REPORT TO

ERILYAN PTY LTD

ON

PRELIMINARY SALINITY ASSESSMENT

FOR

PROPOSED NORTHSIDE WEST CLINIC STAGE 2 DEVELOPMENT

AT

23-27 LYTTON STREET, WENTWORTHVILLE, NSW

Date: 21 December 2021
Ref: E27318PHrpt-SAL-rev2

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ABBREVIATIONS

Australian Height Datum	**AHD**
Acid Sulfate Soil	**ASS**
Below Ground Level	**BGL**
Borehole	**BH**
Cation Exchange Capacity	**CEC**
Calcium	**Ca**
Cement, Concrete and Aggregates Australia	**CCAA**
Chain of Custody	**COC**
Damp Proof Course	**DPC**
Department of Land and Water Conservation	**DLWC**
Dissolved Oxygen	**DO**
International Organisation of Standardisation	**ISO**
JK Environments	**JKE**
Local Government Authority	**LGA**
Map Grid of Australia	**MGA**
Magnesium	**Mg**
National Association of Testing Authorities	**NATA**
Potassium	**K**
Polyvinyl Chloride	**PVC**
Practical Quantitation Limit	**PQL**
Redox Potential	**Eh**
Site Assessment Criteria	**SAC**
Standard Penetration Test	**SPT**
Standard Sampling Procedure	**SSP**
Standing Water Level	**SWL**
Standard Sampling Procedure	**SSP**
Sodium	**Na**
Western Sydney Regional Organisation of Councils	**WSROC**

Units

deci Siemens per Metre	**dS/m**
Electrical Conductivity	**EC**
Exchangeable Sodium Percentage (Sodicity)	**ESP%**
Litres	**L**
Metres	**m**
Metres Below Ground Level	**mBGL**
Millivolts	**mV**
Millilitres	**ml**
Milliequivalents	**meq**
Milligrams per Litre	**mg/L**
Milligrams per Kilogram	**mg/kg**
ohm Centimetres	**ohm.cm**
Parts Per Million	**ppm**
micro Siemens per Centimetre	**µS/cm**

1 INTRODUCTION

Erilyan ('the client') commissioned JK Environments (JKE) to undertake a preliminary salinity assessment and establish the need for a salinity management plan for the proposed Northside West Clinic Stage 2 development at 23-27 Lytton Street, Wentworthville, NSW. The site location is shown on Figure 1 and the assessment was confined to the site boundaries as shown on Figure 2.

We understand that this report will be used to support the lodgement of a Development Application for the proposed Northside West Clinic Stage 2 development.

The salinity assessment was undertaken in conjunction with a Preliminary Site Investigation (PSI) that will be referred to as the 'JKE PSI' herein (Ref: E27318PHrpt, dated 4 June 2021)[1].

A geotechnical investigation was undertaken in conjunction with this assessment by JK Geotechnics (JKG). The results of the geotechnical investigation are presented in a separate report (Ref: 33969BTrpt, dated 13 May 2021)[2]. This report should be read in conjunction with the JKG report.

JKE (as EIS, prior to our rebranding) have previously undertaken two contamination screenings at the site (Ref: E27318Klet[3] and E27318Klet2[4]). A summary of this information has been included in Section 0.

Background information on salinity is included in the appendices.

1.1 Proposed Development Details

From the supplied architectural drawings prepared by Team 2 Architects (Job No. 903, dated 14 December 2021), we understand that the Stage 2 Development will comprise:

- Construction of a three-storey ward building in the area of the existing on-grade carpark on the southern side of the Northside West Clinic; and
- Demolition of the existing building in the western portion of the site and construction of a two-storey Day Programme building above an undercroft car park.

The ground floor level of the proposed ward building will occupy the eastern half of the building footprint and will be approximately level with Lytton Street on the eastern side, and due to the slope of the site will be approximately 1.7m above the existing ground level in the north-western corner. This will likely require either placement of fill or suspending the building over the existing ground surface. The proposed undercroft car park on the western side of the site will be approximately at the existing ground level and we will only require minimal or no excavation or filling. Extensive landscaping is not proposed as part of this development;

[1] JKE, (2021a). *Preliminary (Stage 1) Site Investigation for Proposed Northside West Clinic Stage 2 Development at 23-27 Lytton Street, Wentworthville, NSW.* (referred to as the PSI)

[2] JKG, (2020). *Report to Erilyan Pty Ltd on Geotechnical Investigation for Proposed Northside West Stage 2 at 23-27 Lytton Street, Wentworthville, NSW.* (referred to as JKG report)

[3] EIS (2014). *Report to Erilyan Pty Ltd on Preliminary Soil Contamination Screening & Waste Classification for Proposed Additions to Northside West Clinic at 23-27 Lytton Street, Wentworthville, NSW.* (referred to as EIS 2014)

[4] EIS (2015). *Report to Erilyan Pty Ltd on Preliminary Soil Contamination Screening & Waste Classification for Proposed Additions to Northside West Clinic – Stage 2 Works at 23-27 Lytton Street, Wentworthville, NSW.* (referred to as EIS 2015)

however, it is noted that existing garden beds and trees are to be retained. Some landscaping is proposed beneath the undercroft in the south-west section of the site, however this will largely be a mixture of paving, hard surfaces and built up garden beds and mounds. Please refer to the development plans attached in the appendices.

1.2 Aim and Objectives

The primary aim of the assessment was to characterise the broad scale salinity conditions at the site in the context of the proposed development works. The assessment objectives were to:

- Assess the current site conditions via a site walkover inspection;
- Assess the soil and groundwater salinity conditions via implementation of a preliminary sampling and analysis program; and
- Establish the need for a salinity management plan.

1.3 Scope of Work

The assessment was undertaken generally in accordance with a JKE proposal (Ref: EP53114PH) of 24 November 2020 and written acceptance from the client of 31 March 2021. The scope of work included the following:

- Review site information including topography, soils maps, regional geology and hydro-geology in the vicinity of the site;
- A walkover site inspection to identify obvious visual indicators of salinity or potential problem areas;
- Design and implementation of a field sampling and laboratory analysis program;
- Interpretation of the analytical results based on established assessment criteria; and
- Preparation of a report presenting the results of the assessment.

The assessment was designed and the report was prepared with reference to regulations/guidelines outlined in the table below. Individual guidelines/documents are also referenced within the text of the report.

Table 1-1: Guidelines

Guidelines/Regulations/Documents
Site Investigations for Urban Salinity (2002)[5]
Salinity Code of Practice (2004)[6]
Managing Urban Stormwater – Soil and Construction (4th ed.) (2004)[7]
Salinity Potential in Western Sydney Map (2002)[8]

[5] Department of Land and Water Conservation (DLWC), (2002). *Site Investigations for Urban Salinity,* (referred to as DLWC 2002)

[6] Western Sydney Regional Organisation of Councils (WSROC) and Department of Infrastructure, Planning and Natural Resources (DIPNR), (2003 amended 2004). *Western Sydney Salinity Code of Practice* (referred to as Salinity Code of Practice)

[7] NSW Government/Landcom, (2004). *Managing Urban Stormwater – Soil and Construction*, (4th ed.) (referred to as Blue Book)

[8] DIPNR, (2002). *1:100,000 Map – Salinity Potential in Western Sydney*, (referred to as Salinity Potential Map)

Guidelines/Regulations/Documents
Piling – Design and Installation AS2159-2009 (2009)[9]
Industry Guide T56: Residential Slabs and Footings in Saline Environments (2018)[10]

[9] Standards Australia, (2009). *Piling – Design and Installation, AS2159-2009* (referred to as AS2159-2009)

[10] Cement, Concrete and Aggregates Australia (CCAA), (2018). Industry Guide *T56: Residential Slabs and Footings in Saline Environments* (referred to as CCAA 2018)

2 SITE INFORMATION

2.1 Background

2.1.1 EIS 2014

The EIS 2014 preliminary contamination screening included a site inspection and soil sampling and analysis from four boreholes and one test pit location. Sub-surface conditions encountered at the site consisted of silty gravelly clay fill material beneath pavement to a maximum depth of approximately 0.8m below ground level (BGL), underlain by natural silty clay and siltstone to the termination depth of approximately 6.0mBGL.

2.1.2 EIS 2015

The EIS 2015 preliminary contamination screening included a site inspection and soil sampling and analysis from four borehole locations drilled for the geotechnical investigation. Groundwater wells were installed in two locations (MW101 and MW103) for geotechnical purposes but were not sampled as part of the contamination screening.

Sub-surface conditions encountered at the site consisted of fill material beneath pavement to a maximum depth of approximately 1.3mBGL, underlain by natural silty clay and siltstone to the termination depth of approximately 12mBGL.

2.2 Site Identification

Table 2-1: Site Identification

Site Address:	23-27 Lytton Street, Wentworthville, NSW
Lot & Deposited Plan:	Lot 1 in DP787784
Current Land Use:	Westmead Clinic
Proposed Land Use:	Westmead Clinic
Local Government Authority (LGA):	Cumberland City Council
Site Area (m^2):	6,600
RL (AHD in m) (approx.):	19
Geographical Location (decimal degrees) (approx.):	Latitude: -33.810779 Longitude: 150.974627

2.3 Site Location and Regional Setting

The site is located in a predominantly residential area of Wentworthville and is bound by Lytton Street to the east. The site is located immediately (<50m) to the east of Finlayson Creek.

2.4 Topography

The region consists of undulating topography with the site itself characterised by an overall slope with a gradient of approximately 2° that falls to the west towards Finlayson Creek.

2.5 Site Inspection

A walkover inspection of the site was undertaken by JKE on 28 April 2021. The inspection was limited to accessible areas of the site and immediate surrounds. An internal inspection of buildings was not undertaken.

At the time of the inspection, the majority of site was occupied by three buildings that made up the Westmead Clinic. The main clinical building was of recent construction while the smaller two buildings appeared of older vintage. Part of the central building was cut into the slop of the site to form a steep ramp accessed from Lytton Street to the east. Potential asbestos containing building materials were noted as fibre cement lined eaves and awnings of the older style buildings.

The southern and northern portions of the site contained open air asphaltic concrete car parks. Various large native trees and exotic shrubs were located within landscaped areas around the perimeter of the site. No signs or indicators of former land use were identified at the time of the inspection.

Portions of the site may have historically been cut and/or filled to create a level platform for the existing buildings, particularly in the eastern portion of the site at the higher end of the slope.

Surface water runoff is presumed to follow the general slope of the site to the west towards Finlayson Creek. Stormwater drains were located along the western boundary and were presumably connected to the local stormwater system.

Various large native trees and exotic shrubs were located within landscaped areas around the perimeter of the site. No visual signs of plant stress or dieback were identified at the time of the inspection.

2.6 Surrounding Land Use

During the site inspection, JKE observed the following land uses in the immediate surrounds:

- North – Low density residential properties;
- South – Wentworthville Community Garden and low density residential properties;
- East – Grassed public land and Finlayson Creek; and
- West – Lytton Street and residential beyond.

3 GEOLOGY AND HYDROGEOLOGY

3.1 Regional Geology and Soils

Regional geological information was reviewed for the investigation. The information was sourced from the Lotsearch report attached to the JKE PSI. The report indicates that the site is underlain by Ashfield Shale of the Wianamatta Group, which typically consists of black to dark grey shale and laminite.

The Soil Landscape Map of Penrith (1990)[11] indicates that the site is located within the Blacktown soil landscape. Blacktown soils are characterised by moderate erodibility with some higher local occurrences, low dispersivity and localised areas of moderate salinity.

3.2 Salinity Hazard Map

Salinity information presented in the Lotsearch report indicated that the site is located within an area of moderate salinity potential.

The moderate classification is attributed to scattered areas of scalding and indicator vegetation, in areas where concentrations have not been mapped. Saline areas may occur in this zone, which have not been identified or may occur if risk factors change adversely.

3.3 Acid Sulfate Soil Risk and Planning

The site is not located in an acid sulfate soil (ASS) risk area according to the risk maps prepared by the Department of Land and Water Conservation.

3.4 Hydrogeology

Hydrogeological information presented in the Lotsearch report indicated that the regional aquifer on-site and, in the areas, immediately surrounding the site includes porous, extensive aquifers of low to moderate productivity. There was a total of 15 registered bores within the report buffer of 2,000m. In summary:

- The nearest registered bore was located approximately 569m from the site. This was utilised for monitoring purposes;
- The remaining bores were registered for monitoring or testing purposes;
- There were no nearby bores (i.e. within 500m) registered for domestic or irrigation uses; and
- The drillers log information from the closest registered bores typically identified fill and/or clay soil to depths of 1.2-3.5m, underlain by shale or sandstone bedrock. Standing water levels (SWLs) in the bores ranged from 5.0mBGL to 7.0mBGL.

The Wianamatta Formation is characterised by very low permeability, low storage and high groundwater salinity as a consequence of the depositional environment during the middle Triassic period. This typically renders the shale groundwater unsuitable for any use due to low yield and poor quality. A perched groundwater table condition may occur in the residual soils overlying the Shale at some locations especially

[11] Soil Conservation Service of NSW, (1990) *1:100,000 Map - Soil Landscapes of the Penrith Sheet 9030*

during prolonged wet conditions. This occurs due to the relatively higher permeability of soil at the soil-rock interface. Due to the shorter residence time, the perched water is typically less saline than flows within the bedrock.

