: Silty Sandy Clay	F: Silty Sand	F: Silty Sand	F: Silty Sand	F: Silty Clay	F: Silty Clay	F: Silty Clay	F: Silty Sandy Clay	F: Silty Clay	F: Silty Clay	Duplicate of BH115	Duplicate of BH113
PFAS Compound																					
Perfluorobutanesulfonic acid	0.1	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoropentanesulfonic acid	0.1	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluorohexanesulfonic acid - PFHxS	0.1	NSL	<0.1	<0.1	<0.1	<0.1	**0.2**	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	**0.2**	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoroheptanesulfonic acid	0.1	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluorooctanesulfonic acid PFOS	0.1	140	**0.4**	**0.4**	**0.3**	**2.4**	**2.6**	**0.7**	**2.4**	**2.1**	**1.2**	<0.1	<0.1	**0.3**	**1.0**	**7.8**	**0.3**	**1.1**	**2.1**	**1.7**	**0.5**
Perfluorodecanesulfonic acid	0.2	NSL	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	**0.2**	**3.0**	<0.2	<0.2	<0.2	<0.2	<0.2
Perfluorobutanoic acid	0.2	NSL	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	**0.3**	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Perfluoropentanoic acid	0.2	NSL	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	**0.2**	**0.6**	<0.2	<0.2	<0.2	<0.2	<0.2	**0.4**	<0.2	<0.2	<0.2	<0.2	<0.2
Perfluorohexanoic acid	0.1	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	**0.2**	**0.1**	<0.1	<0.1	<0.1	<0.1	<0.1	**0.2**	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoroheptanoic acid	0.1	NSL	<0.1	<0.1	<0.1	<0.1	**0.1**	<0.1	**0.1**	**0.2**	<0.1	<0.1	<0.1	<0.1	<0.1	**0.1**	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluorooctanoic acid PFOA	0.1	NSL	**0.3**	**0.2**	<0.1	**0.5**	**0.9**	**0.1**	**0.8**	**0.4**	**0.2**	<0.1	<0.1	<0.1	**0.1**	**0.5**	<0.1	**0.1**	**0.2**	**0.2**	<0.1
Perfluorononanoic acid	0.1	NSL	<0.1	<0.1	<0.1	**0.1**	<0.1	<0.1	<0.1	**0.5**	<0.1	<0.1	<0.1	<0.1	<0.1	**0.1**	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluorodecanoic acid	0.5	NSL	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Perfluoroundecanoic acid	0.5	NSL	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	**0.5**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Perfluorododecanoic acid	0.5	NSL	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Perfluorotridecanoic acid	0.5	NSL	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Perfluorotetradecanoic acid	5	NSL	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
4:2 FTS	0.1	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
6:2 FTS	0.1	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
8:2 FTS	0.1	NSL	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
10:2 FTS	0.1	NSL	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Perfluorooctane sulfonamide	1	NSL	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
N-Methyl perfluorooctane sulfonamide	1	NSL	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
N-Ethyl perfluorooctanesulfon amide	1	NSL	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
N-Me perfluorooctanesulfonamid oethanol	1	NSL	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
N-Et perfluorooctanesulfonamid oethanol	5	NSL	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
MePer uorooctanesulf-amid oacetic acid	0.2	NSL	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
EtPer uorooctanesulf-amid oacetic acid	0.2	NSL	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Total Positive PFHxS & PFOS	0.1	NSL	**0.4**	**0.4**	**0.3**	**2.4**	**2.8**	**0.7**	**2.4**	**2.1**	**1.2**	<0.1	<0.1	**0.3**	**1.0**	**7.9**	**0.3**	**1.1**	**2.1**	**1.7**	**0.5**
Total Positive PFOS & PFOA	0.1	NSL	**0.6**	**0.6**	**0.3**	**2.9**	**3.5**	**0.8**	**3.2**	**2.5**	**1.4**	<0.1	<0.1	**0.3**	**1.1**	**8.3**	**0.3**	**1.2**	**2.3**	**1.9**	**0.5**
Total Positive PFAS	0.1	NSL	**0.6**	**0.6**	**0.3**	**3.1**	**3.8**	**0.8**	**3.7**	**4.6**	**1.4**	<0.1	<0.1	**0.3**	**1.4**	**12**	**0.3**	**1.2**	**2.3**	**1.9**	**0.5**

Positive PFAS result **Bold**
PFAS result above the SAC **Bold**

TABLE S10
SUMMARY OF PFAS CONCENTRATIONS IN SOIL - HUMAN HEALTH
Units are µg/Kg unless stated otherwise.

	PQL	NEMP 2020	BH101	BH101 [LAB_DUP]	BH102	BH103	BH103 [LAB_DUP]	BH104	BH105	BH106	BH107	BH108	BH109	BH110	BH111	BH112	BH113	BH114	BH115	SDUP1	SDUP2
	Envirolab	Residential	0.05-0.2	0.05-0.2	0.01-0.1	0.05-0.2	0.05-0.2	0-0.15	0-0.1	0-0.1	0.07-0.3	0.1-0.2	0.04-0.1	0-0.1	0-0.1	0-0.1	0-0.1	0-0.1	0-0.1	0-0.1	0-0.1	0-0.1
	Services	min. access	F: Clayey Sand	Laboratory Duplicate	F: Silty Sand	F: Clayey Sand	Laboratory Duplicate	F: Silty Clay	F: Silty Clay	F: Silty Sandy Clay	F: Silty Sand	F: Silty Sand	F: Silty Sand	F: Silty Clay	F: Silty Clay	F: Silty Clay	F: Silty Sandy Clay	F: Silty Clay	F: Silty Clay	Duplicate of BH115	Duplicate of BH113
PFAS Compound																					
Perfluorobutanesulfonic acid	0.1	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	**<0.1**	**<0.1**	**<0.1**	**<0.1**	**<0.1**	**<0.1**
Perfluoropentanesulfonic acid	0.1	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluorohexanesulfonic acid - PFHxS	0.1	NSL	<0.1	<0.1	<0.1	<0.1	**0.2**	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	**0.2**	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoroheptanesulfonic acid	0.1	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluorooctanesulfonic acid PFOS	0.1	NSL	**0.4**	**0.4**	**0.3**	**2.4**	**2.6**	**0.7**	**2.4**	**2.1**	**1.2**	<0.1	<0.1	**0.3**	**1.0**	**7.8**	**0.3**	**1.1**	**2.1**	**1.7**	**0.5**
Perfluorodecanesulfonic acid	0.2	NSL	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	**0.2**	**3.0**	<0.2	<0.2	<0.2	<0.2	<0.2
Perfluorobutanoic acid	0.2	NSL	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	**0.3**	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Perfluoropentanoic acid	0.2	NSL	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	**0.2**	**0.6**	<0.2	<0.2	<0.2	<0.2	<0.2	**0.4**	<0.2	<0.2	<0.2	<0.2	<0.2
Perfluorohexanoic acid	0.1	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	**0.2**	**0.1**	<0.1	<0.1	<0.1	<0.1	<0.1	**0.2**	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoroheptanoic acid	0.1	NSL	<0.1	<0.1	<0.1	<0.1	**0.1**	<0.1	**0.1**	**0.2**	<0.1	<0.1	<0.1	<0.1	<0.1	**0.1**	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluorooctanoic acid PFOA	0.1	20,000	**0.3**	**0.2**	<0.1	**0.5**	**0.9**	**0.1**	**0.8**	**0.4**	**0.2**	<0.1	<0.1	<0.1	**0.1**	**0.5**	<0.1	**0.1**	**0.2**	**0.2**	<0.1
Perfluorononanoic acid	0.1	NSL	<0.1	<0.1	<0.1	**0.1**	<0.1	<0.1	<0.1	**0.5**	<0.1	<0.1	<0.1	<0.1	<0.1	**0.1**	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluorodecanoic acid	0.5	NSL	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Perfluoroundecanoic acid	0.5	NSL	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	**0.5**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Perfluorododecanoic acid	0.5	NSL	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Perfluorotridecanoic acid	0.5	NSL	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Perfluorotetradecanoic acid	5	NSL	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
4:2 FTS	0.1	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
6:2 FTS	0.1	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
8:2 FTS	0.1	NSL	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
10:2 FTS	0.1	NSL	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Perfluorooctane sulfonamide	1	NSL	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
N-Methyl perfluorooctane sulfonamide	1	NSL	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
N-Ethyl perfluorooctanesulfon amide	1	NSL	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
N-Me perfluorooctanesulfonamid oethanol	1	NSL	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
N-Et perfluorooctanesulfonamid oethanol	5	NSL	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
MePer uorooctanesulf-amid oacetic acid	0.2	NSL	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
EtPer uorooctanesulf-amid oacetic acid	0.2	NSL	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Total Positive PFHxS & PFOS	0.1	2,000	**0.4**	**0.4**	**0.3**	**2.4**	**2.8**	**0.7**	**2.4**	**2.1**	**1.2**	<0.1	<0.1	**0.3**	**1.0**	**7.9**	**0.3**	**1.1**	**2.1**	**1.7**	**0.5**
Total Positive PFOS & PFOA	0.1	NSL	**0.6**	**0.6**	**0.3**	**2.9**	**3.5**	**0.8**	**3.2**	**2.5**	**1.4**	<0.1	<0.1	**0.3**	**1.1**	**8.3**	**0.3**	**1.2**	**2.3**	**1.9**	**0.5**
Total Positive PFAS	0.1	NSL	**0.6**	**0.6**	**0.3**	**3.1**	**3.8**	**0.8**	**3.7**	**4.6**	**1.4**	<0.1	<0.1	**0.3**	**1.4**	**12**	**0.3**	**1.2**	**2.3**	**1.9**	**0.5**

Positive PFAS result **Bold**
PFAS result above the SAC **Bold**

TABLE S11
SUMMARY OF PFAS CONCENTRATIONS IN SOIL - WASTE CLASSIFICATION
Units are µg/Kg unless stated otherwise.

	PQL Envirolab Services	SCC1	SCC2	BH101 0.05-0.2 F: Clayey Sand	BH101 [LAB_DUP] 0.05-0.2 Laboratory Duplicate	BH102 0.01-0.1 F: Silty Sand	BH103 0.05-0.2 F: Clayey Sand	BH103 [LAB_DUP] 0.05-0.2 Laboratory Duplicate	BH104 0-0.15 F: Silty Clay	BH105 0-0.1 F: Silty Clay	BH106 0-0.1 F: Silty Sandy Clay	BH107 0.07-0.3 F: Silty Sand	BH108 0.1-0.2 F: Silty Sand	BH109 0.04-0.1 F: Silty Sand	BH110 0-0.1 F: Silty Clay	BH111 0-0.1 F: Silty Clay	BH112 0-0.1 F: Silty Clay	BH113 0-0.1 F: Silty Sandy Clay	BH114 0-0.1 F: Silty Clay	BH115 0-0.1 F: Silty Clay	SDUP1 0-0.1 Duplicate of BH115	SDUP2 0-0.1 Duplicate of BH113
PFAS Compound																							
Perfluorobutanesulfonic acid	0.1	NSL	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoropentanesulfonic acid	0.1	NSL	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluorohexanesulfonic acid - PFHxS	0.1	NSL	NSL	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoroheptanesulfonic acid	0.1	NSL	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluorooctanesulfonic acid PFOS	0.1	NSL	NSL	**0.4**	**0.4**	**0.3**	**2.4**	**2.6**	**0.7**	**2.4**	**2.1**	**1.2**	**<0.1**	**<0.1**	**0.3**	**1.0**	**7.8**	**0.3**	**1.1**	**2.1**	**1.7**	**0.5**
Perfluorodecanesulfonic acid	0.2	NSL	NSL	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	**0.2**	**3.0**	<0.2	<0.2	<0.2	<0.2	<0.2
Perfluorobutanoic acid	0.2	NSL	NSL	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	**0.3**	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Perfluoropentanoic acid	0.2	NSL	NSL	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	**0.2**	**0.6**	<0.2	<0.2	<0.2	<0.2	<0.2	**0.4**	<0.2	<0.2	<0.2	<0.2	<0.2
Perfluorohexanoic acid	0.1	NSL	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	**0.2**	**0.1**	<0.1	<0.1	<0.1	<0.1	<0.1	**0.2**	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoroheptanoic acid	0.1	NSL	NSL	<0.1	<0.1	<0.1	<0.1	**0.1**	<0.1	**0.1**	**0.2**	<0.1	<0.1	<0.1	<0.1	<0.1	**0.1**	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluorooctanoic acid PFOA	0.1	18,000	72,000	**0.3**	**0.2**	**<0.1**	**0.5**	**0.9**	**0.1**	**0.8**	**0.4**	**0.2**	<0.1	<0.1	<0.1	**0.1**	**0.5**	<0.1	**0.1**	**0.2**	**0.2**	<0.1
Perfluorononanoic acid	0.1	NSL	NSL	<0.1	<0.1	<0.1	**0.1**	<0.1	<0.1	<0.1	**0.5**	<0.1	<0.1	<0.1	<0.1	<0.1	**0.1**	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluorodecanoic acid	0.5	NSL	NSL	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Perfluoroundecanoic acid	0.5	NSL	NSL	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Perfluorododecanoic acid	0.5	NSL	NSL	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Perfluorotridecanoic acid	0.5	NSL	NSL	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Perfluorotetradecanoic acid	5	NSL	NSL	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
4:2 FTS	0.1	NSL	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
6:2 FTS	0.1	NSL	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
8:2 FTS	0.1	NSL	NSL	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
10:2 FTS	0.1	NSL	NSL	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Perfluorooctane sulfonamide	1	NSL	NSL	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
N-Methyl perfluorooctane sulfonamide	1	NSL	NSL	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
N-Ethyl perfluorooctanesulfon amide	1	NSL	NSL	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
N-Me perfluorooctanesulfonamid oethanol	1	NSL	NSL	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
N-Et perfluorooctanesulfonamid oethanol	5	NSL	NSL	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
MePer uorooctanesulf-amid oacetic acid	0.2	NSL	NSL	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
EtPer uorooctanesulf-amid oacetic acid	0.2	NSL	NSL	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Total Positive PFHxS & PFOS	0.1	1800	7,200	**0.4**	**0.4**	**0.3**	**2.4**	**2.8**	**0.7**	**2.4**	**2.1**	**1.2**	<0.1	<0.1	**0.3**	**1.0**	**7.9**	**0.3**	**1.1**	**2.1**	**1.7**	**0.5**
Total Positive PFOS & PFOA	0.1	NSL	NSL	**0.6**	**0.6**	**0.3**	**2.9**	**3.5**	**0.8**	**3.2**	**2.5**	**1.4**	<0.1	<0.1	**0.3**	**1.1**	**8.3**	**0.3**	**1.2**	**2.3**	**1.9**	**0.5**
Total Positive PFAS	0.1	NSL	NSL	**0.6**	**0.6**	**0.3**	**3.1**	**3.8**	**0.8**	**3.7**	**4.6**	**1.4**	<0.1	<0.1	**0.3**	**1.4**	**12**	**0.3**	**1.2**	**2.3**	**1.9**	**0.5**

Result above SCC1 Criteria **Bold**
Result above SCC2 Criteria **Bold**

TABLE S12
SUMMARY OF PFAS CONCENTRATIONS IN TCLP LEACHATE - WASTE CLASSIFICATION
Units are µg/L unless stated otherwise.