3.5 Receiving Water Bodies and Surface Water Run-off

The site location and regional topography indicates that excess surface water flows have the potential to enter the Finlayson Creek located immediately west of the site. This water body could be a potential receptor.

4 SAMPLING AND ANALYSIS PLAN

4.1 Soil Sampling Rationale

The investigation included soil sampling from three locations (BH201 to BH203) in accessible areas of the west section of the site as shown on Figure 2. This density is equivalent to approximately three sampling points per hectare (the area of the site is approximately 0.66 hectares) and meets the requirements for an 'initial site investigation' recommended in the DLWC 2002 document for 'moderately intensive construction', however we note that sampling locations were not evenly distributed across the site. The density was considered adequate to identify large areas of salinity impacted soils at the site.

Soil sampling for this assessment was confined to the depth of approximately 6.5m below existing ground level. This was considered adequate as the proposed development includes only shallow excavations.

Sampling for salinity was limited to the west section of the site and did not include areas beneath existing buildings or in the proposed ward building footprint.

4.2 Soil Sampling Methods

Fieldwork for this investigation was undertaken on 20 April 2021. Sampling locations were set out using a tape measure. Locations were marked using spray paint and were cleared for underground services prior to drilling.

BH201 was drilled using a track mounted hydraulically operated drill rig equipped with spiral flight augers. Soil samples were obtained from a Standard Penetration Test (SPT) sampler or directly from the auger when conditions did not allow use of the SPT sampler. BH202 and BH203 were drilled using hand tools.

Soil samples were collected from the fill and natural profiles encountered during the investigation based on distinct change in lithology or field observations. All samples were recorded on the borehole logs attached in the Appendices.

Samples were placed in plastic bags and sealed using twist ties. Sampling personnel used disposable nitrile gloves during sampling activities. The samples were labelled with the job number, sampling location, sampling depth and date.

On completion of the fieldwork, the samples were delivered in the insulated sample container to a NATA registered laboratory for analysis under standard COC procedures. Field sampling protocols adopted for this assessment are summarised in the appendices.

4.3 Groundwater Sampling Rationale

Two groundwater monitoring wells (MW101 and MW103) were installed in the south section of the site as shown on Figure 2.

4.4 Monitoring Well Installation

The monitoring well construction details are documented on appropriate borehole logs presented in the appendices. The wells were installed to depths of between 11.7m to 12m, and included casing from the surface to depths of between 2m and 3m with slotted PVC to the bottom of the wells. A sand filter pack extended from the bottom of the wells to above the slotted sections, with a bentonite seal above the sand. The wells were completed with a gatic cover.

4.5 Monitoring Well Development and Groundwater Sampling

The monitoring wells were developed using a submersible electric pump on 20 April 2021. Groundwater samples were obtained from the monitoring wells using low flow sampling equipment on 28 April 2021. The pH, temperature, electrical conductivity (EC), dissolved oxygen (DO) and redox potential (Eh) were monitored during sampling using calibrated field instruments. The sampling data sheets are attached in the Appendices. The samples were preserved in accordance with the requirements detailed in AS/NZS 5667.1-1998[12] and placed in an insulated container with ice.

On completion of the fieldwork, the samples were delivered in an insulated sample container to a NATA registered laboratory for analysis under standard chain of custody procedures.

4.6 Laboratory Analysis

Samples were analysed by Envirolab Services Pty Ltd (NATA accreditation number 2901). Reference should be made to the laboratory reports (Ref: 267374, 267802 and 267802-A) attached in the appendices for further details of the analytical methods.

4.7 Analytical Schedule

The analytical schedule is outlined in the following table:

Table 4-1: Analytical Schedule

Analyte	Fill Samples	Natural Soil Samples	Natural Bedrock Samples	Groundwater Samples
pH	1	7	1	2
Electrical Conductivity (EC)	1	7	1	2
Resistivity	1	7	1	-
Texture (used to determine EC extract – ECe)	1	7	1	-

[12] Standards Australia, (1998). *Water Quality – Part 1: Sampling, Guidance on the Design of Sampling Programs, Sampling Techniques and the Preservation and Handling of Samples,* (AS/NZS 5667.1:1998)

Analyte	Fill Samples	Natural Soil Samples	Natural Bedrock Samples	Groundwater Samples
Sulphate	1	7	1	2
Chloride	1	7	1	2

5 SITE ASSESSMENT CRITERIA (SAC)

5.1 Soil Salinity and Plant Growth

The electrical conductivity (EC) of a 1:5 soil:water extract is commonly used as an indicator of soil salinity conditions as the reading is directly related to the electrolyte (salt) concentration of the extract. In order to compare the laboratory data with published salinity classes, the results are converted to equivalent saturated paste (ECe) using texture adjustment values presented in DLWC 2002.

The following table provides a summary of plant response with reference to salinity:

Table 5-1: Plant Response to Soil Salinity

ECe (dS/m)	Salinity Class	Plant Response[1]
<2	Non-saline	Salinity effects mostly negligible
2-4	Slightly saline	Yields of very sensitive crops may be affected
4-8	Moderately saline	Yield of many crops affected
8-16	Very saline	Only tolerant crops yield satisfactorily
>16	Highly saline	Only a few very tolerant crops yield satisfactorily

Note:

1 - Plant Response to Salinity Class has been adopted from DLWC 2002

5.2 Soil pH and Plant Growth

Soil pH is a measure of the acidity or alkalinity of the soils and values have been assessed as an indicator of soil fertility with respect to plant growth. The optimal pH for plant growth is between 5.5 and 7. Beyond this range, effective revegetation of exposed soil following disturbance is increasingly difficult and the potential for erosion is considered to increase.

Highly alkaline soils are commonly associated with saline and sodic soil conditions and can limit the ability of plants to take up water and nutrients. Highly acidic soils exhibit aluminium toxicity toward plants and can limit the ability of plants to take up other essential nutrients including molybdenum.

Interpretation of soil pH with respect to plant growth is undertaken using the ratings published in Bruce and Rayment (1982)[13] presented below:

Table 5-2: Plant Response to Soil pH

pH	Rating
<4.5	Extremely acidic
4.5-5.0	Very strongly acidic

[13] Bruce, R.C. and Rayment, G.E., (1982). *Analytical Methods and Interpretations used by the Agricultural Chemistry Branch for Soil and Land Use Surveys,* (referred to as Bruce and Rayment 1982)

pH	Rating
5.1-5.5	Strongly acidic
5.6 – 7.3	Optimal plant growth
7.4-7.8	Mildly alkaline
7.9-8.4	Moderately alkaline
8.5-9.0	Strongly alkaline
>9.1	Very strongly alkaline

5.3 Cation Exchange Capacity (CEC) in Soil

The ability of soils to attract, retain and exchange cations (positively charged ions) is estimated by the calculated CEC value. CEC represents the major controlling factor in stability of clay soil structure, nutrient availability for plant growth, soil pH and the reaction of the soil to chemical applications (fertilisers, conditioners etc.).

High CEC soils have a greater capacity to retain nutrients, however, deficient soils require greater applications of nutrients to correct imbalances. Low CEC soils have a reduced capacity to retain nutrients and may result in leaching of nutrients from the soil in the event of excess nutrient applications.

Metson (1961)[14] developed a set of ratings for effective CEC and the most abundant cations. These are summarised below (values are in meq/100g):

Table 5-3: CEC Rating

Rating	eCEC	Exch Na	Exch K	Exch Ca	Exch Mg
Very low	<6	0-0.1	0-0.2	0-2	0-0.3
Low	6-12	0.1-0.3	0.2-0.3	2-5	0.3-1
Moderate	12-25	0.3-0.7	0.3-0.7	5-10	1-3
High	25-40	0.7-2	0.7-2	10-20	3-8
Very high	>40	>2	>2	>20	>8

5.3.1 Ratio of Exchangeable Calcium to Magnesium

To maintain soil structure there should be a ratio of around 4:1 to 6:1 calcium to magnesium for a balanced soil (Eckert 1987)[15]. At ratios of less than 4:1 calcium is considered to be deficient, whilst at ratios of greater than 6:1 are considered to be magnesium deficient.

[14] Metson, A.J, (1961). *Methods of Chemical Analysis for Soil Survey Samples* (referred to as Metson 1961)

[15] Eckert, D.J, (1987) .*Soil Test Interpretation: Basic Cation Saturation Ratios and Sufficiency Levels* (referred to as Eckert 1987)

5.4 Exchangeable Sodium Percentage or Sodicity (ESP%)

Exchangeable sodium is an important soil stability and salinity parameter. Excessive exchangeable sodium leads to unstable soils, increased runoff, potential salinity, dispersivity and water logging problems.

Normally the sodium content is expressed as a percentage of the CEC as other cations counteract the negative effects of sodium (known as ESP% and termed sodicity). The effect of the exchangeable sodium (exchangeable sodium percentage, ESP) varies with other soil factors such as the type of clay, the relative quantity of magnesium and the quantity of organic matter. However, Charman & Murphy (2000)[16] indicate that a soil is generally considered sodic if the ESP exceeds 6% and extremely sodic if the ESP exceeds 15%.

5.5 Groundwater Salinity

EC values in groundwater are dependent on numerous factors and can vary with changes in temperature and pH conditions. Suttar (1990)[17] has classed water into different types based on EC values as outlined in the table below.

Table 5-4: EC Ranges in Water

Water Type	EC (µS/cm)
Deionised Water	0.5 – 3
Pure Rainwater	<15
Freshwater Rivers	0 – 800
Marginal River Water	800 – 1600
Brackish Water	1600 – 4800
Saline Water	>4800
Seawater	51,500
Industrial Waters	100 – 10,000

5.6 Recommendations for Concrete Slabs and Footings in Saline Soils

In the absence of endorsed recommendations for buildings in saline environments, reference is made to the CCAA 2018. The guide provides recommendations on the minimum concrete grade/strength required for slabs and footings in saline soils. Reference should be made to the CCAA 2018 publication for further information:

[16] Charman, P.E.V and Murphy, B.W (eds), (2000).*Soils: Their Management and Properties,* (referred to as Charman and Murphy 2000)

[17] Suttar, S., (1990). *Ribbons of Blue Handbook, Scitech*, Victoria (referred to as Suttar 1990)

Table 5-5: Minimum Concrete Grade for Slabs and Footings in Saline Soils

ECe (dS/m)	Salinity Class	Concrete Grade[1]
<2	Non-saline	N20
2-4	Slightly saline	N20
4-8	Moderately saline	N25
8-16	Very saline	N32
>16	Highly saline	≥N40

Note:

1 - Concrete Grade for Salinity Class has been adopted from CCAA 2018

5.7 Recommendations for Durability with Reference to AS2159-2009

In designing for durability, reference should be made to the requirements listed in the AS2159-2009. The exposure classification for concrete and steel piles and foundations is outlined in the following tables.

Table 5-6: Exposure Classification for Concrete Piles

Exposure Conditions				Exposure Classification	
Sulphate (expressed as SO_4)		pH	Chlorides in Groundwater (ppm)	Soil Conditions A[1]	Soil Conditions B[2]
In Soil (ppm)	In Groundwater (ppm)				
<5,000	<1,000	>5.5	<6,000	Mild	Non-aggressive
5,000-10,000	1,000-3,000	4.5-5.5	6,000-12,000	Moderate	Mild
10,000-20,000	3,000-10,000	4-4.5	12,000-30,000	Severe	Moderate
>20,000	>10,000	<4	>30,000	Very severe	Severe

Notes:

1 - High permeability soils (eg sands and gravels) which are in groundwater

2 – Low permeability soils (eg silts and clays) or all soils above groundwater

Table 5-7: Exposure Classification for Steel Piles

Exposure Conditions				Exposure Classifications	
pH	Chlorides		Resistivity (ohm.cm)	Soil Conditions A[1]	Soil Conditions B[2]
	In Soil (ppm)	In Groundwater (ppm)			
>5	<5,000	<1,000	>5,000	Non-aggressive	Non-aggressive
4-5	5,000-20,000	1,000-10,000	2,000-5,000	Mild	Non-aggressive
3-4	20,000-50,000	10,000-20,000	1,000-2,000	Moderate	Mild
<3	>50,000	>20,000	<1,000	Severe	Moderate

Notes:

1 - High permeability soils (eg sands and gravels) which are in groundwater

2 – Low permeability soils (eg silts and clays) or all soils above groundwater

6 INVESTIGATION RESULTS

6.1 Subsurface Conditions

A summary of the subsurface conditions encountered during the investigation is presented in the table below. Reference should be made to the borehole logs attached in the appendices for further details.

Table 6-1: Summary of Subsurface Conditions

Profile	Description (metres below ground level - mBGL)
Pavement	Asphaltic concrete pavement, approximately 80mm thick was encountered at the surface in BH201.
Fill	Fill material was encountered at the surface or beneath the pavement in all boreholes and extended to depths of approximately 0.8m to 1m. BH3 was terminated in the fill at a depth of approximately 0.8m. The fill typically comprised gravelly sand or sand at the surface or beneath the pavement with silty clay fill beneath the sand. The fill contained inclusions of igneous and ironstone gravel, ash, brick and fibre-cement fragments.
Natural Soil	Silty clay was encountered beneath the fill in BH201 and BH202 and extended to depths of approximately 3m to 4.8m. BH202 was terminated in the natural soil. The silty clay was typically brown or grey and includes traces of ironstone gravel, with clayey silt bands beyond a depth of 3m.
Bedrock	Siltstone was encountered beneath the natural soil in BH201 and extended to the termination of the borehole at 11.36m.
Groundwater	Groundwater seepage was not encountered in the boreholes during drilling. The previously installed wells in MW101 and MW103 were sampled as part of the salinity assessment. The SWLs were measured on 28 April 2021 at depths of 4.17m to 4.54m.