	PQL Envirolab Services	TCLP1	TCLP2	BH101 0.05-0.2	BH102 0.01-0.1	BH103 0.05-0.2	BH104 0-0.15	BH105 0-0.1	BH106 0-0.1	BH107 0.07-0.3	BH110 0-0.1	BH111 0-0.1	BH111 [LAB_DUP] 0-0.1	BH112 0-0.1	BH113 0-0.1	BH114 0-0.1	BH115 0-0.1	BH115 [LAB_DUP] 0-0.1
PFAS Compound																		
Perfluorobutanesulfonic acid	0.01	NSL	NSL	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Perfluoropentanesulfonic acid	0.01	NSL	NSL	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorohexanesulfonic acid - PFHxS	0.01	NSL	NSL	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Perfluoroheptanesulfonic acid	0.01	NSL	NSL	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorooctanesulfonic acid PFOS	0.01	NSL	NSL	**0.01**	**0.01**	**0.03**	<0.01	**0.03**	**0.02**	**0.02**	<0.01	**0.02**	**0.02**	**0.04**	<0.01	**0.01**	**0.01**	<0.01
Perfluorodecanesulfonic acid	0.02	NSL	NSL	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorobutanoic acid	0.02	NSL	NSL	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoropentanoic acid	0.02	NSL	NSL	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexanoic acid	0.01	NSL	NSL	<0.01	<0.01	<0.01	<0.01	<0.01	**0.01**	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Perfluoroheptanoic acid	0.01	NSL	NSL	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorooctanoic acid PFOA	0.01	500	2,000	<0.01	<0.01	<0.01	<0.01	**0.02**	<0.01	<0.01	<0.01	<0.01	<0.01	**0.01**	<0.01	<0.01	<0.01	<0.01
Perfluorononanoic acid	0.01	NSL	NSL	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorodecanoic acid	0.02	NSL	NSL	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid	0.02	NSL	NSL	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid	0.05	NSL	NSL	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Perfluorotridecanoic acid	0.1	NSL	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluorotetradecanoic acid	0.5	NSL	NSL	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
4:2 FTS	0.01	NSL	NSL	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
6:2 FTS	0.01	NSL	NSL	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
8:2 FTS	0.02	NSL	NSL	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
10:2 FTS	0.02	NSL	NSL	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorooctane sulfonamide	0.1	NSL	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
N-Methyl perfluorooctane sulfonamide	0.05	NSL	NSL	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctanesulfon amide	0.1	NSL	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
N-Me perfluorooctanesulfonamid oethanol	0.05	NSL	NSL	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
N-Et perfluorooctanesulfonamid oethanol	0.5	NSL	NSL	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
MePer uorooctanesulf-amid oacetic acid	0.02	NSL	NSL	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
EtPer uorooctanesulf-amid oacetic acid	0.02	NSL	NSL	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Total Positive PFHxS & PFOS	0.01	50	200	**0.01**	**0.01**	**0.03**	<0.01	**0.03**	**0.02**	**0.02**	<0.01	**0.02**	**0.02**	**0.04**	<0.01	**0.01**	**0.01**	<0.01
Total Positive PFOS & PFOA	0.01	NSL	NSL	**0.01**	**0.01**	**0.03**	<0.01	**0.05**	**0.02**	**0.02**	<0.01	**0.02**	**0.02**	**0.05**	<0.01	**0.01**	**0.01**	<0.01
Total Positive PFAS	0.01	NSL	NSL	**0.01**	**0.01**	**0.03**	<0.01	**0.05**	**0.03**	**0.02**	<0.01	**0.02**	**0.02**	**0.05**	<0.01	**0.01**	**0.01**	<0.01

Result above TCLP1 Criteria **Bold**
Result above TCLP2 Criteria **Bold**

TABLE G1
SUMMARY OF GROUNDWATER LABORATORY RESULTS COMPARED TO ECOLOGICAL GILs SAC
All results in µg/L unless stated otherwise.

	PQL Envirolab Services	ANZG 2018 Fresh Waters	SAMPLES									
			MW102	MW102 [LAB_DUP]	MW107	MW107 [LAB_DUP]	MW109	MW114	WDUP1	WDUP1 [LAB_DUP]	WDUP2	WDUP2 [LAB_DUP]
Inorganic Compounds and Parameters												
pH	-	6.5 - 8.5	4	[NT]	4.7	NA	4.5	5.6	NA	NA	NA	NA
Electrical Conductivity (µS/cm)	1	NSL	**1100**	[NT]	**520**	NA	**560**	**1400**	NA	NA	NA	NA
Total Recoverable Hydrocarbons (TRH)												
TRH F1	10	NSL	<10	NA	<10	<10	<10	<10	<10	NA	<10	NA
TRH F2	50	NSL	<50	NA	<50	NA	<50	<50	<50	[NT]	<50	NA
TRH F3	100	NSL	<100	NA	<100	NA	<100	<100	<100	<100	<100	NA
TRH F4	100	NSL	<100	NA	<100	NA	<100	<100	<100	<100	<100	NA
Metals and Metalloids												
Arsenic (As III)	1	24	<1	<1	<1	NA	<1	<1	<1	NA	<1	[NT]
Cadmium	0.1	0.2	<0.1	<0.1	**0.1**	NA	<0.1	<0.1	<0.1	NA	<0.1	[NT]
Chromium (SAC for Cr III adopted)	1	3.3	<1	<1	<1	NA	<1	<1	<1	NA	<1	[NT]
Copper	1	1.4	**4**	**4**	**2**	NA	**3**	**1**	**5**	NA	**2**	[NT]
Lead	1	3.4	<1	<1	<1	NA	<1	<1	<1	NA	<1	[NT]
Total Mercury (inorganic)	0.05	0.06	<0.05	<0.05	<0.05	NA	<0.05	<0.05	<0.05	NA	<0.05	<0.05
Nickel	1	11	**3**	**3**	**3**	NA	<1	**14**	<1	NA	**3**	[NT]
Zinc	1	8	**26**	**26**	**31**	NA	**12**	**70**	**13**	NA	**37**	[NT]
Monocyclic Aromatic Hydrocarbons (BTEX Compounds)												
Benzene	1	950	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
Toluene	1	180	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
Ethylbenzene	1	80	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
m+p-xylene	2	75	<2	NA	<2	<2	<2	<2	<2	NA	<2	NA
o-xylene	1	350	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
Total xylenes	2	NSL	<2	NA	<2	<2	<2	<2	<2	NA	<2	NA
Volatile Organic Compounds (VOCs), including chlorinated VOCs												
Dichlorodifluoromethane	10	NSL	<10	NA	<10	<10	<10	<10	<10	NA	<10	NA
Chloromethane	10	NSL	<10	NA	<10	<10	<10	<10	<10	NA	<10	NA
Vinyl Chloride	10	100	<10	NA	<10	<10	<10	<10	<10	NA	<10	NA
Bromomethane	10	NSL	<10	NA	<10	<10	<10	<10	<10	NA	<10	NA
Chloroethane	10	NSL	<10	NA	<10	<10	<10	<10	<10	NA	<10	NA
Trichlorofluoromethane	10	NSL	<10	NA	<10	<10	<10	<10	<10	NA	<10	NA
1,1-Dichloroethene	1	700	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
Trans-1,2-dichloroethene	1	NSL	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
1,1-dichloroethane	1	90	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
Cis-1,2-dichloroethene	1	NSL	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
Bromochloromethane	1	NSL	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
Chloroform	1	370	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
2,2-dichloropropane	1	NSL	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
1,2-dichloroethane	1	1900	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
1,1,1-trichloroethane	1	270	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
1,1-dichloropropene	1	NSL	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
Cyclohexane	1	NSL	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
Carbon tetrachloride	1	240	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
Benzene	1	950	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
Dibromomethane	1	NSL	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
1,2-dichloropropane	1	900	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
Trichloroethene	1	330	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
Bromodichloromethane	1	NSL	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
trans-1,3-dichloropropene	1	NSL	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
cis-1,3-dichloropropene	1	NSL	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
1,1,2-trichloroethane	1	6500	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
Toluene	1	180	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
1,3-dichloropropane	1	1100	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
Dibromochloromethane	1	NSL	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
1,2-dibromoethane	1	NSL	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
Tetrachloroethene	1	70	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
1,1,1,2-tetrachloroethane	1	NSL	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
Chlorobenzene	1	55	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
Ethylbenzene	1	80	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
Bromoform	1	NSL	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
m+p-xylene	2	75	<2	NA	<2	<2	<2	<2	<2	NA	<2	NA
Styrene	1	NSL	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
1,1,2,2-tetrachloroethane	1	400	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
o-xylene	1	350	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
1,2,3-trichloropropane	1	NSL	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
Isopropylbenzene	1	30	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
Bromobenzene	1	NSL	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
n-propyl benzene	1	NSL	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
2-chlorotoluene	1	NSL	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
4-chlorotoluene	1	NSL	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
1,3,5-trimethyl benzene	1	NSL	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
Tert-butyl benzene	1	NSL	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
1,2,4-trimethyl benzene	1	NSL	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
1,3-dichlorobenzene	1	260	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
Sec-butyl benzene	1	NSL	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
1,4-dichlorobenzene	1	60	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
4-isopropyl toluene	1	NSL	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
1,2-dichlorobenzene	1	160	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
n-butyl benzene	1	NSL	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
1,2-dibromo-3-chloropropane	1	NSL	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
1,2,4-trichlorobenzene	1	85	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
Hexachlorobutadiene	1	NSL	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
1,2,3-trichlorobenzene	1	3	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
Polycyclic Aromatic Hydrocarbons (PAHs)												
Naphthalene	0.2	16	<0.2	NA	<0.2	NA	<0.2	<0.2	<0.2	<0.2	<0.1	NA
Acenaphthylene	0.1	NSL	<0.1	NA	<0.1	NA	<0.1	<0.1	<0.1	<0.1	<0.1	NA
Acenaphthene	0.1	NSL	<0.1	NA	<0.1	NA	<0.1	<0.1	<0.1	<0.1	<0.1	NA
Fluorene	0.1	NSL	<0.1	NA	<0.1	NA	<0.1	<0.1	<0.1	<0.1	<0.1	NA
Phenanthrene	0.1	0.6	<0.1	NA	<0.1	NA	<0.1	<0.1	<0.1	<0.1	<0.1	NA
Anthracene	0.1	0.01	<0.1	NA	<0.1	NA	<0.1	<0.1	<0.1	<0.1	<0.1	NA
Fluoranthene	0.1	1	<0.1	NA	<0.1	NA	<0.1	<0.1	<0.1	<0.1	<0.1	NA
Pyrene	0.1	NSL	<0.1	NA	<0.1	NA	<0.1	<0.1	<0.1	<0.1	<0.1	NA
Benzo(a)anthracene	0.1	NSL	<0.1	NA	<0.1	NA	<0.1	<0.1	<0.1	<0.1	<0.1	NA
Chrysene	0.1	NSL	<0.1	NA	<0.1	NA	<0.1	<0.1	<0.1	<0.1	<0.1	NA
Benzo(b,j+k)fluoranthene	0.2	NSL	<0.2	NA	<0.2	NA	<0.2	<0.2	<0.2	<0.2	<0.2	NA
Benzo(a)pyrene	0.1	0.1	<0.1	NA	<0.1	NA	<0.1	<0.1	<0.1	<0.1	<0.1	NA
Indeno(1,2,3-c,d)pyrene	0.1	NSL	<0.1	NA	<0.1	NA	<0.1	<0.1	<0.1	<0.1	<0.1	NA
Dibenzo(a,h)anthracene	0.1	NSL	<0.1	NA	<0.1	NA	<0.1	<0.1	<0.1	<0.1	<0.1	NA
Benzo(g,h,i)perylene	0.1	NSL	<0.1	NA	<0.1	NA	<0.1	<0.1	<0.1	<0.1	<0.1	NA

Concentration above the SAC	**VALUE**
Concentration above the PQL	**Bold**
GIL >PQL	Red

TABLE G2
SUMMARY OF GROUNDWATER LABORATORY RESULTS COMPARED TO HUMAN CONTACT GILs
All results in µg/L unless stated otherwise.

	PQL Envirolab Services	Recreational (10 x NHMRC ADWG)	SAMPLES									
			MW102	MW102 [LAB_DUP]	MW107	MW107 [LAB_DUP]	MW109	MW114	WDUP1	WDUP1 [LAB_DUP]	WDUP2	WDUP2 [LAB_DUP]
Inorganic Compounds and Parameters												
pH	-	NSL	4	[NT]	4.7	NA	4.5	5.6	NA	NA	NA	NA
Electrical Conductivity (µS/cm)	1	NSL	**1100**	[NT]	**520**	NA	**560**	**1400**	NA	NA	NA	NA
Total Recoverable Hydrocarbons (TRH)												
TRH F1	10	NSL	<10	NA	<10	<10	<10	<10	<10	NA	<10	NA
TRH F2	50	NSL	<50	NA	<50	NA	<50	<50	<50	[NT]	<50	NA
TRH F3	100	NSL	<100	NA	<100	NA	<100	<100	<100	<100	<100	NA
TRH F4	100	NSL	<100	NA	<100	NA	<100	<100	<100	<100	<100	NA
Metals and Metalloids												
Arsenic (As III)	1	100	<1	<1	<1	NA	<1	<1	<1	NA	<1	[NT]
Cadmium	0.1	20	<0.1	<0.1	**0.1**	NA	<0.1	<0.1	<0.1	NA	<0.1	[NT]
Chromium (total)	1	500	<1	<1	<1	NA	<1	<1	<1	NA	<1	[NT]
Copper	1	20000	**4**	**4**	**2**	NA	**3**	**1**	**5**	NA	**2**	[NT]
Lead	1	100	<1	<1	<1	NA	<1	<1	<1	NA	<1	[NT]
Total Mercury (inorganic)	0.05	10	<0.05	<0.05	<0.05	NA	<0.05	<0.05	<0.05	NA	<0.05	<0.05
Nickel	1	200	**3**	**3**	**3**	NA	<1	**14**	<1	NA	**3**	[NT]
Zinc	1	30000	**26**	**26**	**31**	NA	**12**	**70**	**13**	NA	**37**	[NT]
Monocyclic Aromatic Hydrocarbons (BTEX Compounds)												
Benzene	1	10	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
Toluene	1	8000	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
Ethylbenzene	1	3000	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
m+p-xylene	2	NSL	<2	NA	<2	<2	<2	<2	<2	NA	<2	NA
o-xylene	1	NSL	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
Total xylenes	2	6000	<2	NA	<2	<2	<2	<2	<2	NA	<2	NA
Volatile Organic Compounds (VOCs), including chlorinated VOCs												
Dichlorodifluoromethane	10	NSL	<10	NA	<10	<10	<10	<10	<10	NA	<10	NA
Chloromethane	10	NSL	<10	NA	<10	<10	<10	<10	<10	NA	<10	NA
Vinyl Chloride	10	3	<10	NA	<10	<10	<10	<10	<10	NA	<10	NA
Bromomethane	10	NSL	<10	NA	<10	<10	<10	<10	<10	NA	<10	NA
Chloroethane	10	NSL	<10	NA	<10	<10	<10	<10	<10	NA	<10	NA
Trichlorofluoromethane	10	NSL	<10	NA	<10	<10	<10	<10	<10	NA	<10	NA
1,1-Dichloroethene	1	300	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
Trans-1,2-dichloroethene	1	600	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
1,1-dichloroethane	1	NSL	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
Cis-1,2-dichloroethene	1	600	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
Bromochloromethane	1	2500	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
Chloroform	1		<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
2,2-dichloropropane	1	NSL	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
1,2-dichloroethane	1	30	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
1,1,1-trichloroethane	1	NSL	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
1,1-dichloropropene	1	NSL	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
Cyclohexane	1	NSL	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
Carbon tetrachloride	1	30	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
Benzene	1	10	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
Dibromomethane	1	NSL	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
1,2-dichloropropane	1	NSL	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
Trichloroethene	1	NSL	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
Bromodichloromethane	1	NSL	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
trans-1,3-dichloropropene	1	1000	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
cis-1,3-dichloropropene	1	1000	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
1,1,2-trichloroethane	1	NSL	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
Toluene	1	8000	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
1,3-dichloropropane	1	NSL	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
Dibromochloromethane	1	NSL	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
1,2-dibromoethane	1	NSL	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
Tetrachloroethene	1	500	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
1,1,1,2-tetrachloroethane	1	NSL	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
Chlorobenzene	1	3000	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
Ethylbenzene	1	3000	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
Bromoform	1	NSL	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
m+p-xylene	2	NSL	<2	NA	<2	<2	<2	<2	<2	NA	<2	NA
Styrene	1	300	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
1,1,2,2-tetrachloroethane	1	NSL	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
o-xylene	1	NSL	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
1,2,3-trichloropropane	1	NSL	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
Isopropylbenzene	1	NSL	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
Bromobenzene	1	NSL	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
n-propyl benzene	1	NSL	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
2-chlorotoluene	1	NSL	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
4-chlorotoluene	1	NSL	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
1,3,5-trimethyl benzene	1	NSL	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
Tert-butyl benzene	1	NSL	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
1,2,4-trimethyl benzene	1	NSL	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
1,3-dichlorobenzene	1	200	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
Sec-butyl benzene	1	NSL	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
1,4-dichlorobenzene	1	400	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
4-isopropyl toluene	1	NSL	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
1,2-dichlorobenzene	1	15000	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
n-butyl benzene	1	NSL	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
1,2-dibromo-3-chloropropane	1	NSL	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
1,2,4-trichlorobenzene	1	300	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
1,2,3-trichlorobenzene	1		<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
Hexachlorobutadiene	1	7	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
Polycyclic Aromatic Hydrocarbons (PAHs)												
Naphthalene	0.2	NSL	<0.2	NA	<0.2	NA	<0.2	<0.2	<0.2	<0.2	<0.1	NA
Acenaphthylene	0.1	NSL	<0.1	NA	<0.1	NA	<0.1	<0.1	<0.1	<0.1	<0.1	NA
Acenaphthene	0.1	NSL	<0.1	NA	<0.1	NA	<0.1	<0.1	<0.1	<0.1	<0.1	NA
Fluorene	0.1	NSL	<0.1	NA	<0.1	NA	<0.1	<0.1	<0.1	<0.1	<0.1	NA
Phenanthrene	0.1	NSL	<0.1	NA	<0.1	NA	<0.1	<0.1	<0.1	<0.1	<0.1	NA
Anthracene	0.1	NSL	<0.1	NA	<0.1	NA	<0.1	<0.1	<0.1	<0.1	<0.1	NA
Fluoranthene	0.1	NSL	<0.1	NA	<0.1	NA	<0.1	<0.1	<0.1	<0.1	<0.1	NA
Pyrene	0.1	NSL	<0.1	NA	<0.1	NA	<0.1	<0.1	<0.1	<0.1	<0.1	NA
Benzo(a)anthracene	0.1	NSL	<0.1	NA	<0.1	NA	<0.1	<0.1	<0.1	<0.1	<0.1	NA
Chrysene	0.1	NSL	<0.1	NA	<0.1	NA	<0.1	<0.1	<0.1	<0.1	<0.1	NA
Benzo(b,j+k)fluoranthene	0.2	NSL	<0.2	NA	<0.2	NA	<0.2	<0.2	<0.2	<0.2	<0.2	NA
Benzo(a)pyrene	0.1	0.1	<0.1	NA	<0.1	NA	<0.1	<0.1	<0.1	<0.1	<0.1	NA
Indeno(1,2,3-c,d)pyrene	0.1	NSL	<0.1	NA	<0.1	NA	<0.1	<0.1	<0.1	<0.1	<0.1	NA
Dibenzo(a,h)anthracene	0.1	NSL	<0.1	NA	<0.1	NA	<0.1	<0.1	<0.1	<0.1	<0.1	NA
Benzo(g,h,i)perylene	0.1	NSL	<0.1	NA	<0.1	NA	<0.1	<0.1	<0.1	<0.1	<0.1	NA

Concentration above the SAC — **VALUE**
Concentration above the PQL — **Bold**
GIL >PQL — Red

TABLE G3
GROUNDWATER LABORATORY RESULTS COMPARED TO SITE SPECIFIC HSLs - RISK ASSESSMENT
All results in µg/L unless stated otherwise.

	PQL Envirolab Services	NHMRC ADWG 2011	WHO 2008	USEPA RSL Tapwater	SAMPLES									
					MW102	MW102 [LAB_DUP]	MW107	MW107 [LAB_DUP]	MW109	MW114	WDUP1	WDUP1 [LAB_DUP]	WDUP2	WDUP2 [LAB_DUP]
Total Recoverable Hydrocarbons (TRH)														
C_6-C_9 Aliphatics (assessed using F1)	10	-	15000	-	<10	NA	<10	<10	<10	<10	<10	NA	<10	NA
>C_9-C_{14} Aliphatics (assessed using F2)	50	-	100	-	<50	NA	<50	NA	<50	<50	<50	[NT]	<50	NA
Monocyclic Aromatic Hydrocarbons (BTEX Compounds)														
Benzene	1	1	-	-	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
Toluene	1	800	-	-	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
Ethylbenzene	1	300	-	-	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
Total xylenes	2	600	-	-	<2	NA	<2	<2	<2	<2	<2	NA	<2	NA
Polycyclic Aromatic Hydrocarbons (PAHs)														
Naphthalene	1	-	-	6.1	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
Volatile Organic Compounds (VOCs), including chlorinated VOCs														
Dichlorodifluoromethane	10	-	-	-	<10	NA	<10	<10	<10	<10	<10	NA	<10	NA
Chloromethane	10	-	-	-	<10	NA	<10	<10	<10	<10	<10	NA	<10	NA
Vinyl Chloride	10	0.3	-	-	<10	NA	<10	<10	<10	<10	<10	NA	<10	NA
Bromomethane	10	-	-	-	<10	NA	<10	<10	<10	<10	<10	NA	<10	NA
Chloroethane	10	-	-	-	<10	NA	<10	<10	<10	<10	<10	NA	<10	NA
Trichlorofluoromethane	10	-	-	-	<10	NA	<10	<10	<10	<10	<10	NA	<10	NA
1,1-Dichloroethene	1	30	-	-	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
Trans-1,2-dichloroethene	1	60	-	-	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
1,1-dichloroethane	1	-	-	-	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
Cis-1,2-dichloroethene	1	60	-	-	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
Bromochloromethane	1	250	-	-	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
Chloroform	1		-	-	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
2,2-dichloropropane	1	-	-	-	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
1,2-dichloroethane	1	3	-	-	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
1,1,1-trichloroethane	1	-	-	-	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
1,1-dichloropropene	1	-	-	-	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
Cyclohexane	1	-	-	-	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
Carbon tetrachloride	1	3	-	-	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
Benzene	1	1	-	-	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
Dibromomethane	1	-	-	-	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
1,2-dichloropropane	1	-	-	-	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
Trichloroethene	1	-	-	-	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
Bromodichloromethane	1	-	-	-	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
trans-1,3-dichloropropene	1	100	-	-	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
cis-1,3-dichloropropene	1	100	-	-	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
1,1,2-trichloroethane	1	-	-	-	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
Toluene	1	800	-	-	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
1,3-dichloropropane	1	-	-	-	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
Dibromochloromethane	1	-	-	-	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
1,2-dibromoethane	1	-	-	-	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
Tetrachloroethene	1	50	-	-	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
1,1,1,2-tetrachloroethane	1	-	-	-	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
Chlorobenzene	1	300	-	-	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
Ethylbenzene	1	300	-	-	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
Bromoform	1	-	-	-	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
m+p-xylene	2	-	-	-	<2	NA	<2	<2	<2	<2	<2	NA	<2	NA
Styrene	1	30	-	-	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
1,1,2,2-tetrachloroethane	1	-	-	-	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
o-xylene	1	-	-	-	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
1,2,3-trichloropropane	1	-	-	-	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
Isopropylbenzene	1	-	-	-	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
Bromobenzene	1	-	-	-	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
n-propyl benzene	1	-	-	-	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
2-chlorotoluene	1	-	-	-	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
4-chlorotoluene	1	-	-	-	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
1,3,5-trimethyl benzene	1	-	-	-	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
Tert-butyl benzene	1	-	-	-	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
1,2,4-trimethyl benzene	1	-	-	-	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
1,3-dichlorobenzene	1	20	-	-	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
Sec-butyl benzene	1	-	-	-	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
1,4-dichlorobenzene	1	40	-	-	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
4-isopropyl toluene	1	-	-	-	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
1,2-dichlorobenzene	1	1500	-	-	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
n-butyl benzene	1	-	-	-	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
1,2-dibromo-3-chloropropane	1	-	-	-	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
1,2,4-trichlorobenzene	1	30	-	-	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
1,2,3-trichlorobenzene	1		-	-	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA
Hexachlorobutadiene	1	0.7	-	-	<1	NA	<1	<1	<1	<1	<1	NA	<1	NA

Concentration above the SAC	**VALUE**
Concentration above the PQL	**Bold**
GIL >PQL	Red

TABLE G4
SUMMARY OF PFAS CONCENTRATIONS IN GROUNDWATER - ECOLOGY
All results in µg/L unless stated otherwise.

	PQL Envirolab Services	NEMP 2020 99% Freshwater	SAMPLES							
			MW102	MW102 [LAB_DUP]	MW107	MW109	MW114	WDUP1	WDUP2	WDUP 2 [LAB_DUP]
PFAS Compound										
Perfluorobutanesulfonic acid	0.0004	NSL	**0.0071**	**0.0069**	**0.0057**	**0.003**	<0.0004	**0.003**	**0.0069**	**0.0053**
Perfluoropentanesulfonic acid	0.001	NSL	**0.004**	**0.004**	**0.004**	**0.001**	<0.001	<0.001	**0.0044**	**0.0038**
Perfluorohexanesulfonic acid - PFHxS	0.0002	NSL	**0.0054**	**0.0052**	**0.029**	**0.0046**	<0.0002	**0.0045**	**0.0241**	**0.0213**
Perfluoroheptanesulfonic acid	0.001	NSL	<0.001	<0.001	**0.001**	<0.001	<0.001	<0.001	**0.001**	<0.0005
Perfluorooctanesulfonic acid PFOS	0.0002	0.00023	**0.0008**	**0.0008**	**0.0077**	**0.0041**	<0.0002	**0.0042**	**0.0046**	**0.0039**
Perfluorodecanesulfonic acid	0.002	NSL	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.0005	<0.0005
Perfluorobutanoic acid	0.002	NSL	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	**0.0081**	**0.0071**
Perfluoropentanoic acid	0.002	NSL	**0.02**	**0.02**	**0.025**	**0.007**	<0.002	**0.007**	**0.0353**	**0.033**
Perfluorohexanoic acid	0.0004	NSL	**0.02**	**0.02**	**0.018**	**0.0071**	<0.0004	**0.0073**	**0.0209**	**0.0196**
Perfluoroheptanoic acid	0.0004	NSL	**0.0058**	**0.0055**	**0.0061**	**0.003**	<0.0004	**0.003**	**0.0043**	**0.0036**
Perfluorooctanoic acid PFOA	0.0002	19	**0.0059**	**0.0054**	**0.013**	**0.0072**	<0.0002	**0.007**	**0.01**	**0.0093**
Perfluorononanoic acid	0.001	NSL	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.0005
Perfluorodecanoic acid	0.002	NSL	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.0005	<0.0005
Perfluoroundecanoic acid	0.002	NSL	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.0005	<0.0005
Perfluorododecanoic acid	0.005	NSL	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.0005	<0.0005
Perfluorotridecanoic acid	0.01	NSL	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.0005	<0.0005
Perfluorotetradecanoic acid	0.05	NSL	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.0005	<0.0005
4:2 FTS	0.001	NSL	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
6:2 FTS	0.0004	NSL	**0.001**	**0.001**	**0.001**	<0.0004	<0.0004	<0.0004	<0.001	<0.001
8:2 FTS	0.0004	NSL	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.001	<0.001
10:2 FTS	0.002	NSL	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.001	<0.001
Perfluorooctane sulfonamide	0.01	NSL	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamide	0.05	NSL	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.001	<0.001
N-Ethyl perfluorooctanesulfon amide	0.1	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.001	<0.001
N-Me perfluorooctanesulfonamid oethanol	0.05	NSL	<0.02	<0.02	<0.01	<0.01	<0.05	<0.01	<0.001	<0.001
N-Et perfluorooctanesulfonamid oethanol	0.5	NSL	<0.2	<0.2	<0.1	<0.1	<0.5	<0.1	<0.001	<0.001
MePer uorooctanesulf-amid oacetic acid	0.002	NSL	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.0005	<0.0005
EtPer uorooctanesulf-amid oacetic acid	0.002	NSL	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.0005	<0.0005
Total Positive PFHxS & PFOS	0.0002	NSL	**0.0062**	**0.006**	**0.037**	**0.0087**	<0.0002	**0.0087**	**0.0287**	**0.0252**
Total Positive PFOS & PFOA	0.0002	NSL	**0.0067**	**0.0062**	**0.02**	**0.011**	<0.0002	**0.011**	**0.0046**	**0.0132**
Total Positive PFAS	0.0002	NSL	**0.07**	**0.07**	**0.11**	**0.037**	<0.0002	**0.036**	**0.12**	**0.107**

Positive PFAS result **Bold**
PFAS result above the SAC **Bold**

TABLE G5
SUMMARY OF PFAS CONCENTRATIONS IN GROUNDWATER - HUMAN HEALTH
All results in µg/L unless stated otherwise.