6.2 Laboratory Results

A summary of the results is presented below.

Table 6-2: Summary of Laboratory Results

Analyte	Results
EC & ECe	The EC results ranged from 140µS/m to 720µS/m. The ECe results ranged from <2dS/m to 5.8dS/m.
Resistivity	Resistivity values were calculated based on the raw EC values. The resistivity values for the soil samples ranged from 1,389ohm.cm to 7,143ohm.cm.
pH	The results of the analysis ranged from 5.3 to 7.8.
CEC	The results of the analysis ranged from: • CEC – 2.6meq/100g to 15meq/100g;

Analyte	Results
	• Exchangeable Na – 0.23meq/100g to 1.6meq/100g; • Exchangeable K – <0.1meq/100g to 0.3meq/100g; • Exchangeable Ca – 0.1meq/100g to 9.7meq/100g; and • Exchangeable Mg – 1.7meq/100g to 5.2meq/100g.
Sulphate	The results ranged from 110mg/kg to 430mg/kg.
Chloride	The results ranged from 47mg/kg to 1,100mg/kg.
Groundwater	The results of the analysis ranged from: • pH – 6.3 to 6.4; • EC – 8,300µS/cm to 12,000µS/cm; • Chloride – 2,100mg/L to 3,000mg/L; and • Sulphate - 570mg/L to 660mg/L.

Note:

Na – Sodium, K – Potassium, Ca – Calcium, Mg – Magnesium

7 RESULTS INTERPRETATION

The soil laboratory results are compared to the relevant SAC in the attached report tables. Interpretation of the results against the SAC is provided in the following table.

Table 7-1: Interpretation of Laboratory Results

Parameter	Notes
Soil Salinity and Plant Growth	The ECe results generally ranged from <2dS/m to 5.8dS/m. Samples from depths shallower than 2m were typically non-saline to slightly saline. Deeper samples were classed as moderately saline. The salinity values generally increased with depth.
Soil pH and Plant Growth	The soil pH results ranged from 5.3 to 7.8 and are classed as strongly acidic to slightly alkaline. The majority of the surficial soils were generally within the optimum range for plant growth. The proposed excavations will generally expose acidic soils and may require treatment with lime or gypsum in order to make the soils suitable for plant growth.
CEC in Soil	The CEC values ranged from 2.6meq/100g to 15meq/100g. The majority of the samples were within the very low to low range which is typical of the soil formation encountered at the site and are generally indicative of the low levels of organic matter within the soils.
Ratio of Calcium to Magnesium	The results indicate that the soils generally have more magnesium than calcium. The CEC of the soil is generally very low to low. Lime and gypsum can be used to stabilise the soil which will improve soil structure for both engineering and fertility purposes.
ESP%	The ESP% values of the samples ranged from 1.5% to 31.2%. The majority of the ESP results exceeded 15% and were classed as highly sodic.
Groundwater Salinity	The laboratory results indicate that the groundwater is generally saline and within the 'saline' water type.
Concrete Slabs and Footings in Saline Soils (CCAA 2018)	The proposed earthworks are anticipated to expose soils generally classed as non-aggressive to a depth of approximately 2m. The CCAA 2018 recommended concrete grade for slabs and footings in slightly saline soils is N20. Cuts below the depth of 2m are anticipated to expose moderately saline soil in some areas of the site. If cuts beyond 2m are required, the recommended concrete grade of N25 for very saline soils should be adopted. Reference should also be made to AS2159-2009 for minimum concrete strengths and reinforcement cover for concrete piles/foundations.
Soil Conditions for Exposure Classification (AS2159-2009)	The boreholes drilled for the investigation have indicated that the subsurface conditions at the site generally comprise of low permeability soils (i.e. silts and clays). Based on this, the exposure classification outlined under 'Soil Conditions B' has been adopted for the assessment.
Exposure Classification for Concrete Piles/Foundations (AS2159-2009)	The soil pH and sulphate results indicate that the soils are non-aggressive to mildly aggressive towards buried concrete. The groundwater pH, sulphate and chloride results indicate that the groundwater is non-aggressive towards buried concrete.

Parameter	Notes
Exposure Classification for Steel Piles/Foundations (AS2159-2009)	The soil resistivity, pH and chloride results indicate that the soils are non-aggressive towards buried steel to a depth of 2m and mildly aggressive towards buried steel beyond a depth of 2m. The groundwater pH and chloride results indicate that the groundwater is non-aggressive towards buried steel.

8 CONCLUSIONS AND RECOMMENDATIONS

The results indicated that that the majority of soil and groundwater at the site is generally non-aggressive to buried concrete and steel. Some soils deeper than 2m were found to be mildly aggressive towards steel and some soils deeper than 1m were found to be mildly aggressive towards concrete.

Soils at the site were generally non-saline to slightly saline to a depth of approximately 2m and the majority of the pH results from surficial soils were within the optimum range for plant growth. As the proposed development will only include new landscaping in the form of planter boxes or raised garden beds, these results are unlikely to impact the proposed development.

Due to the nature of the proposed development, which will be either at existing levels or require filling in some areas, JKE consider that no salinity management plan will be required.

It should be noted that soils at the site were found to be slightly saline to a depth of approximately 2m and moderately saline beyond 2m. As a result, concrete that will be in contact with these soils should be designed appropriately. This includes using N20 grade concrete to a depth of 2m and N25 grade concrete for any foundations that will be deeper than 2m. The soil aggression characteristics must be factored into the engineering design as required.

Soil imported for the required filling works should meet the importation criteria outline in Section 9.

9 SOIL IMPORTATION CRITERIA

The proposed development includes importation of fill/topsoil to achieve the desired finished levels. The salinity, corrosion and contamination conditions of the material should be checked prior to importation. The recommended salinity importation criteria are outlined in the following table:

Table 9-1: Salinity Importation Criteria

Parameter (units)	Acceptable Range	Potential Re-use Implications
pH	>5.5 - 7	Material in this range will generally be non-aggressive towards built structures and within the optimal range for plant growth.
ECe (dS/m)	<2 - 4	Material in this range is non-saline to slightly saline and generally considered acceptable for plant growth. CCAA 2018 recommends a concrete grade of N20 for slabs and footings for these conditions.
CEC (meq/100g)	12 - 25	Material in this range is generally considered acceptable for plant growth.
ESP (%)	<5	Material in this range is generally less dispersive.
Sulphate and Chloride (mg/kg)	<5,000	Material in this range will generally be non-aggressive towards piles/foundations.
Resistivity (ohm.cm)	>5,000	Material in this range will generally be non-aggressive towards piles/foundations.

Parameter (units)	Acceptable Range	Potential Re-use Implications

10 LIMITATIONS

The report limitations are outlined below:

- Salinity is a natural phenomenon and can change over time based on site conditions and climatic variations. Changes to existing drainage patters can also impact the salinity at the site. The results outlined in this report are a snap shot of conditions present at the time of the investigation and is bound to change over time;
- JKE accepts no responsibility for any unidentified salinity 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;
- JKE accepts no responsibility for non-compliance of salinity management recommends outlined in this report;
- 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 salinity sources or may have been impacted by adverse salinity conditions, 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 salinity viewpoint, and vice versa;
- 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;
- Copyright in this report is the property of JKE. JKE has used a degree of care, skill and diligence normally exercised by consulting professionals in similar circumstances and locality. No other warranty expressed or implied is made or intended. Subject to payment of all fees due for the investigation, the client alone shall have a licence to use this report;

- If the client, or any person, provides a copy of this report to any third party, such third party must not rely on this report except with the express written consent of JKE; and
- Any third party who seeks to rely on this report without the express written consent of JKE does so entirely at their own risk and to the fullest extent permitted by law, JKE accepts no liability whatsoever, in respect of any loss or damage suffered by any such third party.

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 salinity concentrations may also vary over time through migration and accumulation of salts, importation of materials, construction and landscaping. 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 salinity, the likely impact on the proposed development and appropriate management 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
The assessment is designed to identify major salinity risks at the site. Implementing the management recommends can minimise the risks. No assessment can identify all risks as salinity is a natural phenomenon which can change over time. Even a rigorous professional assessment may not detect all potential salinity impacts on a site. Salinity may be present in areas that were not surveyed or sampled, or may accumulate in areas which showed no signs of salinity when sampled.

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

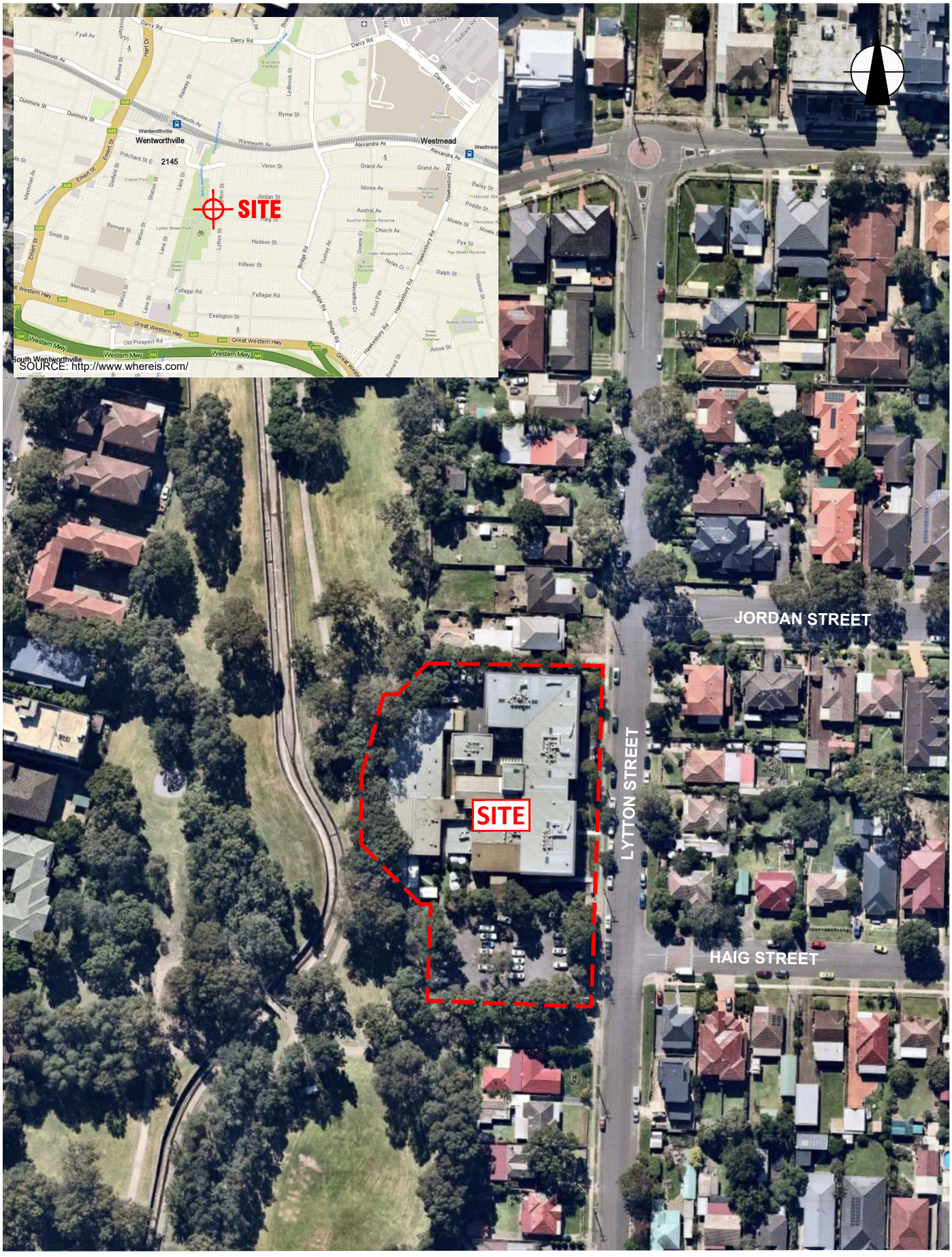
Borehole and test pit logs are prepared by environmental scientists, engineers or geologists based upon interpretation of field conditions and laboratory evaluation of field samples. Logs are normally provided in our reports and these should not be re-drawn for inclusion in site management or other design 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: 23-27 LYTTON STREET, WENTWORTHVILLE, NSW