	PQL Envirolab Services	NEMP 2020 Recreational	SAMPLES							
			MW102	MW102 [LAB_DUP]	MW107	MW109	MW114	WDUP1	WDUP2	WDUP 2 [LAB_DUP]
PFAS Compound										
Perfluorobutanesulfonic acid	0.0004	NSL	**0.0071**	**0.0069**	**0.0057**	**0.003**	<0.0004	**0.003**	**0.0069**	**0.0053**
Perfluoropentanesulfonic acid	0.001	NSL	**0.004**	**0.004**	**0.004**	**0.001**	<0.001	<0.001	**0.0044**	**0.0038**
Perfluorohexanesulfonic acid - PFHxS	0.0002	NSL	**0.0054**	**0.0052**	**0.029**	**0.0046**	<0.0002	**0.0045**	**0.0241**	**0.0213**
Perfluoroheptanesulfonic acid	0.001	NSL	<0.001	<0.001	**0.001**	<0.001	<0.001	<0.001	**0.001**	<0.0005
Perfluorooctanesulfonic acid PFOS	0.0002	NSL	**0.0008**	**0.0008**	**0.0077**	**0.0041**	<0.0002	**0.0042**	**0.0046**	**0.0039**
Perfluorodecanesulfonic acid	0.002	NSL	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.0005	<0.0005
Perfluorobutanoic acid	0.002	NSL	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	**0.0081**	**0.0071**
Perfluoropentanoic acid	0.002	NSL	**0.02**	**0.02**	**0.025**	**0.007**	<0.002	**0.007**	**0.0353**	**0.033**
Perfluorohexanoic acid	0.0004	NSL	**0.02**	**0.02**	**0.018**	**0.0071**	<0.0004	**0.0073**	**0.0209**	**0.0196**
Perfluoroheptanoic acid	0.0004	NSL	**0.0058**	**0.0055**	**0.0061**	**0.003**	<0.0004	**0.003**	**0.0043**	**0.0036**
Perfluorooctanoic acid PFOA	0.0002	5.6	**0.0059**	**0.0054**	**0.013**	**0.0072**	<0.0002	**0.007**	**0.01**	**0.0093**
Perfluorononanoic acid	0.001	NSL	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.0005
Perfluorodecanoic acid	0.002	NSL	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.0005	<0.0005
Perfluoroundecanoic acid	0.002	NSL	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.0005	<0.0005
Perfluorododecanoic acid	0.005	NSL	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.0005	<0.0005
Perfluorotridecanoic acid	0.01	NSL	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.0005	<0.0005
Perfluorotetradecanoic acid	0.05	NSL	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.0005	<0.0005
4:2 FTS	0.001	NSL	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
6:2 FTS	0.0004	NSL	**0.001**	**0.001**	**0.001**	<0.0004	<0.0004	<0.0004	<0.001	<0.001
8:2 FTS	0.0004	NSL	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.001	<0.001
10:2 FTS	0.002	NSL	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.001	<0.001
Perfluorooctane sulfonamide	0.01	NSL	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamide	0.05	NSL	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.001	<0.001
N-Ethyl perfluorooctanesulfon amide	0.1	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.001	<0.001
N-Me perfluorooctanesulfonamid oethanol	0.05	NSL	<0.02	<0.02	<0.01	<0.01	<0.05	<0.01	<0.001	<0.001
N-Et perfluorooctanesulfonamid oethanol	0.5	NSL	<0.2	<0.2	<0.1	<0.1	<0.5	<0.1	<0.001	<0.001
MePer uorooctanesulf-amid oacetic acid	0.002	NSL	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.0005	<0.0005
EtPer uorooctanesulf-amid oacetic acid	0.002	NSL	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.0005	<0.0005
Total Positive PFHxS & PFOS	0.0002	0.7	**0.0062**	**0.006**	**0.037**	**0.0087**	<0.0002	**0.0087**	**0.0287**	**0.0252**
Total Positive PFOS & PFOA	0.0002	NSL	**0.0067**	**0.0062**	**0.02**	**0.011**	<0.0002	**0.011**	**0.0046**	**0.0132**
Total Positive PFAS	0.0002	NSL	**0.07**	**0.07**	**0.11**	**0.037**	<0.0002	**0.036**	**0.12**	**0.107**

Positive PFAS result **Bold**
PFAS result above the SAC **Bold**

Detailed Site Investigation (DSI)
Neringah Hospital, 4-12 Neringah Avenue South, Wahroonga, NSW
E35312BR

JKEnvironments

TABLE Q1
SOIL QA/QC SUMMARY

			TRH C6 - C10	TRH >C10-C16	TRH >C16-C34	TRH >C34-C40	Benzene	Toluene	Ethylbenzene	m+p-xylene	o-Xylene
	PQL Envirolab SYD		*25*	*50*	*100*	*100*	*0.2*	*0.5*	*1*	*2*	*1*
	PQL Envirolab VIC		*25*	*50*	*100*	*100*	*0.2*	*0.5*	*1*	*2*	*1*
Intra	BH115	0-0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<2	<1
laboratory	SDUP1	0-0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<2	<1
duplicate	MEAN		nc	nc	nc	nc	nc	nc	nc	nc	nc
	RPD %		nc	nc	nc	nc	nc	nc	nc	nc	nc
Inter	BH113	0-0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<2	<1
laboratory	SDUP2	0-0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<2	<1
duplicate	MEAN		nc	nc	nc	nc	nc	nc	nc	nc	nc
	RPD %		nc	nc	nc	nc	nc	nc	nc	nc	nc
Intra	BH104	0-0.15	<25	<50	<100	<100	<0.2	<0.5	<1	<2	<1
laboratory	SDUP5	0-0.15	<25	<50	<100	<100	<0.2	<0.5	<1	<2	<1
duplicate	MEAN		nc	nc	nc	nc	nc	nc	nc	nc	nc
	RPD %		nc	nc	nc	nc	nc	nc	nc	nc	nc
Inter	BH111	0-0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<2	<1
laboratory	SDUP6	0-0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<2	<1
duplicate	MEAN		nc	nc	nc	nc	nc	nc	nc	nc	nc
	RPD %		nc	nc	nc	nc	nc	nc	nc	nc	nc
Field	TB-S1		-	-	-	-	<0.2	<0.5	<1	<2	<1
Blank	28/07/22										
Trip	TS-SI		-	-	-	-	97%	96%	100%	100%	101%
Spike	28/07/22										
Field	FR	µg/L	-	-	-	-	<1	<1	<1	<2	<1
Rinsate	1/08/22										

			-phthalene	Ace-phthylene	Ace-ph-thene	Fluorene	Phe-nthrene	Anthracene	Fluoranthene	Pyrene	Benzo(a)anthracene	Chrysene	Benzo(b,j+k)fluoranthene	Benzo(a)pyrene	Indeno(1,2,3-c,d)pyrene	Dibenzo(a,h)anthra-cene	Benzo(g,h,i)perylene
	PQL Envirolab SYD		*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.2*	*0.05*	*0.1*	*0.1*	*0.1*
	PQL Envirolab VIC		*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.2*	*0.1*	*0.1*	*0.1*	*0.1*
Intra	BH115	0-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	0.2	0.1	0.1	<0.2	0.1	<0.1	<0.1	<0.1
laboratory	SDUP1	0-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	0.2	0.2	0.1	<0.2	0.2	<0.1	<0.1	<0.1
duplicate	MEAN		nc	nc	nc	nc	nc	nc	0.2	0.2	0.15	0.1	nc	0.15	nc	nc	nc
	RPD %		nc	nc	nc	nc	nc	nc	0%	0%	67%	0%	nc	67%	nc	nc	nc
Inter	BH113	0-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	0.2	0.2	0.1	<0.2	0.2	<0.1	<0.1	0.1
laboratory	SDUP2	0-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.4	0.7	0.3	0.4	0.8	0.58	0.4	<0.1	0.4
duplicate	MEAN		nc	nc	nc	nc	nc	nc	0.3	0.45	0.25	0.25	0.45	0.39	0.225	nc	0.25
	RPD %		nc	nc	nc	nc	nc	nc	67%	111%	40%	120%	156%	97%	156%	nc	120%
Intra	BH104	0-0.15	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.05	<0.1	<0.1	<0.1
laboratory	SDUP5	0-0.15	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.05	<0.1	<0.1	<0.1
duplicate	MEAN		nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	RPD %		nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
Inter	BH111	0-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	0.1	<0.1	<0.1	<0.2	0.09	<0.1	<0.1	<0.1
laboratory	SDUP6	0-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	0.05	<0.1	<0.1	<0.1
duplicate	MEAN		nc	nc	nc	nc	nc	nc	0.075	0.075	nc	nc	nc	0.07	nc	nc	nc
	RPD %		nc	nc	nc	nc	nc	nc	67%	67%	nc	nc	nc	57%	nc	nc	nc
Field	TB-S1		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Blank	28/07/22																
Trip	TS-SI		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Spike	28/07/22																
Field	FR	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rinsate	1/08/22																

			HCB	alpha- BHC	gamma- BHC	beta- BHC	Heptachlor	delta- BHC	Aldrin	Heptachlor Epoxide	Gamma- Chlordane	alpha- chlordane	Endosulfan I	pp- DDE	Dieldrin	Endrin	pp- DDD	Endosulfan II	pp- DDT	Endrin Aldehyde	Endosulfan Sulphate	Methoxychlor
	PQL Envirolab SYD		*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*
	PQL Envirolab VIC		*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*
Intra	BH115	0-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
laboratory	SDUP1	0-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
duplicate	MEAN		nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	0.25	nc	nc	nc	nc	nc	nc	nc
	RPD %		nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	40%	nc	nc	nc	nc	nc	nc	nc
Inter	BH113	0-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.4	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
laboratory	SDUP2	0-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
duplicate	MEAN		nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	0.3	nc	nc	nc	nc	nc	nc	nc
	RPD %		nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	67%	nc	nc	nc	nc	nc	nc	nc
Intra	BH104	0-0.15	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
laboratory	SDUP5	0-0.15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
duplicate	MEAN		nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	RPD %		nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
Inter	BH111	0-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
laboratory	SDUP6	0-0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
duplicate	MEAN		nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
	RPD %		nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
Field	TB-S1		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Blank	28/07/22																					
Trip	TS-SI		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Spike	28/07/22																					
Field	FR	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rinsate	1/08/22																					

			Azinphos-methyl (Guthion)	Bromophos-ethyl	Chlorpyriphos	Chlorpyriphos-methyl	Diazinon	Dichlorvos	Dimethoate	Ethion	Fenitrothion	Malathion	Parathion	Ronnel	Total PCBS	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Zinc	ACM >7mm Estimation % (w/w)	FA and AF Estimation % (w/w)
	PQL Envirolab SYD		*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*4*	*0.4*	*1*	*1*	*1*	*0.1*	*1*	*1*	*<0.01*	*<0.001*
	PQL Envirolab VIC		*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*4*	*0.4*	*1*	*1*	*1*	*0.1*	*1*	*1*	*<0.01*	*<0.001*
Intra	BH115	0-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<4	<0.4	14	21	80	0.1	3	150	<0.01	<0.001
laboratory	SDUP1	0-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<4	<0.4	11	15	61	0.1	3	92	<0.01	<0.001
duplicate	MEAN		nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	12.5	18	70.5	0.1	3	121	nc	nc
	RPD %		nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	24%	33%	27%	0%	0%	48%	nc	nc
Inter	BH113	0-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	4	<0.4	15	10	32	<0.1	2	60	<0.01	<0.001
laboratory	SDUP2	0-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	6	<0.4	19	15	55	<0.1	5	71	<0.01	<0.001
duplicate	MEAN		nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	5	nc	17	12.5	43.5	nc	3.5	65.5	nc	nc
	RPD %		nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	40%	nc	24%	40%	53%	nc	86%	17%	nc	nc
Intra	BH104	0-0.15	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<4	<0.4	3	8	6	<0.1	1	21	-	-
laboratory	SDUP5	0-0.15	-	-	-	-	-	-	-	-	-	-	-	-	-	<4	<0.4	3	8	6	<0.1	1	24	-	-
duplicate	MEAN		nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	3	8	6	nc	1	22.5	-	-
	RPD %		nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	0%	0%	0%	nc	0%	13%	-	-
Inter	BH111	0-0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	10	<0.4	16	9	160	<0.1	2	82	-	-
laboratory	SDUP6	0-0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	14	<0.4	11	12	190	0.2	2	150	-	-
duplicate	MEAN		nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	12	nc	13.5	10.5	175	0.125	2	116	-	-
	RPD %		nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	33%	nc	37%	29%	17%	120%	0%	59%	-	-
Field	TB-S1		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Blank	28/07/22																								
Trip	TS-SI		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Spike	28/07/22																								
Field	FR	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rinsate	1/08/22																								

Result outside of QA/QC acceptance criteria

TABLE Q2
SUMMARY OF PFAS FIELD QA/QC IN SOIL
Units are µg/Kg unless stated otherwise.

			Perfluorobutanesulfonic acid	Perfluoropentanesulfonic acid	Perfluorohexanesulfonic acid - PFHxS	Perfluoroheptanesulfonic acid	Perfluorooctanesulfonic acid PFOS	Perfluorodecanesulfonic acid	Perfluorobutanoic acid	Perfluoropentanoic acid	Perfluorohexanoic acid	Perfluoroheptanoic acid	Perfluorooctanoic acid PFOA	Perfluorononanoic acid	Perfluorodecanoic acid	Perfluoroundecanoic acid	Perfluorododecanoic acid	Perfluorotridecanoic acid	Perfluorotetradecanoic acid	4:2 FTS	6:2 FTS	8:2 FTS	10:2 FTS	Perfluorooctane sulfonamide	N-Methyl perfluorooctane sulfonamide	N-Ethyl perfluorooctanesulfon amide	N-Me perfluorooctanesulfonamid oethanol	N-Et perfluorooctanesulfonamid oethanol	MePer uorooctanesulf-amid oacetic acid	EtPer uorooctanesulf-amid oacetic acid	Total Positive PFHxS & PFOS	Total Positive PFOS & PFOA	Total Positive PFAS
PQL Envirolab			*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.2*	*0.2*	*0.2*	*0.1*	*0.1*	*0.1*	*0.1*	*0.5*	*0.5*	*0.5*	*0.5*	*5*	*0.1*	*0.1*	*0.1*	*0.1*	*1.0*	*1.0*	*1.0*	*1.0*	*5*	*0.2*	*0.2*	*0.1*	*0.1*	*0.1*
PQL Envirolab VIC			*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.2*	*0.2*	*0.2*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.5*	*0.5*	*0.5*	*5*	*0.1*	*0.1*	*0.1*	*0.1*	*1.0*	*1.0*	*1.0*	*1.0*	*5*	*0.2*	*0.2*	*0.1*	*0.1*	*0.1*
Intra	BH115	0-0.1	<0.1	<0.1	<0.1	<0.1	2.1	<0.2	<0.2	<0.2	<0.1	<0.1	0.2	<0.1	<0.5	<0.5	<0.5	<0.5	<5	<0.1	<0.1	<0.2	<0.2	<1	<1	<1	<1	<5	<0.2	<0.2	2.1	2.3	2.3
laboratory	SDUP1	0-0.1	<0.1	<0.1	<0.1	<0.1	1.7	<0.2	<0.2	<0.2	<0.1	<0.1	0.2	<0.1	<0.5	<0.5	<0.5	<0.5	<5	<0.1	<0.1	<0.2	<0.2	<1	<1	<1	<1	<5	<0.2	<0.2	1.7	1.9	1.9
duplicate	MEAN		nc	nc	nc	nc	1.9	nc	nc	nc	nc	nc	0.2	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	1.9	2.1	2.1
	RPD %		nc	nc	nc	nc	21%	nc	nc	nc	nc	nc	0%	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	21%	19%	19%
Inter	BH113	0-0.1	<0.1	<0.1	<0.1	<0.1	0.3	<0.2	<0.2	<0.2	<0.1	<0.1	<0.1	<0.1	<0.5	<0.5	<0.5	<0.5	<5	<0.1	<0.1	<0.2	<0.2	<1	<1	<1	<1	<5	<0.2	<0.2	0.3	0.3	0.3
laboratory	SDUP2	0-0.1	<0.1	<0.1	<0.1	<0.1	0.5	<0.2	<0.2	<0.2	<0.1	<0.1	<0.1	<0.1	<0.5	<0.5	<0.5	<0.5	<5	<0.1	<0.1	<0.2	<0.2	<1	<1	<1	<1	<5	<0.2	<0.2	0.5	0.5	0.5
duplicate	MEAN		nc	nc	nc	nc	0.4	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	0.4	0.4	0.4
	RPD %		nc	nc	nc	nc	50%	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	50%	50%	50%
Field	TB-S2	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.2	<0.2	<0.1	<0.1	<0.1	<0.1	<0.5	<0.5	<0.5	<0.5	<5	<0.1	<0.1	<0.2	<0.2	<1	<1	<1	<1	<5	<0.2	<0.2	<0.1	<0.1	<0.1
Blank	28/07/2022																																	

Result outside of QA/QC acceptance criteria Value

TABLE Q3
GROUNDWATER QA/QC SUMMARY

		TRH C6 - C10	TRH >C10-C16	TRH >C16-C34	TRH >C34-C40	Benzene	Toluene	Ethylbenzene	m+p-xylene	o-Xylene	Naphthalene	Acenaphthylene	Acenaph-thene	Fluorene	Phenanthrene	Anthracene	Fluoranthene	Pyrene	Benzo(a)anthracene	Chrysene	Benzo(b,j+k)fluoranthene	Benzo(a)pyrene	Indeno(1,2,3-c,d)pyrene	Dibenzo(a,h)anthra-cene	Benzo(g,h,i)perylene	Arsenic	Cadmium	Chromium VI	Copper	Lead	Mercury	Nickel	Zinc
	PQL Envirolab SYD	*10*	*50*	*100*	*100*	*1*	*1*	*1*	*2*	*1*	*0.2*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.2*	*0.1*	*0.1*	*0.1*	*0.1*	*1*	*0.1*	*1*	*1*	*1*	*0.05*	*1*	*1*
	PQL Envirolab VIC	*10*	*50*	*100*	*100*	*1*	*1*	*1*	*2*	*1*	*0.2*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.2*	*0.1*	*0.1*	*0.1*	*0.1*	*1*	*0.1*	*1*	*1*	*1*	*0.05*	*1*	*1*
Intra	MW109	<10	<50	<100	<100	<1	<1	<1	<2	<1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<1	<0.1	<1	3	<1	<0.05	<1	12
laboratory	WDUP1	<10	<50	<100	<100	<1	<1	<1	<2	<1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<1	<0.1	<1	5	<1	<0.05	<1	13
duplicate	MEAN	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	4	nc	nc	nc	12.5
	RPD %	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	50%	nc	nc	nc	8%
Inter	MW107	<10	<50	<100	<100	<1	<1	<1	<2	<1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<1	0.1	<1	2	<1	<0.05	3	31
laboratory	WDUP2	<10	<50	<100	<100	<1	<1	<1	<2	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<1	<0.1	<1	2	<1	<0.05	3	37
duplicate	MEAN	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	0.075	nc	2	nc	nc	3	34
	RPD %	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	67%	nc	0%	nc	nc	0%	18%
Field	TB-W1	<10	<50	<100	<100	<1	<1	<1	<2	<1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<1	<0.1	<1	<1	<1	<0.05	<1	<1
Blank	8/08/2022																																
Field	FR1-IP	<10	<50	<100	<100	<1	<1	<1	<2	<1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<1	<0.1	<1	<1	<1	<0.05	<1	3
Rinsate	8/08/2022																																
Trip	TS-W1	-	-	-	-	94%	89%	94%	89%	87%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Spike	8/08/2022																																

Result outside of QA/QC acceptance criteria Value

TABLE Q4
SUMMARY OF PFAS FIELD QA/QC IN GROUNDWATER
Units are µg/L unless stated otherwise.

		Perfluorobutanesulfonic acid	Perfluoropentanesulfonic acid	Perfluorohexanesulfonic acid - PFHxS	Perfluoroheptanesulfonic acid	Perfluorooctanesulfonic acid PFOS	Perfluorodecanesulfonic acid	Perfluorobutanoic acid	Perfluoropentanoic acid	Perfluorohexanoic acid	Perfluoroheptanoic acid	Perfluorooctanoic acid PFOA	Perfluorononanoic acid	Perfluorodecanoic acid	Perfluoroundecanoic acid	Perfluorododecanoic acid	Perfluorotridecanoic acid	Perfluorotetradecanoic acid	4:2 FTS	6:2 FTS	8:2 FTS	10:2 FTS	Perfluorooctane sulfonamide	N-Methyl perfluorooctane sulfonamide	N-Ethyl perfluorooctanesulfon amide	N-Me perfluorooctanesulfonamid oethanol	N-Et perfluorooctanesulfonamid oethanol	MePer uorooctanesulf-amid oacetic acid	EtPer uorooctanesulf-amid oacetic acid	Total Positive PFHxS & PFOS	Total Positive PFOS & PFOA	Total Positive PFAS
PQL Envirolab		*0.0004*	*0.001*	*0.0002*	*0.001*	*0.0002*	*0.002*	*0.002*	*0.002*	*0.0004*	*0.0004*	*0.0002*	*0.001*	*0.002*	*0.002*	*0.005*	*0.01*	*0.05*	*0.001*	*0.0004*	*0.0004*	*0.002*	*0.01*	*0.05*	*0.1*	*0.05*	*0.5*	*0.002*	*0.002*	*0.0002*	*0.0002*	*0.0002*
PQL ALS Sydney		*0.0005*	*0.0005*	*0.0005*	*0.0005*	*0.0002*	*0.0005*	*0.002*	*0.0005*	*0.0005*	*0.0005*	*0.0005*	*0.0005*	*0.0005*	*0.0005*	*0.0005*	*0.0005*	*0.0005*	*0.001*	*0.001*	*0.001*	*0.001*	*0.0005*	*0.001*	*0.001*	*0.001*	*0.001*	*0.0005*	*0.0005*	*0.0002*	*0.0002*	*0.0002*
Intra laboratory duplicate	MW109	0.003	0.001	0.0046	<0.001	0.0041	<0.002	<0.02	0.007	0.0071	0.003	0.0072	<0.001	<0.002	<0.002	<0.005	<0.01	<0.05	<0.001	<0.0004	<0.0004	<0.002	<0.02	<0.05	<0.1	<0.01	<0.1	<0.002	<0.002	0.0087	0.011	0.037
	WDUP1	0.003	<0.001	0.0045	<0.001	0.0042	<0.002	<0.02	0.007	0.0073	0.003	0.007	<0.001	<0.002	<0.002	<0.005	<0.01	<0.05	<0.001	<0.0004	<0.0004	<0.002	<0.02	<0.05	<0.1	<0.01	<0.1	<0.002	<0.002	0.0087	0.011	0.036
	MEAN	0.003	0.0255	0.00455	nc	0.00415	nc	nc	0.007	0.0072	0.003	0.0071	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	0.0087	0.011	0.0365
	RPD %	0%	192%	2%	nc	2%	nc	nc	0%	3%	0%	3%	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	0%	0%	3%
Inter laboratory duplicate	MW107	0.0057	0.004	0.029	0.001	0.0077	<0.002	<0.02	0.025	0.018	0.0061	0.013	<0.001	<0.002	<0.002	<0.005	<0.01	<0.05	<0.001	0.001	<0.0004	<0.002	<0.02	<0.05	<0.1	<0.01	<0.1	<0.002	<0.002	0.037	0.02	0.11
	WDUP2	0.0069	0.0044	0.0241	0.001	0.0046	<0.0005	0.0081	0.0353	0.0209	0.0043	0.01	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.0005	0.0287	0.0046	0.12
	MEAN	0.0063	0.0042	0.02655	0.001	0.00615	nc	0.05405	0.03015	0.01945	0.0052	0.0115	nc	nc	nc	nc	nc	nc	nc	0.0255	nc	nc	nc	nc	nc	nc	nc	nc	nc	0.03285	0.0123	0.115
	RPD %	19%	10%	18%	0%	50%	nc	170%	34%	15%	35%	26%	nc	nc	nc	nc	nc	nc	nc	192%	nc	nc	nc	nc	nc	nc	nc	nc	nc	25%	125%	9%
Field Blank	TB-W1 8/08/2022	<0.0004	<0.001	<0.0002	<0.001	<0.0002	<0.002	<0.002	<0.002	<0.0004	<0.0004	<0.0002	<0.001	<0.002	<0.002	<0.005	<0.01	<0.05	<0.001	<0.0004	<0.0004	<0.002	<0.01	<0.05	<0.1	<0.05	<0.5	<0.002	<0.002	<0.0002	<0.0002	<0.0002

Result outside of QA/QC acceptance criteria Value

Appendix D: DSI Borehole Logs

JKEnvironments

ENVIRONMENTAL LOG

Log No. **BH101** **1/1**

Environmental logs are not to be used for geotechnical purposes

Client: HAMMONDCARE

Project: PROPOSED REDEVELOPMENT OF NERINGAH HOSPITAL

Location: NERINGAH HOSPITAL, 4-12 NERINGAH AVENUE SOUTH, WAHROONGA, NSW

Job No.: E35312BR **Method:** PUSHTUBE / SPIRAL AUGER **R.L. Surface:** ≈ 198.5m

Date: 28/7/22 **Datum:** AHD

Plant Type: EZI PROBE **Logged/Checked by:** A.D./T.H.

Groundwater Record	SAMPLES ES	SAMPLES ASS	SAMPLES ASB	SAMPLES PFAS	SAMPLES DB	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION							0			ASPHALTIC CONCRETE: 50mm.t	M			SCREEN: 3.03kg 0.05-0.2m NO FCF
										FILL: Clayey sand, fine to medium grained, light brown, trace of igneous and ironstone gravel, and glass.	w≈PL			SCREEN: 3.98kg 0.2-0.5m NO FCF
									CI-CH	FILL: Silty clay, medium to high plasticity, brown, trace of igneous and ironstone gravel, ash and root fibres.	w≈PL			RESIDUAL
							1			Silty CLAY: medium to high plasticity, yellow brown mottled red, trace of ironstone gravel, and root fibres.				
										as above, but grey mottled red.				
										END OF BOREHOLE AT 1.4m				
							2							
							3							
							4							
							5							
							6							
							7							

JKEnvironments

ENVIRONMENTAL LOG

Environmental logs are not to be used for geotechnical purposes

Log No. BH102 **1/2**

Client: HAMMONDCARE

Project: PROPOSED REDEVELOPMENT OF NERINGAH HOSPITAL

Location: NERINGAH HOSPITAL, 4-12 NERINGAH AVENUE SOUTH, WAHROONGA, NSW

Job No.: E35312BR **Method:** SPIRAL AUGER **R.L. Surface:** ≈ 197.5m

Date: 1/8/22 **Datum:** AHD

Plant Type: JK400 **Logged/Checked by:** H.W./T.H.

Groundwater Record	SAMPLES (ES, ASS, ASB, PFAS, DB)	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
			0		-	ASPHALTIC CONCRETE: 10mm.t	M			SCREEN: 5.4kg 0.01-0.1m NO FCF
						FILL: Silty sand, fine to medium grained, brown, trace of igneous and sandstone gravel.	w≈PL			
					CI-CH	FILL: Silty clay, medium to high plasticity, brown, trace of igneous and ironstone gravel, and ash.	w≈PL			SCREEN: 3.4kg 0.1-0.5m NO FCF
			1			Silty CLAY: medium to high plasticity, orange brown, trace of ironstone gravel, and root fibres.				RESIDUAL
		N = 18 4,8,10				as above, but grey.				
4/8/22 ▼ 8/8/22 ▼			2		-	Extremely Weathered siltstone: silty CLAY, low to medium plasticity, grey.	XW			ASHFIELD SHALE LOW 'TC' BIT RESISTANCE
		N > 7 4,7/50mm REFUSAL	3				DW			
			4							
			5							
			6							
▶						SILTSTONE: dark grey.	SW			MODERATE RESISTANCE
			7							

JKEnvironments

ENVIRONMENTAL LOG

Environmental logs are not to be used for geotechnical purposes

Log No. **BH102** **2/2**

Client: HAMMONDCARE

Project: PROPOSED REDEVELOPMENT OF NERINGAH HOSPITAL

Location: NERINGAH HOSPITAL, 4-12 NERINGAH AVENUE SOUTH, WAHROONGA, NSW

Job No.: E35312BR **Method:** SPIRAL AUGER **R.L. Surface:** ≈ 197.5m

Date: 1/8/22 **Datum:** AHD

Plant Type: JK400 **Logged/Checked by:** H.W./T.H.

Groundwater Record	SAMPLES ES	SAMPLES ASS	SAMPLES ASB	SAMPLES PFAS	SAMPLES DB	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
▼							8			SILTSTONE: dark grey.	SW			
							9			END OF BOREHOLE AT 9.0m				GROUNDWATER MONITORING WELL INSTALLED TO 8.0m. CLASS 18 MACHINE SLOTTED 50mm DIA. PVC STANDPIPE 2.0m TO 8.0m. CASING 0m TO 2.0m. 2mm SAND FILTER PACK 1.8m TO 8.0m. BENTONITE SEAL 1.2m TO 1.8m. BACKFILLED WITH SAND TO THE SURFACE. COMPLETED WITH A CONCRETED GATIC COVER.
							10							
							11							
							12							
							13							
							14							

JKEnvironments

ENVIRONMENTAL LOG

Log No. **BH103** **1/1**

Environmental logs are not to be used for geotechnical purposes

Client: HAMMONDCARE

Project: PROPOSED REDEVELOPMENT OF NERINGAH HOSPITAL

Location: NERINGAH HOSPITAL, 4-12 NERINGAH AVENUE SOUTH, WAHROONGA, NSW

Job No.: E35312BR **Method:** HAND AUGER **R.L. Surface:** ≈ 196.7m

Date: 28/7/22 **Datum:** AHD

Plant Type: - **Logged/Checked by:** A.D./T.H.

Groundwater Record	SAMPLES ES	SAMPLES ASS	SAMPLES ASB	SAMPLES PFAS	SAMPLES DB	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION							0		-	ASPHALTIC CONCRETE: 50mm.t	w≈PL			SCREEN: 14.3kg 0.05-0.2m NO FCF
										FILL: Clayey sand, fine to medium grained, light brown, trace of igneous and ironstone gravel.				
									CI-CH	FILL: Silty clay, medium to high plasticity, brown, trace of igneous and ironstone gravel, sand and root fibres.	w≈PL			SCREEN: 12.13kg 0.2-0.6m NO FCF
							1			Silty CLAY: medium to high plasticity, red brown, trace of ironstone gravel.				RESIDUAL
										END OF BOREHOLE AT 1.0m				HAND AUGER REFUSAL
							2							
							3							
							4							
							5							
							6							
							7							

JKEnvironments

ENVIRONMENTAL LOG

Environmental logs are not to be used for geotechnical purposes

Log No. BH104 1/1

SDUP5: 0-0.1m

Client: HAMMONDCARE

Project: PROPOSED REDEVELOPMENT OF NERINGAH HOSPITAL

Location: NERINGAH HOSPITAL, 4-12 NERINGAH AVENUE SOUTH, WAHROONGA, NSW

Job No.: E35312BR **Method:** HAND AUGER **R.L. Surface:** ≈ 199.4m

Date: 28/7/22 **Datum:** AHD

Plant Type: - **Logged/Checked by:** A.D./T.H.

Groundwater Record	SAMPLES ES	SAMPLES ASS	SAMPLES ASB	SAMPLES PFAS	SAMPLES DB	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION	■		■	■	■		0		CI-CH	FILL: Silty clay, medium to high plasticity, brown, trace of igneous gravel, sand, tile fragments, bark mulch and root fibres.	w≈PL			SCREEN: 10.5kg 0-0.15m NO FCF
										Silty CLAY: medium to high plasticity, grey mottled red and orange, trace of ironstone gravel and root fibres.	w≈PL			RESIDUAL
							1			END OF BOREHOKE AT 0.8m				
							2							
							3							
							4							
							5							
							6							
							7							

JKEnvironments

ENVIRONMENTAL LOG

Environmental logs are not to be used for geotechnical purposes

Log No. BH105 1/1

SDUP4: 0-0.1m

Client: HAMMONDCARE

Project: PROPOSED REDEVELOPMENT OF NERINGAH HOSPITAL

Location: NERINGAH HOSPITAL, 4-12 NERINGAH AVENUE SOUTH, WAHROONGA, NSW

Job No.: E35312BR **Method:** PUSHTUBE / SPIRAL AUGER **R.L. Surface:** ≈ 199.3m

Date: 28/7/22 **Datum:** AHD

Plant Type: EZI PROBE **Logged/Checked by:** A.D./T.H.