Project No: E27318PH

Figure No: 1

JKEnvironments

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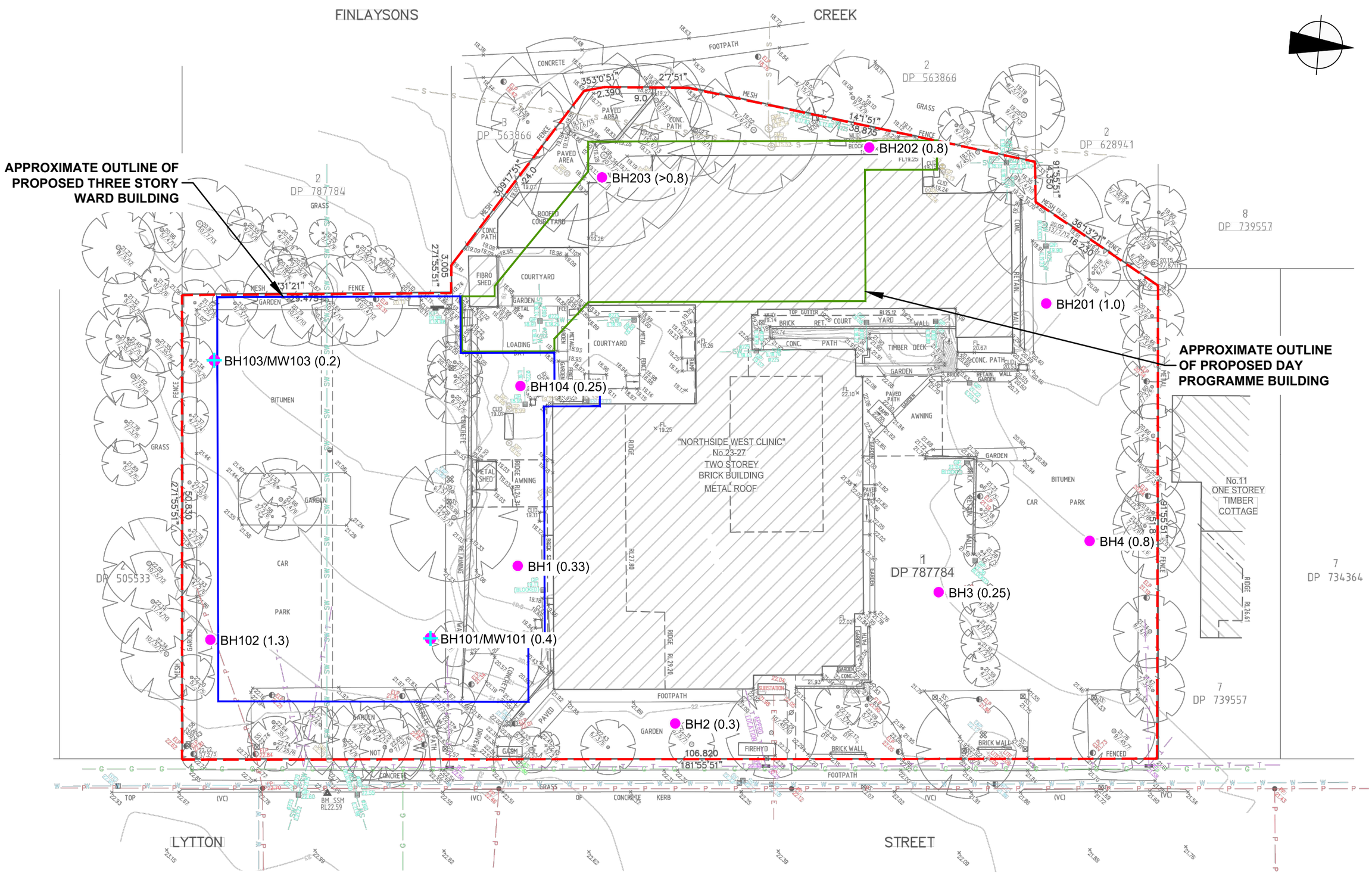

LEGEND

APPROXIMATE SITE BOUNDARY	
BH(Fill Depth)	BOREHOLE LOCATION, NUMBER AND DEPTH OF FILL (m)
BH/MW(Fill Depth)	BOREHOLE AND GROUNDWATER MONITORING WELL LOCATION, NUMBER AND DEPTH OF FILL (m)

0 4 8 12 16 20

SCALE 1:400 @A3 METRES

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

Title: **SAMPLE LOCATION PLAN**

Location: 23-27 LYTTON STREET, WENTWORTHVILLE, NSW

Project No: E27318PH

Figure No: 2

JKEnvironments

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Appendix B: Laboratory Results Summary Tables

ABBREVIATIONS AND EXPLANATIONS FOR SALINITY TABLES

Abbreviations used in the Tables:

Ca	Calcium
CEC	Cation Exchange Capacity
DO	Dissolved Oxygen
EC	Electrical Conductivity
ECe	Extract Electrical Conductivity
Eh	Redox Potential
ESP	Exchangeable Sodium Percentage (Each Na/CEC)
K	Potassium
Mg	Magnesium
Na	Sodium
SWL	Standing Water Level

Units used in the Tables

°C	Degrees Celsius
dS/m	deciSiemens per metre
m	meters
meq/100g	milliequivalents per 100 grams
mg/kg	milligrams per kilogram
mg/L	milligrams per litre
mV	millivolts
ohm.cm	ohm centimetre
µS/cm	microSiemens per centimetre

Notes on Specific Tables

SUMMARY OF SOIL LABORATORY RESULTS - EC and ECe

- The salinity Class has been adopted from 'Site Investigations for Urban Salinity' DLWC 2002.
- The chart function assumes an ECe value of 1.9 for values that are less than the practical quatitation limit.

SUMMARY OF RESISTIVITY CALCULATION ON SOIL EC RESULTS

- The resistivity values have been calculated on the laboratory EC values.
- The classification has been derived from the Australian Standard 2159-2009 Piling Design and Installation (Table 6.5.2 [A] & [C])
- Table 6.5.2 [A] of Australian Standard 2159-2009 recommends using a Moderate Exposure Classification for Steel Piles in Fresh Water - Soft Running Water

SUMMARY OF SOIL LABORATORY RESULTS - pH

- The pH Classification has been derived from the Australian Standard 2159-2009 Piling Design and Installation (Tables 6.4.2 [C] & 6.5.2 [C])
- Table 6.5.2 [A] of Australian Standard 2159-2009 recommends using a Moderate Exposure Classification for Steel Piles in Fresh Water - Soft Running Water

SUMMARY OF SOIL LABORATORY RESULTS - SULFATE & CHLORIDES

- The classification has been derived from the Australian Standard 2159-2009 Piling Design and Installation (Table 6.5.2 [A] & [C])
- The chart function assumes an concentration of 0.5mg/kg for values that are less than the practical quatitation li

SUMMARY OF SOIL LABORATORY RESULTS - CEC & ESP

- The Sodicity rating has been adopted from the publication 'Site Investigations for Urban Salinity' DLWC 2002.

SUMMARY OF GROUNDWATER LABORATORY RESULTS

- The classification has been derived from the Australian Standard 2159-2009 Piling Design and Installation (Table 6.5.2 [A] & [C]) .
- Table 6.4.2 [A] recommends using a Mild Exposure Classification for Concrete Piles in Fresh Water - Treat as in Soil Condition 'A'.
- Table 6.5.2 [A] recommends using a Moderate Exposure Classification for Steel Piles in Fresh Water - Soft Running Water.

TABLE B
SUMMARY OF SOIL LABORATORY RESULTS - EC and ECe

Borehole Number	Sample Depth (m)	Sample Description	EC (µS/cm)	ECe (dS/m)	Salinity Class
BH201	1.0-1.2	Clay	400	2.8	SLIGHTLY SALINE
BH201	1.8-2.0	Clay	430	3	SLIGHTLY SALINE
BH201	3.35-3.45	Clay	680	4.8	MODERATELY SALINE
BH201	4.0-4.1	Clay	720	5.8	MODERATELY SALINE
BH201	6.1-6.5	Clay	500	4.5	MODERATELY SALINE
BH202	0.8-0.9	Clay	170	<2	NON SALINE
BH202 - [LAB_DU	0.8-0.9	LAB DUPLICATE	160	<2	NON SALINE
BH202	1.4-1.6	Clay	260	<2	NON SALINE
BH202	2.4-2.5	Clay	630	4.4	MODERATELY SALINE
BH203	0.5-0.7	Clay	140	<2	NON SALINE
Text1					
Total Number of Samples			10	10	-
Minimum Value			140	<PQL	-
Maximum Value			720	5.8	-

ECe Values (dS/m)	Salinity Class
<2	NON SALINE
2 to 4	SLIGHTLY SALINE
4 to 8	MODERATELY SALINE
8 to 16	VERY SALINE
>16	HIGHLY SALINE

TABLE C
SUMMARY OF RESISTIVITY CALCULATION ON SOIL EC RESULTS

Borehole Number	Sample Depth (m)	Sample Description	EC (µS/cm)	Resistivity (ohm.cm)	Classification Condition B
BH201	1.0-1.2	Clay	400	2,500	Non Aggressive
BH201	1.8-2.0	Clay	430	2,326	Non Aggressive
BH201	3.35-3.45	Clay	680	1,471	Mildly Aggressive
BH201	4.0-4.1	Clay	720	1,389	Mildly Aggressive
BH201	6.1-6.5	Clay	500	2,000	Mildly Aggressive
BH202	0.8-0.9	Clay	170	5,882	Non Aggressive
BH202 - [LAB_DUP]	0.8-0.9	LAB DUPLICATE	160	6,250	Non Aggressive
BH202	1.4-1.6	Clay	260	3,846	Non Aggressive
BH202	2.4-2.5	Clay	630	1,587	Mildly Aggressive
BH203	0.5-0.7	Clay	140	7,143	Non Aggressive
Total Number of Samples			10	10	-
Minimum Value			140	1,389	-
Maximum Value			720	7,143	-

Classification is based on Soil condition 'B' - low permeability soils (e.g. silts & clays) or all soils above groundwater.

Resistivity Values (ohm.cm)	Classification for Steel Piles
>5,000	Non-Aggressive
2,000 - 5,000	Non-Aggressive
1,000 - 2,000	Mildly Aggressive
<1,000	Moderately Aggressive

TABLE D
SUMMARY OF SOIL LABORATORY RESULTS - pH

Borehole Number	Sample Depth (m)	Sample Description	pH	Classification for Concrete Piles Condition B	Classification for Steel Piles Condition B
BH201	1.0-1.2	Clay	5.3	Mildly Aggressive	Non-Aggressive
BH201	1.8-2.0	Clay	5.9	Non-Aggressive	Non-Aggressive
BH201	3.35-3.45	Clay	5.8	Non-Aggressive	Non-Aggressive
BH201	4.0-4.1	Clay	6	Non-Aggressive	Non-Aggressive
BH201	6.1-6.5	Clay	7.2	Non-Aggressive	Non-Aggressive
BH202	0.8-0.9	Clay	6.8	Non-Aggressive	Non-Aggressive
BH202 - [LAB_	0.8-0.9	LAB DUPLICATE	6.8	Non-Aggressive	Non-Aggressive
BH202	1.4-1.6	Clay	5.4	Mildly Aggressive	Non-Aggressive
BH202	2.4-2.5	Clay	5.5	Mildly Aggressive	Non-Aggressive
BH203	0.5-0.7	Clay	7.8	Non-Aggressive	Non-Aggressive
Total Number of Samples			10	-	-
Minimum Value			5.3	-	-
Maximum Value			7.8	-	-

Classification is based on Soil condition 'B' - low permeability soils (e.g. silts & clays) or all soils above groundwater.

	Classification for Concrete Piles
>5.5	Non-Aggressive
4.5 - 5.5	Mildly Aggressive
4 - 4.5	Moderately Aggressive
<4	Severely Aggressive

pH Value	Classification for Steel Piles
>5	Non-Aggressive
4.0 - 5.0	Non-Aggressive
3.0 - 4.0	Mildly Aggressive
<3	Moderately Aggressive

TABLE E
SUMMARY OF SOIL LABORATORY RESULTS - SULPHATE & CHLORIDES

Borehole Number	Sample Depth (m)	Sample Description	Chloride (mg/kg)	Sulphate (mg/kg)	Classification for Concrete Piles Sulfate - Condition B	Classification for Steel Piles Chloride - Condition B
BH201	1.0-1.2	Clay	390	270	Non-Aggressive	Non-Aggressive
BH201	1.8-2.0	Clay	300	430	Non-Aggressive	Non-Aggressive
BH201	3.35-3.45	Clay	990	140	Non-Aggressive	Non-Aggressive
BH201	4.0-4.1	Clay	1100	170	Non-Aggressive	Non-Aggressive
BH201	6.1-6.5	Clay	630	110	Non-Aggressive	Non-Aggressive
BH202	0.8-0.9	Clay	120	140	Non-Aggressive	Non-Aggressive
BH202 - [LA	0.8-0.9	LAB DUPLICATE	110	130	Non-Aggressive	Non-Aggressive
BH202	1.4-1.6	Clay	280	130	Non-Aggressive	Non-Aggressive
BH202	2.4-2.5	Clay	790	180	Non-Aggressive	Non-Aggressive
BH203	0.5-0.7	Clay	47	130	Non-Aggressive	Non-Aggressive
Total Number of Samples			10	10	-	-
Minimum Value			47	110	-	-
Maximum Value			1100	430	-	-

Classification is based on Soil condition 'B' - low permeability soils (e.g. silts & clays) or all soils above groundwater.

Sulfate Values	Classification for Concrete Piles
<5,000	Non-Aggressive
5,000 - 10,000	Mildly Aggressive
10,000 - 20,000	Moderately Aggressive
>20,000	Severely Aggressive

Chloride Values	Classification for Steel Piles
<5,000	Non-Aggressive
5,000 - 20,000	Non-Aggressive
20,000 - 50,000	Mildly Aggressive
>50,000	Moderately Aggressive

TABLE F
SUMMARY OF SOIL LABORATORY RESULTS - CEC & ESP

Borehole Number	Sample Depth (m)	Sample Description	Exchangeable Ca	Exchangeable K	Exchangeable Mg	Exchangeable Na	CEC	ESP	Ca:Mg
			(meq/100g)					%	
BH201	1.0-1.2	Clay	1.4	0.1	4.7	1.4	7.6	18.4%	0.3:1
BH201	4.0-4.1	Clay	0.1	<0.1	1.7	0.81	2.6	31.2%	0.06:1
BH201	6.1-6.5	Clay	0.3	0.2	3.7	1.6	5.9	27.1%	0.08:1
BH202	0.8-0.9	Clay	7.5	0.2	5.2	0.5	13	3.8%	1.44:1
BH202	2.4-2.5	Clay	0.8	0.1	3.3	0.75	4.9	15.3%	0.24:1
BH202 - [LA	2.4-2.5	LAB DUPLICATE	0.8	0.1	3.4	0.75	5	15.0%	0.24:1
BH203	0.5-0.7	Clay	9.7	0.3	4.5	0.23	15	1.5%	2.16:1
Total Number of Samples			7	7	7	7	7	7	7
Minimum Value			0.10	<PQL	1.70	0.23	2.6	1.5%	0.06 :1
Maximum Value			9.70	0.30	5.20	1.60	15.0	31.2%	2.16 :1

ESP Value	Sodicity Rating
< 5%	Non-Sodic
5% to 15%	Sodic
> 15%	Highly Sodic

TABLE G
SUMMARY OF GROUNDWATER LABORATORY RESULTS

Sample Reference	Field Measurements						Laboratory Results				Classification for Concrete Piles Soil Condition B	Classification for Steel Piles Soil Condition B
	SWL (m)	pH	EC (µS/cm)	Temp (°C)	Eh (mV)	DO (mg/L)	pH	EC (µS/cm)	Sulfate (mg/L)	Chloride (mg/L)		
MW101	4.535	5.96	9,997	21	-47.8	0.3	6.3	12,000	660	3,000	Non-Aggressive	Non-Aggressive
MW103	4.17	6.04	7,205	21.3	-14.2	0.3	6.4	8,300	570	2,100	Non-Aggressive	Non-Aggressive
Total Number of Samples	2	2	2	2	2	2	2	2	2	2	-	-
Minimum Value	4.17	6.0	7,205	21	-47.8	0.3	6.3	8,300	570	2,100	-	-
Maximum Value	4.535	6.0	9,997	21.3	-14.2	0.3	6.4	12,000	660	3,000	-	-

Exposure Classification for Concrete Piles

Classification is based on Soil condition 'B' - low permeability soils (e.g. silts and clays) or all soils above groundwater.

pH	Sulfate (mg/L)	Chloride (mg/L)	Classification B
> 5.5	<1,000	<6,000	Non-Aggressive
4.5 - 5.5	1,000 - 3,000	6,000 - 12,000	Mildly Aggressive
4.0 - 4.5	3,000 - 10,000	12,000 - 30,000	Moderately Aggressive
< 4	>10,000	>30,000	Severely Aggressive

Exposure Classification for Steel Piles

Classification is also based on Soil condition 'B' - low permeability soils (e.g. silts and clays) or all soils above groundwater.

pH	Chloride (mg/L)	Classification B
> 5	<1,000	Non-Aggressive
4.0 - 5.0	1,000 - 10,000	Non-Aggressive
3.0 - 4.0	10,000 - 20,000	Mildly Aggressive
<3	>20,000	Moderately Aggressive

Appendix C: Background on Salinity

Background on Salinity

A. General Information on Salinity

Salinity is the accumulation and concentration of salt at or near the ground surface or within surface water bodies. Salt is naturally present in the landscape through deposition of salt from the ocean in coastal areas and through weathering of bedrock that contains salt, accumulated during deposition of original sediments in a prehistoric marine environment. The salts are commonly soluble chlorides, sulphates or carbonates of sodium and magnesium.

In Sydney, salinity issues are typically associated with the Wianamatta Group shales and their derived soil landscapes. The natural vegetation of western Sydney is dominated by large isolated trees with deep root systems that remove subsurface moisture. Slow rates of percolation through the relatively impermeable clay soil and uptake of a large proportion of rainfall by the trees results in limited recharge of the groundwater system by rainfall. The depth to groundwater has developed a natural equilibrium and there is little tendency for salt contained in the groundwater or subsoils to rise to the surface.

B. Salinity and Urban Development

Salinity becomes a problem in urban areas when changes in the land use result in changes to the way water moves through the environment. This can result in vegetation die-back, decrease in water quality and damage to urban infrastructure.

Removal of deep rooted tree species during development and replacement with urban infrastructure, houses and industrial developments reduces the mechanism for the removal of subsurface moisture.

The development of urban salinity is commonly associated with changes in the hydrological cycle through the environment (rainfall, surface run-off, water infiltration and groundwater system). An increase in the quantity of water reaching the groundwater table as a result of vegetation clearance, irrigation of parklands, leaking water infrastructure and changes in drainage patterns, can cause a relatively rapid rise in the groundwater table. Earthworks that include excavation of natural soil profiles and exposure of more saline subsurface soils or shale bedrock may also result in an increase in salt concentrations at the ground surface.

Construction of roads, pipelines and buildings commonly results in removal of topsoil leading to exposure of the subsoils and interception of surficial and shallow subsurface drainage. In addition, over-irrigation of urban gardens, leaking water infrastructure and concentrated drainage patterns can result in increased water movement through the subsoil to the groundwater system leading to a relatively rapid rise in the groundwater table.

A rise in groundwater levels and impediments to subsurface drainage patterns can transport salt formerly stored in the bedrock to the surficial soil profile. This may result in salt encrustation of exposed soils, building foundations, roads, drainage infrastructure and corrosion of metal, concrete and other building materials. Increasing salt concentrations in surficial soils (and consequently in surface waters) may also result in die-off

of the existing vegetation, further reducing the hydrological load on the groundwater system and resulting in further groundwater table rises.

C. Potential Salinity Impacts on Urban Development

Some of the adverse impacts that can arise from saline conditions include:

- Salt scalds caused by a rise in the subsoil moisture content that mobilises salt to the ground surface;
- Salt scalds caused by modification of former drainage patterns which leads to the day lighting of subsurface seepage (either perched water or groundwater) in areas lower in the catchment, either at breaks in the slope or within drainage lines;
- A rise in groundwater table or accumulation of salt rich seepage leading to corrosion of subsurface facilities including concrete structures, metal pipework, cables, foundations, underground services, etc;
- Rising damp, where salt rich moisture is drawn into building and pavement materials by capillary action leading to deterioration of brick, mortar and concrete;
- Structural cracking, damage or building collapse which may occur as a result of shifting and or sinking foundations;
- Plant die-back associated with a rise in groundwater table level that mobilises excess salt to the plant root zone; and
- Subsurface water discharge and subsequent pollution of streams and drainage channels.

D. Soils and Groundwater Planning Strategy in Western Sydney

The aim of the DLWC 2002 document is to provide a framework for the sustainable development and management of new developments in the western region of Sydney. In relation to salinity management, the development should be designed and constructed such that there is no significant increase in the water table level and no adverse salinity impacts.

The proposed development controls that relate to soils and groundwater issues are summarised below:

1. A water management strategy should be prepared to address the following:
    - Reduction of potable water usage onsite;
    - Development of best practice measures for stormwater reuse for open space irrigation;
    - Reduction of potable water demand;
    - Reduction of adverse impacts on local groundwater regimes;
    - Reduction of change in local flow regimes; and
    - Preparation of water maintenance and a monitoring management system.
2. A salinity management plan should be prepared that includes a groundwater management strategy related to:
    - Adoption of small landscaped areas to reduce irrigation requirements;
    - Use of native and other low water requirement plants;
    - Use of mulch cover (not in drainage lines);
    - Use of low flow watering facilities for landscaped areas;
    - Implementation of a tree planting program, especially in high recharge areas, of native, deep rooted, large growing species to assist retention of the groundwater at existing levels;

- Retention of existing native tree cover where possible; and
- Not permitting infiltration pits or tanks to disperse surface water.

3. An assessment of soil and rock conditions at the site, including erosion, expansive and dispersive soil conditions, and plant growth potential should be undertaken.
4. Use of the Blue Book (2004) as a guide to prepare soil and water management plans. The approved plan and subsequent works are to be supervised by appropriately qualified experienced personnel.

Appendix D: Proposed Development Plans

NORTHSIDE WEST CLINIC
WENTWORTHVILLE

ARCHITECTURAL DRAWING SET FOR:

DEVELOPMENT APPLICATION

NORTHSIDE WEST CLINIC
27 LYTTON ST, WENTWORTHVILLE
NEW SOUTH WALES

CLIENT:
ERILYAN

DA Sheet List

Sheet Number	Sheet Name	Current Revision	Current Revision Date
DA			
000-Specification + Site			
DA0000	COVER SHEET	4	14.12.21
DA0010	SITE PLAN - EXISTING	4	14.12.21
DA0011	SITE ANALYSIS	4	14.12.21
010 Overall Plan			
DA0100	OVERALL SITE PLAN - LOWER GROUND	4	14.12.21
DA0101	OVERALL SITE PLAN - GROUND FLOOR	5	14.12.21
DA0102	OVERALL SITE PLAN - LEVEL 1	4	14.12.21
DA0103	OVERALL SITE PLAN - LEVEL 2	4	14.12.21
DA0104	OVERALL SITE PLAN - LEVEL 3	4	14.12.21
DA0105	OVERALL SITE PLAN	4	14.12.21
050-Demolition Plan			
DA0500	OVERALL DEMOLITION - LOWER GROUND	3	14.12.21
DA0501	OVERALL DEMOLITION - GROUND	3	14.12.21
100-General Arrangement Plan			
DA1000	LOWER GROUND - STAGE 2	4	14.12.21
DA1001	LOWER GROUND - WEST PARKING	5	14.12.21
DA1002	GROUND - STAGE 2	4	14.12.21
DA1003	GROUND - STAGE 1	4	14.12.21
DA1004	GROUND -WEST PARKING	5	14.12.21
DA1005	LEVEL 1 - STAGE 2	5	14.12.21
DA1006	LEVEL 1 - WEST BLOCK	4	14.12.21
DA1007	LEVEL 2 - STAGE 2	4	14.12.21
DA1008	LEVEL 2 - WEST BLOCK	4	14.12.21
DA1009	LEVEL 3 - STAGE 2	4	14.12.21
DA1010	ROOF - STAGE 2	4	14.12.21
200-Elevations			
DA2000	ELEVATION	5	14.12.21
DA2001	ELEVATION	5	14.12.21
300-Sections			
DA3000	SECTIONS	6	14.12.21
800-LEP Height			
DA8100	LEP Height	3	14.12.21
DA8101	LEP Height	3	14.12.21
DA8102	LEP Height	3	14.12.21
DA8103	LEP Height	3	14.12.21
DA8104	LEP Height	3	14.12.21
DA8105	LEP Height	3	14.12.21
DA8106	LEP Height	3	14.12.21
800-Shadow Studies			
DA8000	SHADOW DIAGRAMS - SUMMER SOLSTICE	4	14.12.21
DA8002	SHADOW DIAGRAMS - WINTER SOLSTICE	4	14.12.21

DRAWING STATUS:

DEVELOPMENT APPLICATION

Rev	Revision Description	Date
1	Preliminary Issue	28.07.21
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3	ISSUE FOR DEVELOPMENT APPLICATION	27.10.21
4	ISSUE FOR DEVELOPMENT APPLICATION	14.12.21