Groundwater Record	SAMPLES ES	SAMPLES ASS	SAMPLES ASB	SAMPLES PFAS	SAMPLES DB	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION							0		CI-CH	FILL: Silty clay, medium to high plasticity, brown, trace of ironstone and sandstone gravel, sand and root fibres.	w≈PL			GRAS COVER
										Silty CLAY: medium to high plasticity, grey mottled yellow and red brown, trace of ironstone gravel and root fibres.	w≈PL			SCREEN: 11.52kg 0-0.15m NO FCF
							1		-	Extremely Weathered siltstone: silty CLAY, low to medium plasticity, grey, with ironstone gravel bands.	XW			RESIDUAL / ASHFIELD SHALE
										END OF BOREHOLE AT 1.2m				
							2							
							3							
							4							
							5							
							6							
							7							

JKEnvironments

ENVIRONMENTAL LOG

Log No. **BH106** **1/1**

Environmental logs are not to be used for geotechnical purposes

Client: HAMMONDCARE

Project: PROPOSED REDEVELOPMENT OF NERINGAH HOSPITAL

Location: NERINGAH HOSPITAL, 4-12 NERINGAH AVENUE SOUTH, WAHROONGA, NSW

Job No.: E35312BR **Method:** HAND AUGER **R.L. Surface:** ≈ 198.6m

Date: 4/8/22 **Datum:** AHD

Plant Type: - **Logged/Checked by:** E.W./T.H.

Groundwater Record	SAMPLES ES	SAMPLES ASS	SAMPLES ASB	SAMPLES PFAS	SAMPLES DB	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION	■		■		■		0			FILL: Silty sandy clay, low to medium plasticity, dark brown, trace of sandstone gravel and roots.	w<PL w≈PL			SCREEN: 10.46kg 0-0.1m NO FCF
										FILL: Silty clay, medium to high plasticity, red brown mottled grey, trace of sandstone gravel.				INSUFFICIENT RETURN FOR BULK SCREEN
							1			END OF BOREHOLE AT 0.5m				HAND AUGER REFUSAL
							2							
							3							
							4							
							5							
							6							
							7							

JKEnvironments

ENVIRONMENTAL LOG

Log No. BH107 1/2

Environmental logs are not to be used for geotechnical purposes

Client: HAMMONDCARE

Project: PROPOSED REDEVELOPMENT OF NERINGAH HOSPITAL

Location: NERINGAH HOSPITAL, 4-12 NERINGAH AVENUE SOUTH, WAHROONGA, NSW

Job No.: E35312BR **Method:** SPIRAL AUGER **R.L. Surface:** ≈ 202.5m

Date: 1/8/22 **Datum:** AHD

Plant Type: JK400 **Logged/Checked by:** H.W./T.H.

Groundwater Record	SAMPLES ES	SAMPLES ASS	SAMPLES ASB	SAMPLES PFAS	SAMPLES DB	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
							0		-	ASPHALTIC CONCRETE: 70mm.t	D			SCREEN: 2.5kg 0.07-0.3m NO FCF
										FILL: Silty sand, fine to medium grained, grey, with igneous gravel.	w≈PL			
						N = 9 4,4,5			CI-CH	FILL: Silty sandy clay, low to medium plasticity, brown, fine to medium grained sand, trace of ironstone gravel.	w≈PL			SCREEN: 4.77kg 0.3-0.5m NO FCF
							1			Silty CLAY: medium to high plasticity, red brown, trace of ironstone gravel.				RESIDUAL
						N = 26 7,12,14								
							2			as above, but grey and red brown.				
						N > 5 17,5/ 50mm	3			Extremely Weathered siltstone:silty CLAY, medium to high plasticity, grey.	XW			ASHFIELD SHALE
4/8/22 ▼														
8/8/22 ▼							4							
						N = 29 10,12,17								
ON COMPLET-ION ▼							5							
							6			as above, but brown.	DW			MODERATE 'TC' BIT RESISTANCE
							7							

JKEnvironments

ENVIRONMENTAL LOG

Log No. **BH107** **2/2**

Environmental logs are not to be used for geotechnical purposes

Client: HAMMONDCARE

Project: PROPOSED REDEVELOPMENT OF NERINGAH HOSPITAL

Location: NERINGAH HOSPITAL, 4-12 NERINGAH AVENUE SOUTH, WAHROONGA, NSW

Job No.: E35312BR **Method:** SPIRAL AUGER **R.L. Surface:** ≈ 202.5m

Date: 1/8/22 **Datum:** AHD

Plant Type: JK400 **Logged/Checked by:** H.W./T.H.

Groundwater Record	SAMPLES ES	SAMPLES ASS	SAMPLES ASB	SAMPLES PFAS	SAMPLES DB	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	■									Extremely Weathered siltstone:silty CLAY, medium to high plasticity, brown.	DW			
	■						8			SILTSTONE: dark grey.	SW			HIGH RESISTANCE
										END OF BOREHOLE AT 8.2m				'TC' BIT REFUSAL GROUNDWATER MONITORING WELL INSTALLED TO 8.2m. CLASS 18 MACHINE SLOTTED 50mm DIA. PVC STANDPIPE 2.0m TO 8.2m. CASING 0m TO 2.0m. 2mm SAND FILTER PACK 1.8m TO 8.2m. BENTONITE SEAL 1.0m TO 1.8m. BACKFILLED WITH SAND TO THE SURFACE. COMPLETED WITH A CONCRETED GATIC COVER.
							9							
							10							
							11							
							12							
							13							
							14							

JKEnvironments

ENVIRONMENTAL LOG

Log No. **BH108** **1/1**

Environmental logs are not to be used for geotechnical purposes

Client: HAMMONDCARE

Project: PROPOSED REDEVELOPMENT OF NERINGAH HOSPITAL

Location: NERINGAH HOSPITAL, 4-12 NERINGAH AVENUE SOUTH, WAHROONGA, NSW

Job No.: E35312BR **Method:** PUSHTUBE / SPIRAL AUGER **R.L. Surface:** ≈ 202m

Date: 28/7/22 **Datum:** AHD

Plant Type: EZI PROBE **Logged/Checked by:** A.D./T.H.

Groundwater Record	SAMPLES ES	SAMPLES ASS	SAMPLES ASB	SAMPLES PFAS	SAMPLES DB	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION							0			ASPHALTIC CONCRETE: 100mm.t				
									-	FILL: Silty sand, fine to medium grained, light grey mottled yellow brown, trace of igneous and sandstone gravel.	M			INSUFFICIENT RETURN FOR BULK SCREEN
											w≈PL			SCREEN: 4.03kg 0.3-1.2m NO FCF
							1			FILL: Silty sand, fine to medium grained, yellow brown, trace of igneous and sandstone gravel and metal slag.				
									CI-CH	FILL: Silty clay, medium to high plasticity, brown, trace of igneous and sandstone gravel and ash.	w≈PL			RESIDUAL
										Silty CLAY: medium to high plasticity, grey mottled red brown, trace of ironstone gravel.				
							2			END OF BOREHOE AT 2.0m				
							3							
							4							
							5							
							6							
							7							

JKEnvironments

ENVIRONMENTAL LOG

Log No. BH109 1/2

Environmental logs are not to be used for geotechnical purposes

Client: HAMMONDCARE

Project: PROPOSED REDEVELOPMENT OF NERINGAH HOSPITAL

Location: NERINGAH HOSPITAL, 4-12 NERINGAH AVENUE SOUTH, WAHROONGA, NSW

Job No.: E35312BR **Method:** SPIRAL AUGER **R.L. Surface:** ≈ 201.5m

Date: 1/8/22 **Datum:** AHD

Plant Type: JK400 **Logged/Checked by:** H.W./T.H.

Groundwater Record	SAMPLES (ES, ASS, ASB, PFAS, DB)	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
			0		-	ASPHALTIC CONCRETE: 40mm.t	M			SCREEN: 2.02kg 0.04-0.1m NO FCF
						FILL: Silty sand, fine to medium grained, brown and yellow brown, trace of sandstone gravel, clay nodules and ash.	w>PL			SCREEN: 5.25kg 0.1-0.3m NO FCF
		N = 5 2,3,2			CI-CH	FILL: Silty clay, medium to high plasticity, grey, trace of sand, ironstone gravel and ash.	w≈PL			SCREEN: 4.75kg 0.3-0.7m NO FCF
			1			Silty CLAY: medium to high plasticity, orange brown mottled yellow brown, trace of ironstone gravel.				RESIDUAL
		N = 20 7,10,10				as above, but grey mottled red.				
4/8/22 ▼			2							
8/8/22 ▼										
		N > 19 8,19/ 150mm REFUSAL	3		-	Extremely Weathered siltstone: silty CLAY, medium to high plasticity, brown	XW			ASHFIELD SHALE LOW 'TC' BIT RESISTANCE
			4							
ON COMPLET-ION ▼			5							
			6				DW			
▶		N > 9 13,9/ 50mm REFUSAL								
			7							

JKEnvironments

ENVIRONMENTAL LOG

Environmental logs are not to be used for geotechnical purposes

Log No. **BH109** **2/2**

Client: HAMMONDCARE

Project: PROPOSED REDEVELOPMENT OF NERINGAH HOSPITAL

Location: NERINGAH HOSPITAL, 4-12 NERINGAH AVENUE SOUTH, WAHROONGA, NSW

Job No.: E35312BR **Method:** SPIRAL AUGER **R.L. Surface:** ≈ 201.5m

Date: 1/8/22 **Datum:** AHD

Plant Type: JK400 **Logged/Checked by:** H.W./T.H.

Groundwater Record	SAMPLES ES	SAMPLES ASS	SAMPLES ASB	SAMPLES PFAS	SAMPLES DB	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
										Extremely Weathered siltstone: silty CLAY, medium to high plasticity, dark grey.	DW			
							8			SILTSTONE: grey.	SW			MODERATE TO HIGH RESISTANCE
										END OF BOREHOLE AT 8.2m				GROUNDWATER MONITORING WELL INSTALLED TO 8.2m. CLASS 18 MACHINE SLOTTED 50mm DIA. PVC STANDPIPE 2.0m TO 8.2m. CASING 0m TO 2.0m. 2mm SAND FILTER PACK 1.8m TO 8.2m. BENTONITE SEAL 1.0m TO 1.8m. BACKFILLED WITH SAND TO THE SURFACE. COMPLETED WITH A CONCRETED GATIC COVER.
							9							
							10							
							11							
							12							
							13							
							14							

JKEnvironments

ENVIRONMENTAL LOG

Environmental logs are not to be used for geotechnical purposes

Log No. BH110 1/1

SDUP3: 0-0.1m

Client: HAMMONDCARE

Project: PROPOSED REDEVELOPMENT OF NERINGAH HOSPITAL

Location: NERINGAH HOSPITAL, 4-12 NERINGAH AVENUE SOUTH, WAHROONGA, NSW

Job No.: E35312BR **Method:** PUSHTUBE / SPIRAL AUGER **R.L. Surface:** ≈ 203.5m

Date: 28/7/22 **Datum:** AHD

Plant Type: EZI PROBE **Logged/Checked by:** A.D./T.H.

Groundwater Record	SAMPLES ES	SAMPLES ASS	SAMPLES ASB	SAMPLES PFAS	SAMPLES DB	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLE-TION							0			FILL: Silty clay, medium to high plasticity, red brown mottled grey and orange, trace of igneous, ironstone and sandstone gravel, sand, tile and concrete fragments, plastic, bark mulch and root fibres.	w≈PL			MULCH COVER SCREEN: 10.3kg 0-0.1m NO FCF
									CI-CH	Silty CLAY: medium to high plasticity, grey mottled red brown, trace of ironstone gravel and root fibres.	w≈PL			SCREEN: 11.05kg 0.1-0.6m NO FCF RESIDUAL
							1			END OF BOREHOLE AT 1.4m				
							2							
							3							
							4							
							5							
							6							
							7							

JKEnvironments

ENVIRONMENTAL LOG

Environmental logs are not to be used for geotechnical purposes

Log No. BH111 1/1

SDUP6: 0-0.1m

Client: HAMMONDCARE

Project: PROPOSED REDEVELOPMENT OF NERINGAH HOSPITAL

Location: NERINGAH HOSPITAL, 4-12 NERINGAH AVENUE SOUTH, WAHROONGA, NSW

Job No.: E35312BR **Method:** HAND AUGER **R.L. Surface:** ≈ 203m

Date: 28/7/22 **Datum:** AHD

Plant Type: - **Logged/Checked by:** A.D./T.H.

Groundwater Record	SAMPLES ES	SAMPLES ASS	SAMPLES ASB	SAMPLES PFAS	SAMPLES DB	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION	■		■	■	■		0		CI-CH	FILL: Silty clay, medium to high plasticity, brown, trace of igneous, ironstone and sandstone gravel, sand, ceramic, glass and plastic fragments, and root fibres.	w≈PL W≈PL			GRASS COVER SCREEN: 10.2kg 0-0.1m NO FCF
										Silty CLAY: medium to high plasticity, grey mottled red, trace of ironstone gravel.				SCREEN: 10.11kg 0.1-0.2m NO FCF
							1			END OF BOREHOLE AT 0.8m				RESIDUAL
							2							
							3							
							4							
							5							
							6							
							7							

JKEnvironments

ENVIRONMENTAL LOG

Log No. **BH112** **1/1**

Environmental logs are not to be used for geotechnical purposes

Client: HAMMONDCARE

Project: PROPOSED REDEVELOPMENT OF NERINGAH HOSPITAL

Location: NERINGAH HOSPITAL, 4-12 NERINGAH AVENUE SOUTH, WAHROONGA, NSW

Job No.: E35312BR **Method:** HAND AUGER **R.L. Surface:** ≈ 203m

Date: 28/7/22 **Datum:** AHD

Plant Type: - **Logged/Checked by:** A.D./T.H.

Groundwater Record	SAMPLES ES	SAMPLES ASS	SAMPLES ASB	SAMPLES PFAS	SAMPLES DB	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION							0			FILL: Silty clay, medium to high plasticity, brown, trace of igneous and sandstone gravel, plastic and root fibres.	w≈PL			GRASS COVER SCREEN: 10.64kg 0-0.1m NO FCF
							1		CI-CH	Silty CLAY: medium to high plasticity, red brown mottled grey, trace of ironstone gravel.	w≈PL			SCREEN: 10.3kg 0.1-0.7m NO FCF RESIDUAL
										END OF BOREHOLE AT 1.3m				
							2							
							3							
							4							
							5							
							6							
							7							

JKEnvironments

ENVIRONMENTAL LOG

Environmental logs are not to be used for geotechnical purposes

Log No. BH113 1/1

SDUP2: 0-0.1m

Client: HAMMONDCARE

Project: PROPOSED REDEVELOPMENT OF NERINGAH HOSPITAL

Location: NERINGAH HOSPITAL, 4-12 NERINGAH AVENUE SOUTH, WAHROONGA, NSW

Job No.: E35312BR **Method:** PUSHTUBE / SPIRAL AUGER **R.L. Surface:** ≈ 205.7m

Date: 28/7/22 **Datum:** AHD

Plant Type: EZI PROBE **Logged/Checked by:** A.D./T.H.

Groundwater Record	SAMPLES ES	SAMPLES ASS	SAMPLES ASB	SAMPLES PFAS	SAMPLES DB	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION							0			FILL: Silty sandy clay, low to medium plasticity, brown, fine to medium grained sand, trace of igneous, ironstone and sandstone gravel, concrete, tile and glass fragments, bark mulch and root fibres.	w≈PL			MULCH COVER SCREEN: 10.1kg 0-0.1m NO FCF
							1		CI-CH	Silty CLAY: medium to high plasticity, yellow brown mottled red, trace of ironstone gravel and root fibres.	w≈PL			SCREEN: 14.6kg 0.1-0.7m NO FCF
										as above, but grey mottled red and orange.	w<PL			RESIDUAL
										END OF BOREHOLE AT 1.4m				
							2							
							3							
							4							
							5							
							6							
							7							

JKEnvironments

ENVIRONMENTAL LOG

Environmental logs are not to be used for geotechnical purposes

Log No. BH114 **1/2**

Client: HAMMONDCARE

Project: PROPOSED REDEVELOPMENT OF NERINGAH HOSPITAL

Location: NERINGAH HOSPITAL, 4-12 NERINGAH AVENUE SOUTH, WAHROONGA, NSW

Job No.: E35312BR **Method:** SPIRAL AUGER **R.L. Surface:** ≈ 205.6m

Date: 29/7/22 **Datum:** AHD

Plant Type: JK305 **Logged/Checked by:** T.F./T.H.

Groundwater Record	SAMPLES ES	SAMPLES ASS	SAMPLES ASB	SAMPLES PFAS	SAMPLES DB	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
							0			FILL: Silty clay, low plasticity, dark grey, grey and brown, with igneous, ironstone and sandstone gravel, trace of concrete and tile fragments, rubber, ash and root fibres.	w>PL			GRASS COVER APPEARS MODERATELY TO WELL COMPACTED
						N = 11 8,6,5	1			FILL: Silty clay, low plasticity, grey brown, trace of igneous and ironstone gravel.	w>PL	St-VSt	200 180 140	SCREEN: 11.52kg 0-0.1m NO FCF
									CH	Silty CLAY: high plasticity, light grey mottled orange and red, trace of ironstone gravel.	w<PL	Hd	450 520 520 420	SCREEN: 10.22kg 0.1-1.0m NO FCF HP TESTING ON DISTURBED SAMPLE
							2							RESIDUAL HP TESTING ON DISTURBED SAMPLE
ON COMPLET-ION ▼							3							
							4		-	Extremely Weathered siltstone: silty CLAY, light grey, medium plasticity, with occasional ironstone gravel bands.	XW	Hd		ASHFIELD SHALE VERY LOW 'TC' BIT RESISTANCE
4/8/22 ▼							5							
8/8/22 ▼										SILTSTONE: light grey and grey, with occasional ironstone gravel bands and, medium to high plasticity, grey brown, silty clay bands.	DW	VL		LOW RESISTANCE WITH VERY LOW RESISTANCE BANDS
							6							
							7							

JKEnvironments

ENVIRONMENTAL LOG

Environmental logs are not to be used for geotechnical purposes

Log No.
BH114
2/2

Client: HAMMONDCARE

Project: PROPOSED REDEVELOPMENT OF NERINGAH HOSPITAL

Location: NERINGAH HOSPITAL, 4-12 NERINGAH AVENUE SOUTH, WAHROONGA, NSW

Job No.: E35312BR **Method:** SPIRAL AUGER **R.L. Surface:** ≈ 205.6m

Date: 29/7/22 **Datum:** AHD

Plant Type: JK305 **Logged/Checked by:** T.F./T.H.

Groundwater Record	SAMPLES ES	SAMPLES ASS	SAMPLES ASB	SAMPLES PFAS	SAMPLES DB	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
▶										SILTSTONE: light grey and grey, with occasional ironstone gravel bands and, medium to high plasticity, grey brown, silty clay bands.	DW	VL		
							8			SILTSTONE: grey.	DW	L		LOW RESISTANCE
							9							GROUNDWATER MONITORING WELL INSTALLED TO 14.0m. CLASS 18 MACHINE SLOTTED 50mm DIA. PVC STANDPIPE 14.0m TO 8.0m. CASING 8.0m TO 0m. 2mm SAND FILTER PACK 14.0m TO 7.8m. BENTONITE SEAL 7.8m TO 6.8m. BACKFILLED WITH SAND AND CUTTINGS TO THE SURFACE. COMPLETED WITH A CONCRETED GATIC COVER.
							10							
							11				SW	L-M		
							12							
												M		LOW TO MODERATE RESISTANCE
							13							MODERATE RESISTANCE
							14			END OF BOREHOLE AT 14.0m				

JKEnvironments

ENVIRONMENTAL LOG

Environmental logs are not to be used for geotechnical purposes

Log No. BH115 1/1

SDUP15: 0-0.1m

Client: HAMMONDCARE

Project: PROPOSED REDEVELOPMENT OF NERINGAH HOSPITAL

Location: NERINGAH HOSPITAL, 4-12 NERINGAH AVENUE SOUTH, WAHROONGA, NSW

Job No.: E35312BR **Method:** PUSHTUBE / SPIRAL AUGER **R.L. Surface:** ≈ 205.8m

Date: 28/7/22 **Datum:** AHD

Plant Type: EZI PROBE **Logged/Checked by:** A.D./T.H.

Groundwater Record	SAMPLES ES	SAMPLES ASS	SAMPLES ASB	SAMPLES PFAS	SAMPLES DB	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
							0			FILL: Silty clay, low to medium plasticity, brown, trace of sand, ironstone and sandstone gravel, brick and tile fragments and root fibres.	w≈PL			GRASS COVER SCREEN: 11.4kg 0-0.1m NO FCF
							1		CI-CH	Silty CLAY: medium to high plasticity, yellow brown mottled red brown, trace of ironstone gravel.	w≈PL			SCREEN: 9.8kg 0.1-0.8m NO FCF RESIDUAL
▶							2			as above, but grey.	w>PL			
										END OF BOREHOLE AT 2.4m				
							3							
							4							
							5							
							6							
							7							

ENVIRONMENTAL LOGS EXPLANATION NOTES

INTRODUCTION

These notes have been provided to amplify the environmental report in regard to classification methods, field procedures and certain matters relating to the logging of soil and rock. Not all notes are necessarily relevant to all reports.

Where geotechnical borehole logs are utilised for environmental purpose, reference should also be made to the explanatory notes included in the geotechnical report. Environmental logs are not suitable for geotechnical purposes.

The ground is a product of continuing natural and man-made processes and therefore exhibits a variety of characteristics and properties which vary from place to place and can change with time. Environmental studies include gathering and assimilating limited facts about these characteristics and properties in order to understand or predict the behaviour of the ground on a particular site under certain conditions. This report may contain such facts obtained by inspection, excavation, probing, sampling, testing or other means of investigation. If so, they are directly relevant only to the ground at the place where and time when the investigation was carried out.

DESCRIPTION AND CLASSIFICATION METHODS

The methods of description and classification of soils and rocks used in this report are based on Australian Standard 1726:2017 *'Geotechnical Site Investigations'*. In general, descriptions cover the following properties – soil or rock type, colour, structure, strength or density, and inclusions. Identification and classification of soil and rock involves judgement and the Company infers accuracy only to the extent that is common in current geoenvironmental practice.

Soil types are described according to the predominating particle size and behaviour as set out in the attached soil classification table qualified by the grading of other particles present (eg. sandy clay) as set out below:

Soil Classification	Particle Size
Clay	< 0.002mm
Silt	0.002 to 0.075mm
Sand	0.075 to 2.36mm
Gravel	2.36 to 63mm
Cobbles	63 to 200mm
Boulders	> 200mm

Non-cohesive soils are classified on the basis of relative density, generally from the results of Standard Penetration Test (SPT) as below:

Relative Density	SPT 'N' Value (blows/300mm)
Very loose (VL)	< 4
Loose (L)	4 to 10
Medium dense (MD)	10 to 30
Dense (D)	30 to 50
Very Dense (VD)	> 50

Cohesive soils are classified on the basis of strength (consistency) either by use of a hand penetrometer, vane shear, laboratory testing and/or tactile engineering examination. The strength terms are defined as follows.

Classification	Unconfined Compressive Strength (kPa)	Indicative Undrained Shear Strength (kPa)
Very Soft (VS)	≤ 25	≤ 12
Soft (S)	> 25 and ≤ 50	> 12 and ≤ 25
Firm (F)	> 50 and ≤ 100	> 25 and ≤ 50
Stiff (St)	> 100 and ≤ 200	> 50 and ≤ 100
Very Stiff (VSt)	> 200 and ≤ 400	> 100 and ≤ 200
Hard (Hd)	> 400	> 200
Friable (Fr)	Strength not attainable – soil crumbles	

Rock types are classified by their geological names, together with descriptive terms regarding weathering, strength, defects, etc. Where relevant, further information regarding rock classification is given in the text of the report. In the Sydney Basin, 'shale' is used to describe fissile mudstone, with a weakness parallel to bedding. Rocks with alternating inter-laminations of different grain size (eg. siltstone/claystone and siltstone/fine grained sandstone) are referred to as 'laminite'.

INVESTIGATION METHODS

The following is a brief summary of investigation methods currently adopted by the Company and some comments on their use and application. All methods except test pits, hand auger drilling and portable Dynamic Cone Penetrometers require the use of a mechanical rig which is commonly mounted on a truck chassis or track base.

Test Pits: These are normally excavated with a backhoe or a tracked excavator, allowing close examination of the insitu soils and 'weaker' bedrock if it is safe to descend into the pit. The depth of penetration is limited to about 3m for a backhoe and up to 6m for a large excavator. Limitations of test pits are the problems associated with disturbance and difficulty of reinstatement and the consequent effects on close-by structures. Care must be taken if construction is to be carried out near test pit locations to either properly recompact the backfill during construction or to design and construct the

structure so as not to be adversely affected by poorly compacted backfill at the test pit location.

Hand Auger Drilling: A borehole of 50mm to 100mm diameter is advanced by manually operated equipment. Refusal of the hand auger can occur on a variety of materials such as obstructions within any fill, tree roots, hard clay, gravel or ironstone, cobbles and boulders, and does not necessarily indicate rock level.

Continuous Spiral Flight Augers: The borehole is advanced using 75mm to 115mm diameter continuous spiral flight augers, which are withdrawn at intervals to allow sampling and insitu testing. This is a relatively economical means of drilling in clays and in sands above the water table. Samples are returned to the surface by the flights or may be collected after withdrawal of the auger flights, but they can be very disturbed and layers may become mixed. Information from the auger sampling (as distinct from specific sampling by SPTs or undisturbed samples) is of limited reliability due to mixing or softening of samples by groundwater, or uncertainties as to the original depth of the samples. Augering below the groundwater table is of even lesser reliability than augering above the water table.

Rock Augering: Use can be made of a Tungsten Carbide (TC) bit for auger drilling into rock to indicate rock quality and continuity by variation in drilling resistance and from examination of recovered rock cuttings. This method of investigation is quick and relatively inexpensive but provides only an indication of the likely rock strength and predicted values may be in error by a strength order. Where rock strengths may have a significant impact on construction feasibility or costs, then further investigation by means of cored boreholes may be warranted.

Wash Boring: The borehole is usually advanced by a rotary bit, with water being pumped down the drill rods and returned up the annulus, carrying the drill cuttings. Only major changes in stratification can be assessed from the cuttings, together with some information from "feel" and rate of penetration.

Mud Stabilised Drilling: Either Wash Boring or Continuous Core Drilling can use drilling mud as a circulating fluid to stabilise the borehole. The term 'mud' encompasses a range of products ranging from bentonite to polymers. The mud tends to mask the cuttings and reliable identification is only possible from intermittent intact sampling (eg. from SPT and U50 samples) or from rock coring, etc.

Continuous Core Drilling: A continuous core sample is obtained using a diamond tipped core barrel. Provided full core recovery is achieved (which is not always possible in very low strength rocks and granular soils), this technique provides a very reliable (but relatively expensive) method of investigation. In rocks, NMLC or HQ triple tube core barrels, which give a core of about 50mm and 61mm diameter, respectively, is usually used with water flush. The length of core recovered is compared to the length drilled and any length not recovered is shown as NO CORE. The location of NO CORE recovery is determined on site by the supervising engineer; where the location is uncertain, the loss is placed at the bottom of the drill run.

Standard Penetration Tests: Standard Penetration Tests (SPT) are used mainly in non-cohesive soils, but can also be used in cohesive soils, as a means of indicating density or strength and also of obtaining a relatively undisturbed sample. The test procedure is described in Australian Standard 1289.6.3.1–2004 (R2016) *'Methods of Testing Soils for Engineering Purposes, Soil Strength and Consolidation Tests – Determination of the Penetration Resistance of a Soil – Standard Penetration Test (SPT)'*.

The test is carried out in a borehole by driving a 50mm diameter split sample tube with a tapered shoe, under the impact of a 63.5kg hammer with a free fall of 760mm. It is normal for the tube to be driven in three successive 150mm increments and the 'N' value is taken as the number of blows for the last 300mm. In dense sands, very hard clays or weak rock, the full 450mm penetration may not be practicable and the test is discontinued.

The test results are reported in the following form:

- In the case where full penetration is obtained with successive blow counts for each 150mm of, say, 4, 6 and 7 blows, as

  N = 13
  4, 6, 7

- In a case where the test is discontinued short of full penetration, say after 15 blows for the first 150mm and 30 blows for the next 40mm, as

  N > 30
  15, 30/40mm

The results of the test can be related empirically to the engineering properties of the soil.

A modification to the SPT is where the same driving system is used with a solid 60° tipped steel cone of the same diameter as the SPT hollow sampler. The solid cone can be continuously driven for some distance in soft clays or loose sands, or may be used where damage would otherwise occur to the SPT. The results of this Solid Cone Penetration Test (SCPT) are shown as 'N_c' on the borehole logs, together with the number of blows per 150mm penetration.

LOGS

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

The terms and symbols used in preparation of the logs are defined in the following pages.

Interpretation of the information shown on the logs, and its application to design and construction, should therefore take into account the spacing of boreholes or test pits, the method of drilling or excavation, the frequency of sampling and testing and the possibility of other than 'straight line' variations between the boreholes or test pits. Subsurface conditions between boreholes or test pits may vary significantly from conditions encountered at the borehole or test pit locations.

GROUNDWATER

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

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

More reliable measurements can be made by installing standpipes which are read after the groundwater level has stabilised at intervals ranging from several days to perhaps weeks for low permeability soils. Piezometers, sealed in a particular stratum, may be advisable in low permeability soils or where there may be interference from perched water tables or surface water.

FILL

The presence of fill materials can often be determined only by the inclusion of foreign objects (eg. bricks, steel, etc) or by distinctly unusual colour, texture or fabric. Identification of the extent of fill materials will also depend on investigation methods and frequency. Where natural soils similar to those at the site are used for fill, it may be difficult with limited testing and sampling to reliably assess the extent of the fill.

The presence of fill materials is usually regarded with caution as the possible variation in density and material type is much greater than with natural soil deposits. Consequently, there is an increased risk of adverse environmental characteristics or behaviour. If the volume and nature of fill is of importance to a project, then frequent test pit excavations are preferable to boreholes.

LABORATORY TESTING

Laboratory testing has not been undertaken to confirm the soil classification and rock strengths indicated on the environmental logs unless noted in the report.