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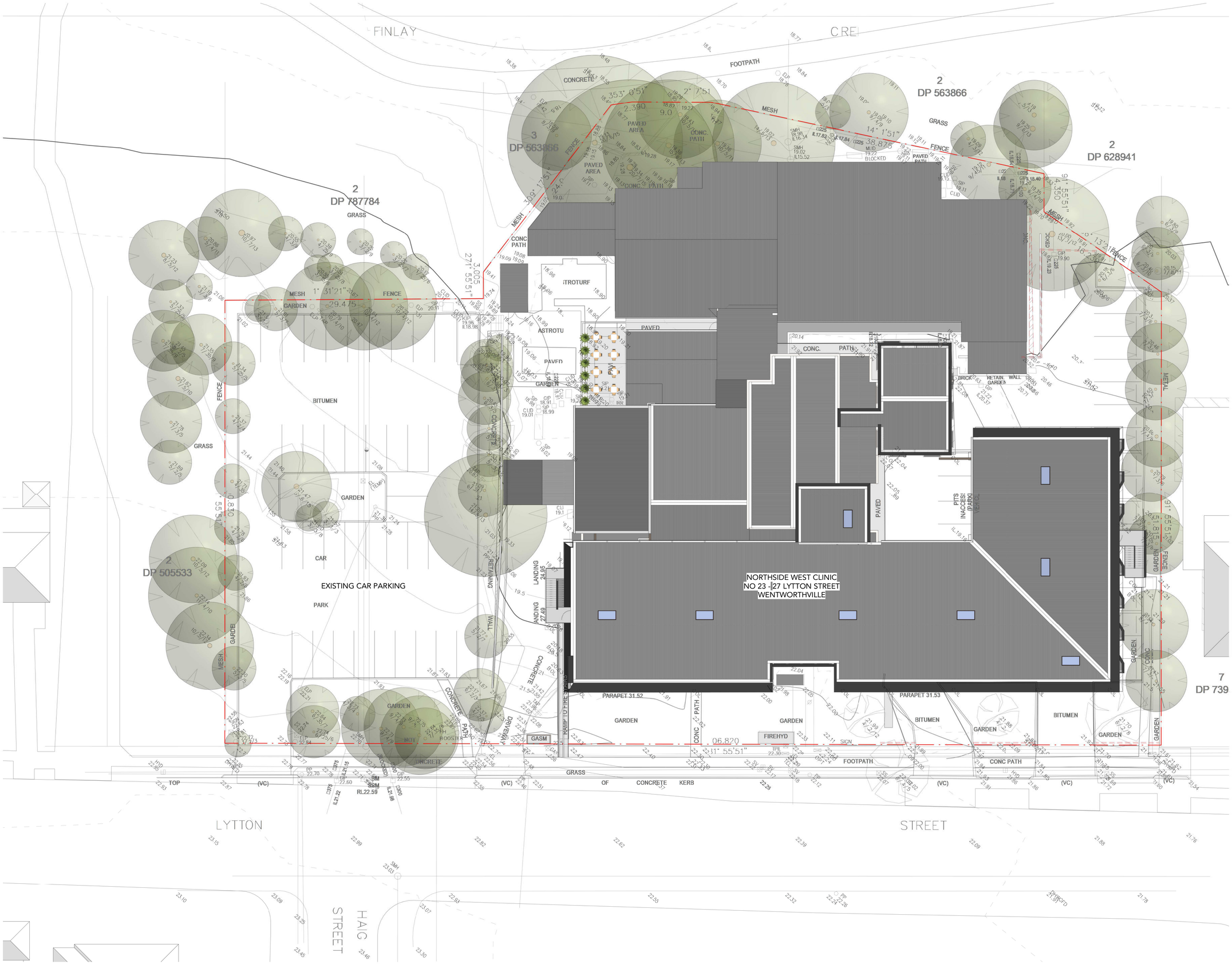
Project:
Northside West Stage 2

Wentworthville. NSW 2145

Title:
COVER SHEET

Project #:	Scale:	Drw:	Chd:
903	@A1	IK	IK

Drawing #: DA0000 Rev: 4



1 DA Site Plan - Existing
Scale: 1 : 200

DRAWING STATUS:

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SCALE 1:100

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Project:
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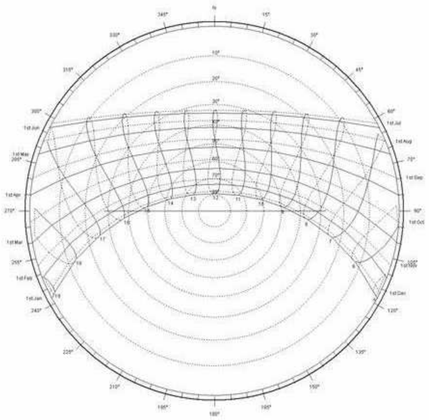
Wentworthville. NSW 2145

Title:
SITE PLAN - EXISTING

Project #:	Scale:	Drw:	Chk:
903	1 : 200 @A1	IK	VM

Drawing #: DA0010 Rev: 4

LOCATION PLAN - OVERALL



SUN PATH DIAGRAM
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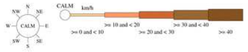
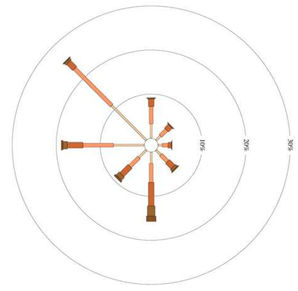
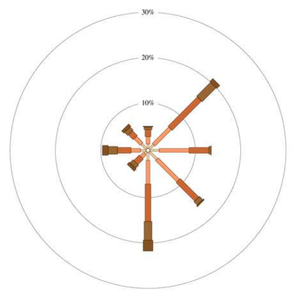


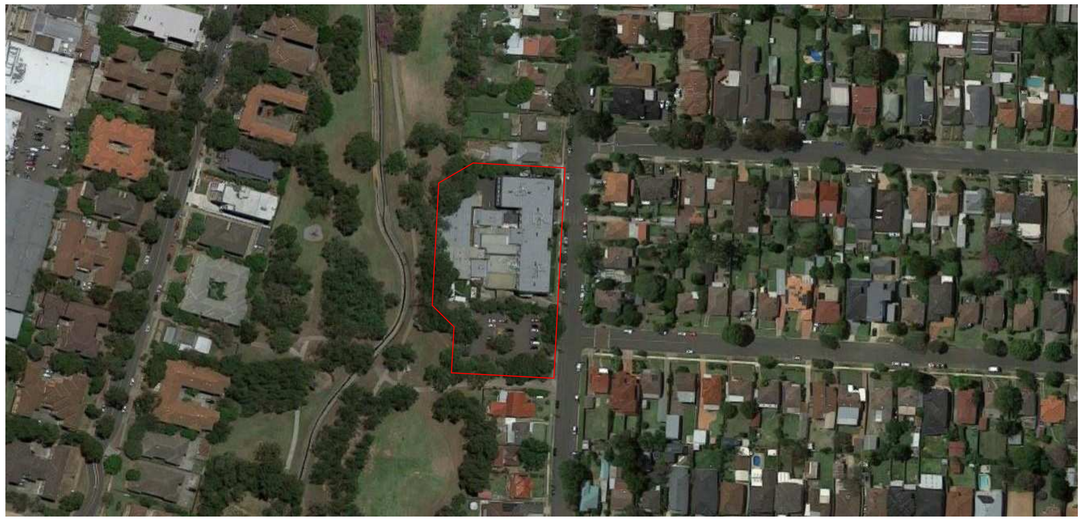


WIND ROSE AT 9AM
SYDNEY

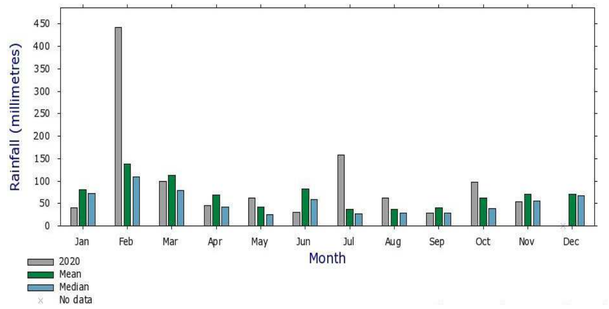


WIND ROSE AT 3PM
SYDNEY

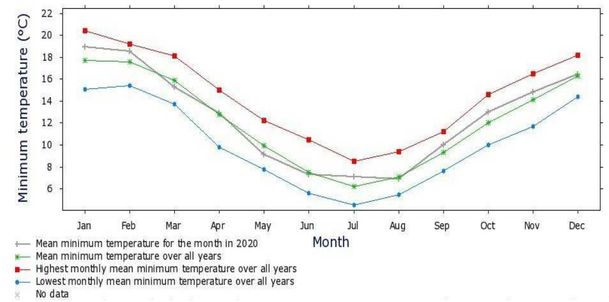
LOCATION PLAN



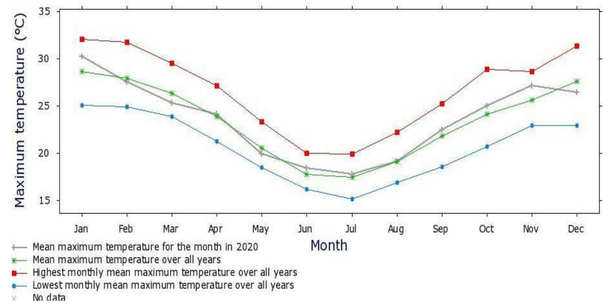
SITE PLAN



RAINFALL DATA: WENWORTHVILLE (GREYSTANES)
CLIMATE DATA FROM BUREAU OF METEOROLOGY



MINIMUM TEMPERATURE DATA: WENTWORTHVILLE (PARAMATTA NORTH)
CLIMATE DATA FROM BUREAU OF METEOROLOGY



MAXIMUM TEMPERATURE DATA: WENTWORTHVILLE (PARAMATTA NORTH)
CLIMATE DATA FROM BUREAU OF METEOROLOGY

DRAWING STATUS:

DEVELOPMENT APPLICATION

Rev	Revision Description	Date
1	Preliminary Issue	28.07.21
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SCALE 1:100

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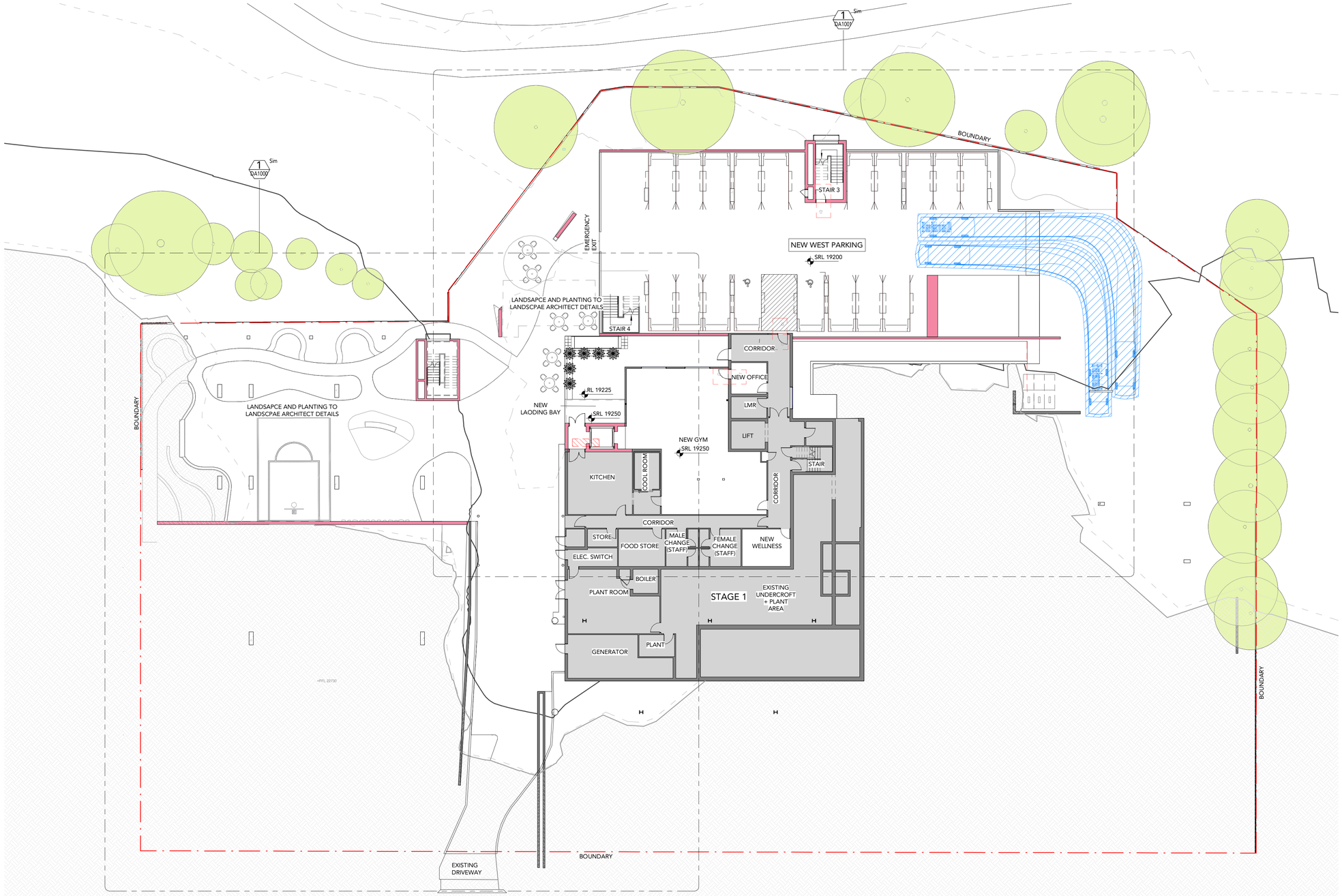
Title:
SITE ANALYSIS

Project #:	Scale:	Drw:	Chd:
903	@A1	IK	VM

Drawing #: DA0011

Rev: 4



1 DA Overall - Lower Ground
Scale: 1 : 200

DRAWING STATUS:

DEVELOPMENT APPLICATION

Rev	Revision Description	Date
1	Preliminary Issue	28.07.21
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LEGEND

- NOT IN SCOPE
- EXISTING WALL
- NEW WALL

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0 1 2 3 4 5
SCALE 1:100

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Title:
OVERALL SITE PLAN - LOWER GROUND

Job	Scale	Dwn	Chd
903	As indicated @A1	IK	VM

Drawing #: DA0100
Rev: 4

1 DA Overall - Ground Floor
Scale: 1 : 200

DRAWING STATUS:

DEVELOPMENT APPLICATION

Rev	Revision Description	Date
1	Preliminary Issue	28.07.21
2	Preliminary Issue	05.08.21
3	Preliminary Issue - Landscaping	13.10.21
4	ISSUE FOR DEVELOPMENT APPLICATION	27.10.21
5	ISSUE FOR DEVELOPMENT APPLICATION	14.12.21

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LEGEND

- NOT IN SCOPE
- EXISTING WALL
- NEW WALL

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0 1 2 3 4 5
SCALE 1:100

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Wentworthville. NSW 2145

Title:
OVERALL SITE PLAN - GROUND FLOOR

Job #	Scale		Drw	Chd
903	As indicated	@A1	IK	IK

Drawing #: DA0101
Rev: 5

WARD ROOM:	41 ROOMS (INCL. 3 ACC.)
NEW CONCSULT:	9 ROOMS

1 DA Overall - Level 1
Scale: 1 : 200

DRAWING STATUS:

DEVELOPMENT APPLICATION

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LEGEND

- NOT IN SCOPE
- EXISTING WALL
- NEW WALL

FLOOR PLAN LEGEND

- WARD ROOMS
- SUPPORT ROOMS
- UTILITY ROOMS

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0 1 2 3 4 5
SCALE 1:100

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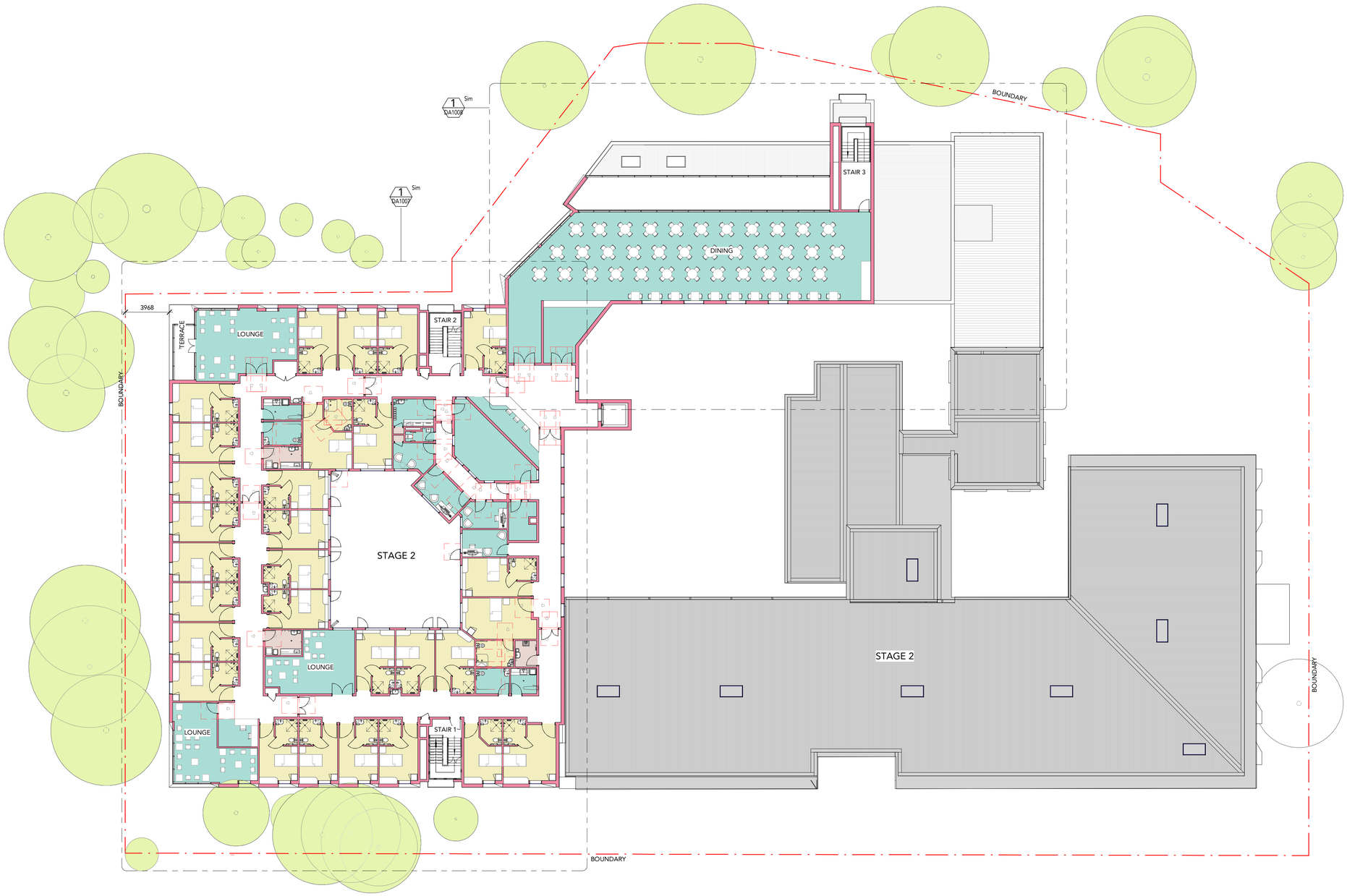
Northside West Stage 2

Wentworthville. NSW 2145

Title:
OVERALL SITE PLAN - LEVEL 1

Project #:	Scale:	Drw:	Chd:
903	As indicated @A1	IK	VM

Drawing #: DA0102
Rev: 4



WARD ROOM: 29 ROOMS (INCL. 2 ACC.)

1 DA Overall - Level 2
Scale: 1 : 200

DRAWING STATUS:

DEVELOPMENT APPLICATION

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LEGEND

- NOT IN SCOPE
- EXISTING WALL
- NEW WALL

FLOOR PLAN LEGEND

- WARD ROOMS
- SUPPORT ROOMS
- UTILITY ROOMS

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SCALE 1:100

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Project:
Northside West Stage 2

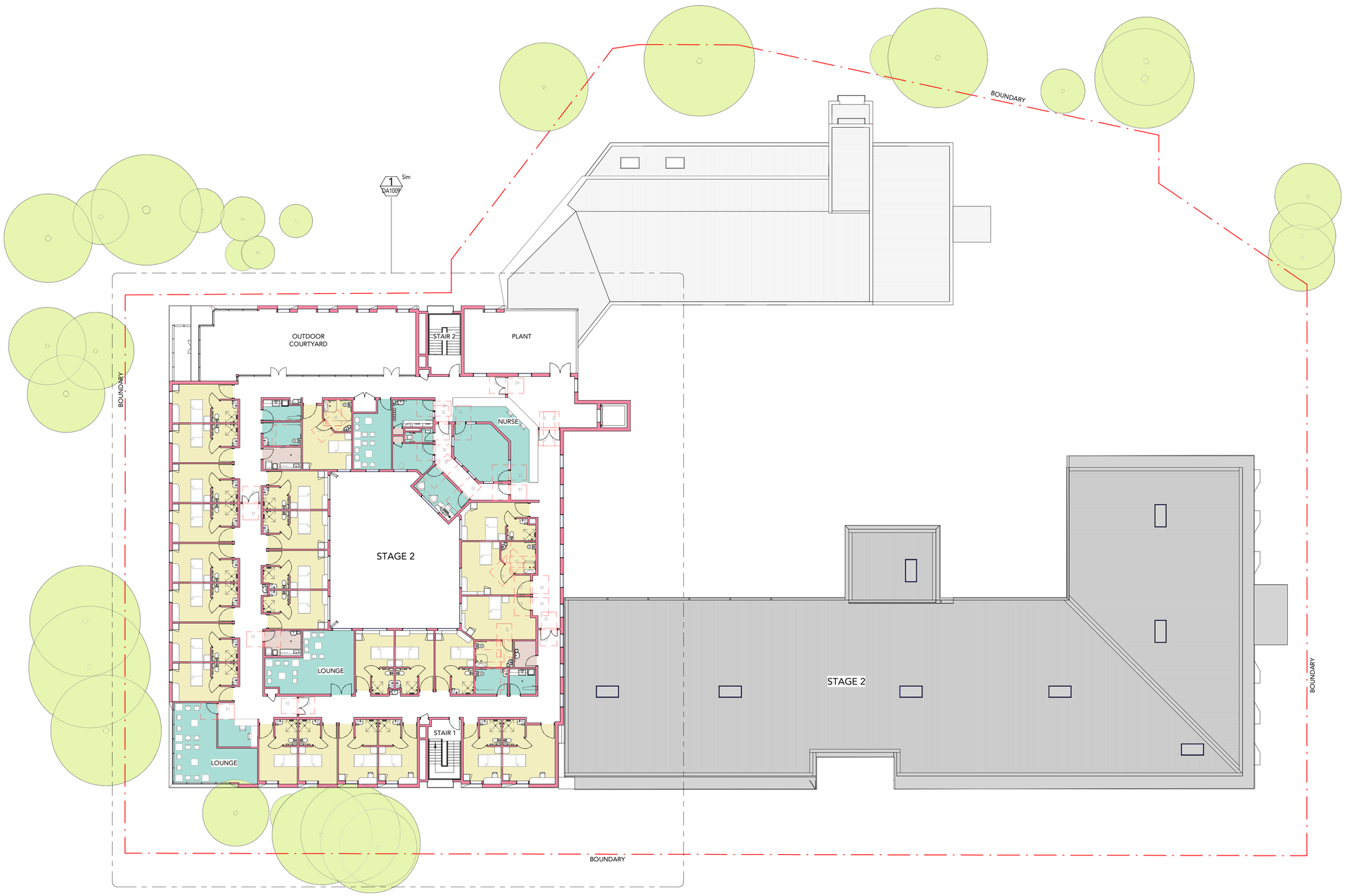
Wentworthville. NSW 2145

Title:
OVERALL SITE PLAN - LEVEL 2

Project #:	Scale:	Drw:	Ckd:
903	As indicated @A1	IK	VM

Drawing #: DA0103

Rev: 4



WARD ROOMS: 25 ROOMS (INCL. 3 ACC.)

1 DA Overall - Level 3
Scale: 1 : 200

DRAWING STATUS:

DEVELOPMENT APPLICATION

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LEGEND

- NOT IN SCOPE
- EXISTING WALL
- NEW WALL

FLOOR PLAN LEGEND

- WARD ROOMS
- SUPPORT ROOMS
- UTILITY ROOMS

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0 1 2 3 4 5
SCALE 1:100

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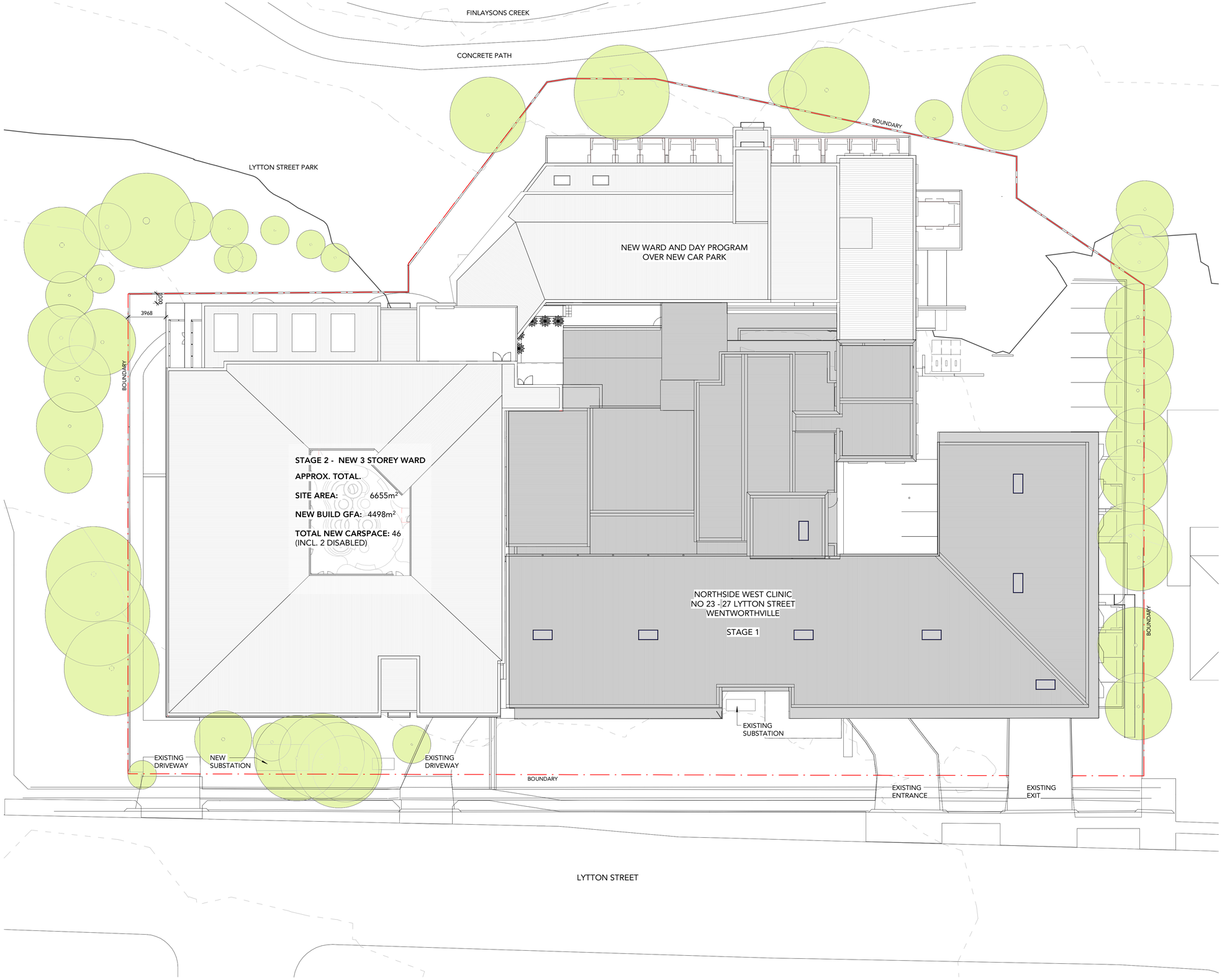
Wentworthville. NSW 2145