SYMBOL LEGENDS

SOIL


FILL


TOPSOIL


CLAY (CL, CI, CH)


SILT (ML, MH)


SAND (SP, SW)


GRAVEL (GP, GW)


SANDY CLAY (CL, CI, CH)


SILTY CLAY (CL, CI, CH)


CLAYEY SAND (SC)


SILTY SAND (SM)


GRAVELLY CLAY (CL, CI, CH)


CLAYEY GRAVEL (GC)


SANDY SILT (ML, MH)


PEAT AND HIGHLY ORGANIC SOILS (Pt)

ROCK


CONGLOMERATE


SANDSTONE


SHALE/MUDSTONE


SILTSTONE


CLAYSTONE


COAL


LAMINITE


LIMESTONE


PHYLLITE, SCHIST


TUFF


GRANITE, GABBRO


DOLERITE, DIORITE


BASALT, ANDESITE


QUARTZITE

OTHER MATERIALS


BRICKS OR PAVERS


CONCRETE


ASPHALTIC CONCRETE

CLASSIFICATION OF COARSE AND FINE GRAINED SOILS

Major Divisions		Group Symbol	Typical Names	Field Classification of Sand and Gravel	Laboratory Classification	
Coarse grained soil (more than 65% of soil excluding oversize fraction is greater than 0.075mm)	GRAVEL (more than half of coarse fraction is larger than 2.36mm	GW	Gravel and gravel-sand mixtures, little or no fines	Wide range in grain size and substantial amounts of all intermediate sizes, not enough fines to bind coarse grains, no dry strength	≤ 5% fines	$C_u > 4$ $1 < C_c < 3$
		GP	Gravel and gravel-sand mixtures, little or no fines, uniform gravels	Predominantly one size or range of sizes with some intermediate sizes missing, not enough fines to bind coarse grains, no dry strength	≤ 5% fines	Fails to comply with above
		GM	Gravel-silt mixtures and gravel-sand-silt mixtures	'Dirty' materials with excess of non-plastic fines, zero to medium dry strength	≥ 12% fines, fines are silty	Fines behave as silt
		GC	Gravel-clay mixtures and gravel-sand-clay mixtures	'Dirty' materials with excess of plastic fines, medium to high dry strength	≥ 12% fines, fines are clayey	Fines behave as clay
	SAND (more than half of coarse fraction is smaller than 2.36mm)	SW	Sand and gravel-sand mixtures, little or no fines	Wide range in grain size and substantial amounts of all intermediate sizes, not enough fines to bind coarse grains, no dry strength	≤ 5% fines	$C_u > 6$ $1 < C_c < 3$
		SP	Sand and gravel-sand mixtures, little or no fines	Predominantly one size or range of sizes with some intermediate sizes missing, not enough fines to bind coarse grains, no dry strength	≤ 5% fines	Fails to comply with above
		SM	Sand-silt mixtures	'Dirty' materials with excess of non-plastic fines, zero to medium dry strength	≥ 12% fines, fines are silty	N/A
		SC	Sand-clay mixtures	'Dirty' materials with excess of plastic fines, medium to high dry strength	≥ 12% fines, fines are clayey	

Major Divisions		Group Symbol	Typical Names	Field Classification of Silt and Clay			Laboratory Classification
				Dry Strength	Dilatancy	Toughness	% < 0.075mm
ine grained soils (more than 35% of soil excluding oversize fraction is less than 0.075mm)	SILT and CLAY (low to medium plasticity)	ML	Inorganic silt and very fine sand, rock flour, silty or clayey fine sand or silt with low plasticity	None to low	Slow to rapid	Low	Below A line
		CL, CI	Inorganic clay of low to medium plasticity, gravelly clay, sandy clay	Medium to high	None to slow	Medium	Above A line
		OL	Organic silt	Low to medium	Slow	Low	Below A line
	SILT and CLAY (high plasticity)	MH	Inorganic silt	Low to medium	None to slow	Low to medium	Below A line
		CH	Inorganic clay of high plasticity	High to very high	None	High	Above A line
		OH	Organic clay of medium to high plasticity, organic silt	Medium to high	None to very slow	Low to medium	Below A line
	Highly organic soil	Pt	Peat, highly organic soil	–	–	–	–

Laboratory Classification Criteria

A well graded coarse grained soil is one for which the coefficient of uniformity $Cu > 4$ and the coefficient of curvature $1 < C_c < 3$. Otherwise, the soil is poorly graded. These coefficients are given by:

$$C_U = \frac{D_{60}}{D_{10}} \qquad and \qquad C_C = \frac{(D_{30})^2}{D_{10}\, D_{60}}$$

Where D_{10}, D_{30} and D_{60} are those grain sizes for which 10%, 30% and 60% of the soil grains, respectively, are smaller.

NOTES:

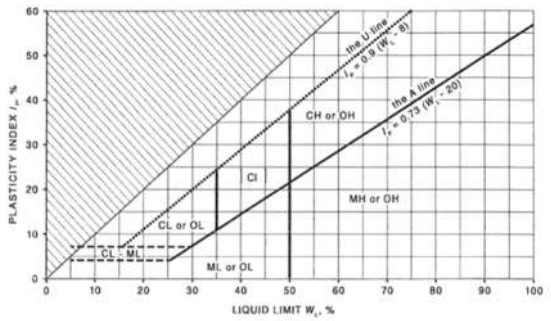
1 For a coarse grained soil with a fines content between 5% and 12%, the soil is given a dual classification comprising the two group symbols separated by a dash; for example, for a poorly graded gravel with between 5% and 12% silt fines, the classification is GP-GM.

2 Where the grading is determined from laboratory tests, it is defined by coefficients of curvature (C_c) and uniformity (C_u) derived from the particle size distribution curve.

3 Clay soils with liquid limits > 35% and ≤ 50% may be classified as being of medium plasticity.

4 The U line on the Modified Casagrande Chart is an approximate upper bound for most natural soils.

Modified Casagrande Chart for Classifying Silts and Clays according to their Behaviour



LOG SYMBOLS

Log Column	Symbol	Definition
Groundwater Record		Standing water level. Time delay following completion of drilling/excavation may be shown.
		Extent of borehole/test pit collapse shortly after drilling/excavation.
		Groundwater seepage into borehole or test pit noted during drilling or excavation.
Samples	ES	Sample taken over depth indicated, for environmental analysis.
	U50	Undisturbed 50mm diameter tube sample taken over depth indicated.
	DB	Bulk disturbed sample taken over depth indicated.
	DS	Small disturbed bag sample taken over depth indicated.
	ASB	Soil sample taken over depth indicated, for asbestos analysis.
	ASS	Soil sample taken over depth indicated, for acid sulfate soil analysis.
	SAL	Soil sample taken over depth indicated, for salinity analysis.
	PFAS	Soil sample taken over depth indicated, for analysis of Per- and Polyfluoroalkyl Substances.
Field Tests	N = 17 4, 7, 10	Standard Penetration Test (SPT) performed between depths indicated by lines. Individual figures show blows per 150mm penetration. 'Refusal' refers to apparent hammer refusal within the corresponding 150mm depth increment.
	N_c = 5 7 3R	Solid Cone Penetration Test (SCPT) performed between depths indicated by lines. Individual figures show blows per 150mm penetration for 60° solid cone driven by SPT hammer. 'R' refers to apparent hammer refusal within the corresponding 150mm depth increment.
	VNS = 25 PID = 100	Vane shear reading in kPa of undrained shear strength. Photoionisation detector reading in ppm (soil sample headspace test).
Moisture Condition (Fine Grained Soils)	w > PL $w \approx$ PL w < PL $w \approx$ LL w > LL	Moisture content estimated to be greater than plastic limit. Moisture content estimated to be approximately equal to plastic limit. Moisture content estimated to be less than plastic limit. Moisture content estimated to be near liquid limit. Moisture content estimated to be wet of liquid limit.
(Coarse Grained Soils)	D M W	DRY – runs freely through fingers. MOIST – does not run freely but no free water visible on soil surface. WET – free water visible on soil surface.
Strength (Consistency) Cohesive Soils	VS S F St VSt Hd Fr ( )	VERY SOFT – unconfined compressive strength ≤ 25kPa. SOFT – unconfined compressive strength > 25kPa and ≤ 50kPa. FIRM – unconfined compressive strength > 50kPa and ≤ 100kPa. STIFF – unconfined compressive strength > 100kPa and ≤ 200kPa. VERY STIFF – unconfined compressive strength > 200kPa and ≤ 400kPa. HARD – unconfined compressive strength > 400kPa. FRIABLE – strength not attainable, soil crumbles. Bracketed symbol indicates estimated consistency based on tactile examination or other assessment.
Density Index/ Relative Density (Cohesionless Soils)	VL L MD D VD ( )	**Density Index (I_D) Range (%)** / **SPT 'N' Value Range (Blows/300mm)** VERY LOOSE ≤ 15 / 0 – 4 LOOSE > 15 and ≤ 35 / 4 – 10 MEDIUM DENSE > 35 and ≤ 65 / 10 – 30 DENSE > 65 and ≤ 85 / 30 – 50 VERY DENSE > 85 / > 50 Bracketed symbol indicates estimated density based on ease of drilling or other assessment.

Log Column	Symbol	Definition
Hand Penetrometer Readings	300 250	Measures reading in kPa of unconfined compressive strength. Numbers indicate individual test results on representative undisturbed material unless noted otherwise.
Remarks	'V' bit	Hardened steel 'V' shaped bit.
	'TC' bit	Twin pronged tungsten carbide bit.
	T_{60}	Penetration of auger string in mm under static load of rig applied by drill head hydraulics without rotation of augers.
	Soil Origin	The geological origin of the soil can generally be described as: RESIDUAL – soil formed directly from insitu weathering of the underlying rock. No visible structure or fabric of the parent rock. EXTREMELY WEATHERED – soil formed directly from insitu weathering of the underlying rock. Material is of soil strength but retains the structure and/or fabric of the parent rock. ALLUVIAL – soil deposited by creeks and rivers. ESTUARINE – soil deposited in coastal estuaries, including sediments caused by inflowing creeks and rivers, and tidal currents. MARINE – soil deposited in a marine environment. AEOLIAN – soil carried and deposited by wind. COLLUVIAL – soil and rock debris transported downslope by gravity, with or without the assistance of flowing water. Colluvium is usually a thick deposit formed from a landslide. The description 'slopewash' is used for thinner surficial deposits. LITTORAL – beach deposited soil.

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, but the soil has not been significantly transported.
Extremely Weathered		XW		Material is weathered to such an extent that it has soil properties. Mass structure and material texture and fabric of original rock are still visible.
Highly Weathered	Distinctly Weathered (Note 1)	HW	DW	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 deposition of weathering products in pores.
Moderately Weathered		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 not recognisable, but shows little or no change of strength from fresh rock.
Slightly Weathered		SW		Rock is partially discoloured with staining or bleaching along joints 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.

NOTE 1: The term 'Distinctly Weathered' is used where it is not practicable to distinguish between 'Highly Weathered' and 'Moderately Weathered' rock. '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'*. There is some change in rock strength.

Rock Material Strength Classification

Term	Abbreviation	Uniaxial Compressive Strength (MPa)	Guide to Strength	
			Point Load Strength Index $Is_{(50)}$ (MPa)	Field Assessment
Very Low Strength	VL	0.6 to 2	0.03 to 0.1	Material crumbles under firm blows with sharp end of pick; can be peeled with knife; too hard to cut a triaxial sample by hand. Pieces up to 30mm thick can be broken by finger pressure.
Low Strength	L	2 to 6	0.1 to 0.3	Easily scored with a knife; indentations 1mm to 3mm show in the specimen with firm blows of the pick point; has 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 Strength	M	6 to 20	0.3 to 1	Scored with a knife; a piece of core 150mm long by 50mm diameter can be broken by hand with difficulty.
High Strength	H	20 to 60	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 Strength	VH	60 to 200	3 to 10	Hand specimen breaks with pick after more than one blow; rock rings under hammer.
Extremely High Strength	EH	> 200	> 10	Specimen requires many blows with geological pick to break through intact material; rock rings under hammer.

Appendix E: Waste and Imported Materials Tracking Spreadsheet Examples

Imported Materials Register

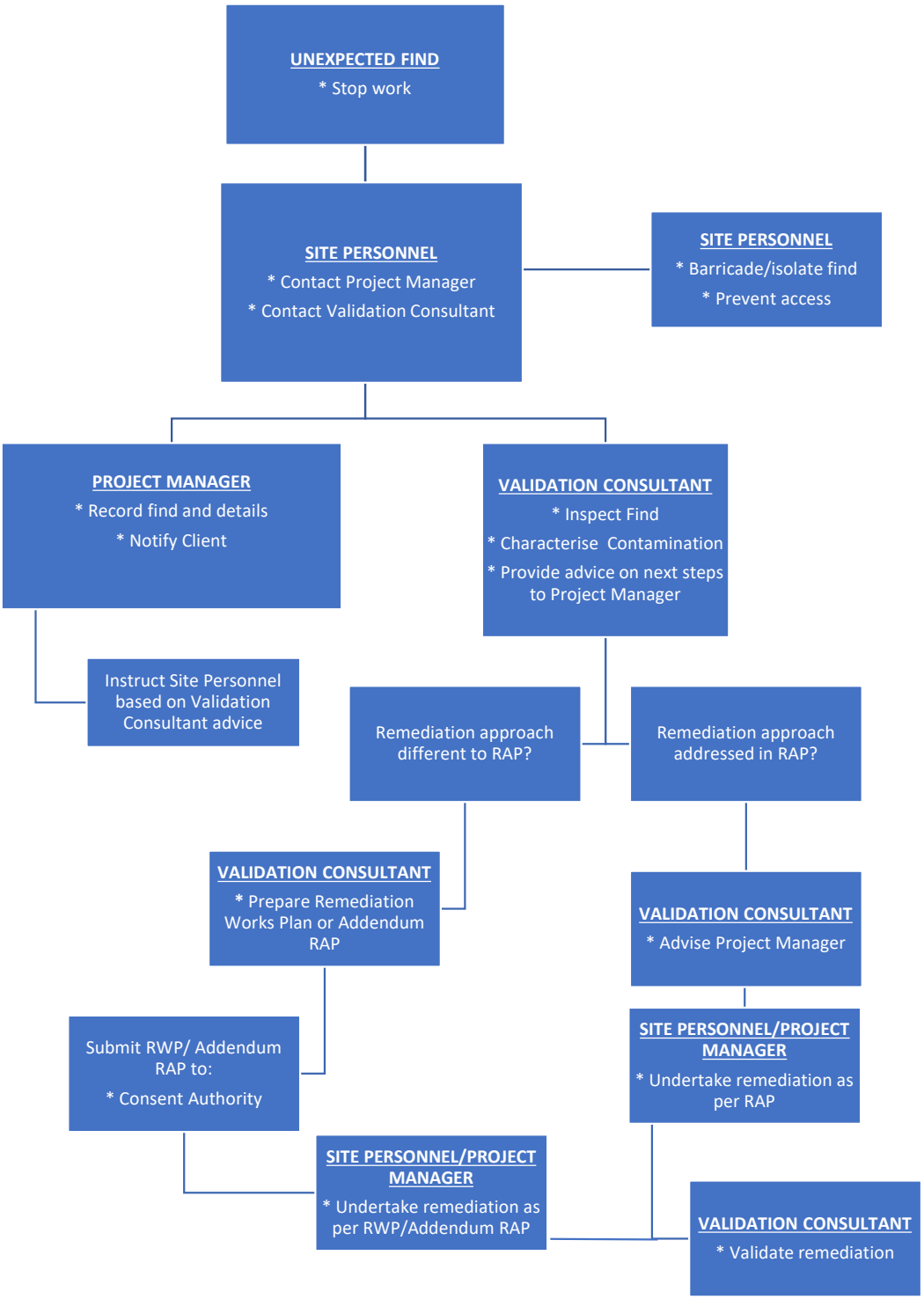
Supplier	Date	Docket/Invoice #	Product Type	Quantity (specify m3 or tonnes)	Area where Material was Placed

Exported (Waste) Materials Register

Load	Date	Material Type / Classification	Site Area where Waste was Generated	Waste Classification Report Reference	Disposal Facility	Tipping Receipt/Docket Number	Tracking Number (where relevant)	Tonnage

Appendix F: Unexpected Finds Protocol Summary

UNEXPECTED FINDS PROTOCOL FLOW-CHART



Appendix G: Guidelines and Reference Documents

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