Title:
OVERALL SITE PLAN - LEVEL 3

Project #	Scale	Drw	Chd
903	As indicated @A1	IK	VM

Drawing #: DA0104
Rev: 4



1 DA Overall - Roof
Scale: 1 : 200

DRAWING STATUS:

DEVELOPMENT APPLICATION

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LEGEND

- NOT IN SCOPE
- EXISTING WALL
- NEW WALL

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0 1 2 3 4 5
SCALE 1:100

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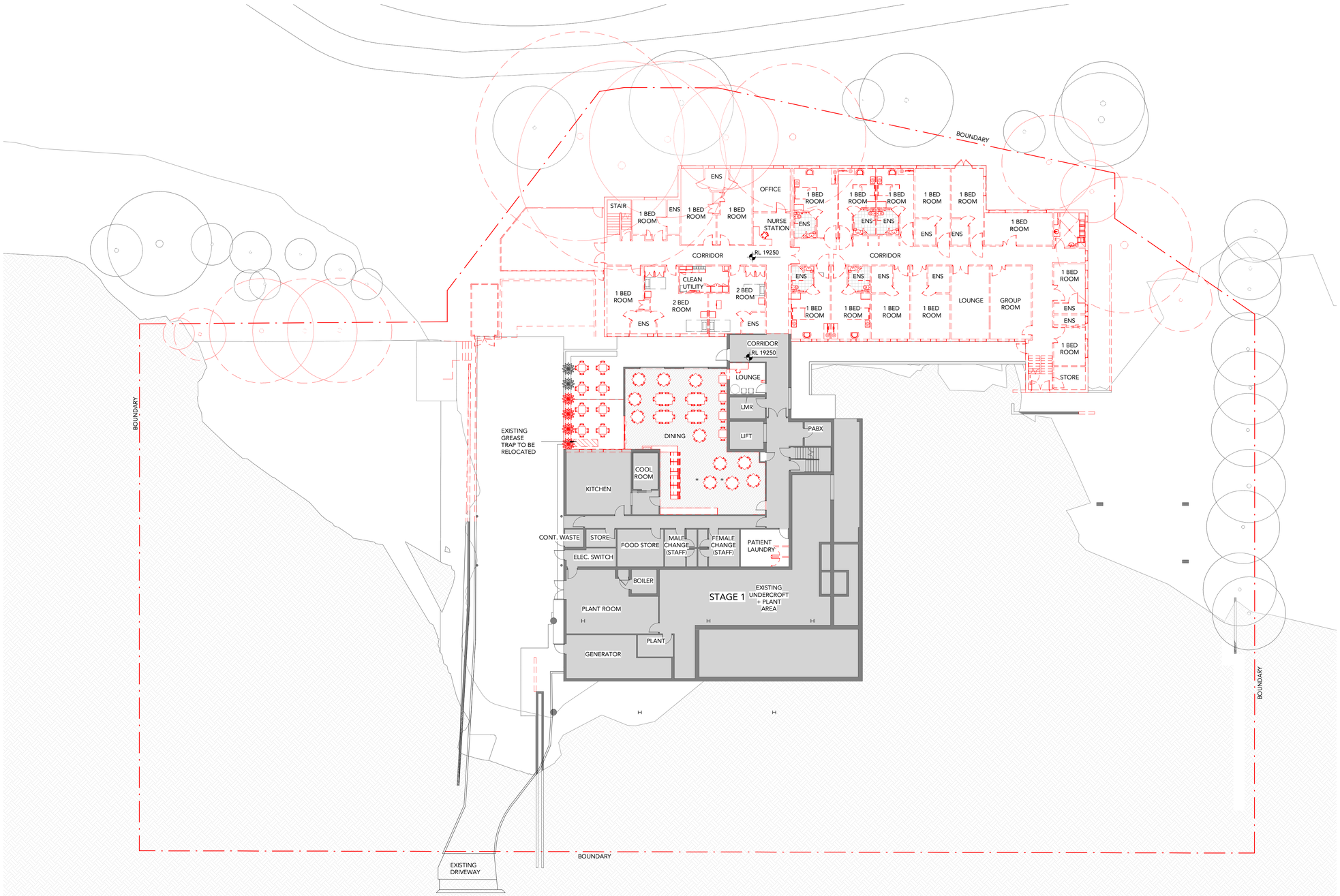
Project:
Northside West Stage 2

Wentworthville. NSW 2145

Title:
OVERALL SITE PLAN

Project #:	Scale:	Drw:	Chd:
903	As indicated @A1	IK	VM

Drawing #: DA0105 Rev: 4



1 DA Overall Demo - Lower Ground
Scale: 1 : 200

DRAWING STATUS:

DEVELOPMENT APPLICATION

Rev	Revision Description	Date
1	Preliminary Issue - Demo Plan	15.10.21
2	ISSUE FOR DEVELOPMENT APPLICATION	27.10.21
3	ISSUE FOR DEVELOPMENT APPLICATION	14.12.21

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LEGEND

EXISTING TREE TO BE RELOCATED

WALL, DOOR AND WINDOW TO BE DEMOLISHED

NOT PART OF SCOPE

ERILYAN

0 1 2 3 4 5
SCALE 1:100

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ABN: 72 104 833 507
Reg Vic: 19340

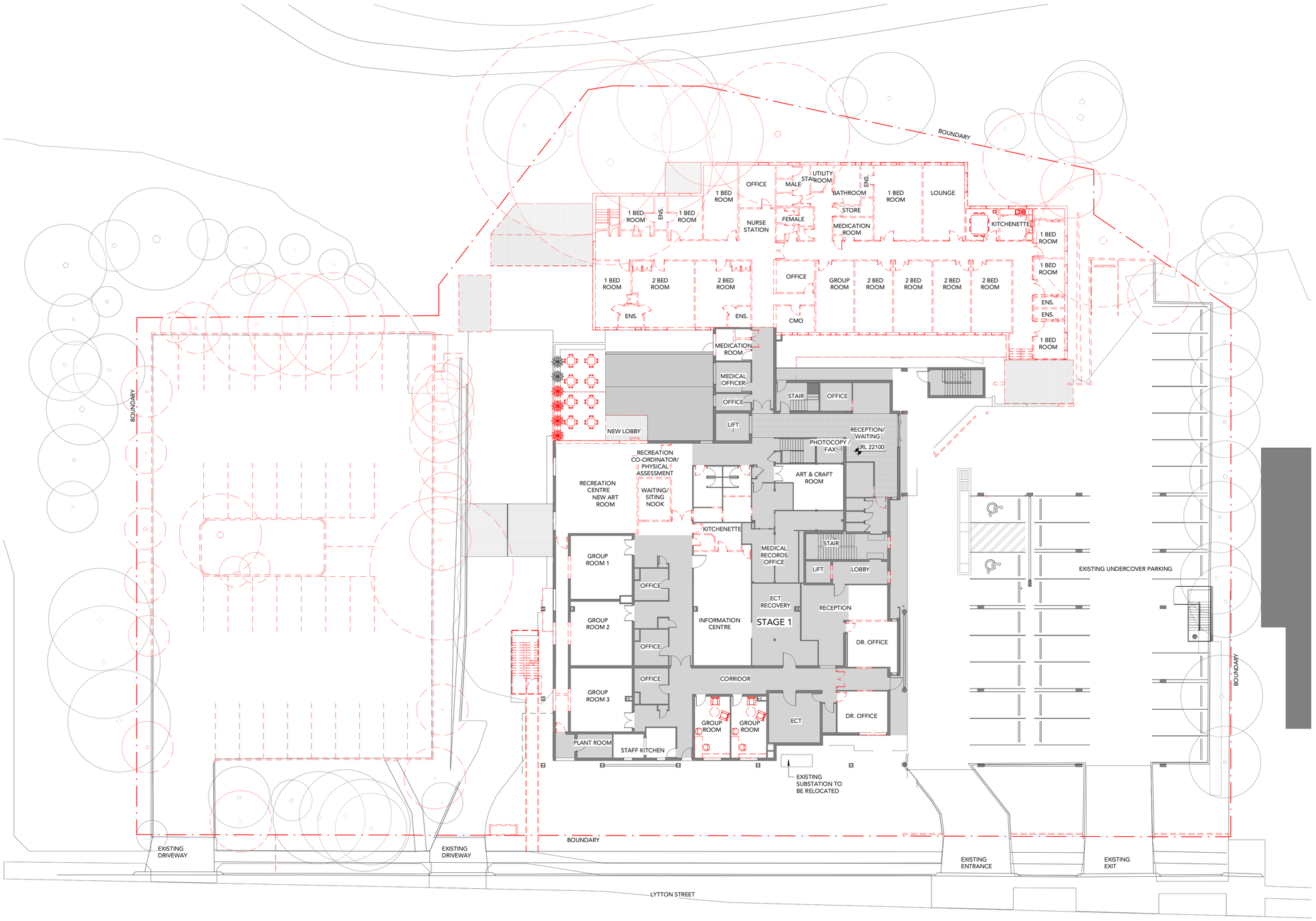
Project:
Northside West Stage 2

Wentworthville. NSW 2145

Title:
OVERALL DEMOLITION - LOWER GROUND

Job No.	Scale:	Drw:	Chkd:
903	As indicated @A1	IK	Checker

Drawing #: DA0500 Rev: 3



1 DA Overall Demo - Ground Floor
Scale: 1 : 200

DRAWING STATUS:

DEVELOPMENT APPLICATION

Rev	Revision Description	Date
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LEGEND

- EXISTING TREE TO BE RELOCATED
- WALL, DOOR AND WINDOW TO BE DEMOLISHED
- NOT PART OF SCOPE

ERILYAN

0 1 2 3 4 5
SCALE 1:100

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Reg Vic: 19340

Project:
Northside West Stage 2

Wentworthville. NSW 2145

Title:
OVERALL DEMOLITION - GROUND

Project #:	Scale:	Drw:	Chd:
903	As indicated @A1	IK	IK

Drawing #: DA0501 Rev: 3

1 DA - Lower Ground Stage 2
Scale: 1 : 100

DRAWING STATUS:

DEVELOPMENT APPLICATION

Rev	Revision Description	Date
1	Preliminary Issue	28.07.21
2	Preliminary Issue	05.08.21
3	ISSUE FOR DEVELOPMENT APPLICATION	27.10.21
4	ISSUE FOR DEVELOPMENT APPLICATION	14.12.21

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LEGEND

- NOT IN SCOPE
- EXISTING WALL
- NEW WALL

ERILYAN

SCALE 1:100

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Project:
Northside West Stage 2
Wentworthville. NSW 2145

Title:
LOWER GROUND - STAGE 2

Project #	Scale	Drw.	Chk.
903	1 : 100 @A1	IK	VM

Drawing #: DA1000
Rev: 4

DA2001
2

LANDSAPCE AND PLANTING TO LANDSCPAE ARCHITECT DETAILS

BOUNDARY

10 9 8 7 6 5 4 3 2 1

UP
STAIR 3
ELECT.

EMERGENCY EXIT

NEW WEST PARKING
SRL 19200

RL 19200
1:5
RL 19460

LINE OF RAMP ABOVE

RL 19500
1:5
1:10
RL 19300

11 12 13 14 15 16 17 18

UP

6 BICYCLE PARKING SPACE

NEW OFFICE
10 m²

LMR
7 m²

LIFT
9 m²

PABX
6 m²

CLEANERS
4 m²

STAIR
5 m²

EXISTING GREASE TRAP
TO BE RELOCATED

NEW
LAODING BAY

LIFT

CONFIRM
EXISTING DUCT

NEW GYM
140 m²

KITCHEN
45 m²

COOL ROOM
8 m²

CORRIDOR
21 m²

CONT. WASTE
3 m²

STORE
5 m²

FOOD STORE
16 m²

ELEC. SWITCH
8 m²

MALE
CHANGE
(STAFF)
7 m²

FEMALE
CHANGE
(STAFF)
11 m²

NEW
WELLNESS
17 m²

REFURBISHED

BOILER
6 m²

PLANT ROOM
46 m²

EXISTING
UNDERCROFT
+ PLANT
AREA
126 m²

H H H

1 DA - Lower Ground West Parking and Stage 1
Scale: 1 : 100

DRAWING STATUS:

DEVELOPMENT APPLICATION

Rev	Revision Description	Date
1	Preliminary Issue	28.07.21
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LEGEND

- NOT IN SCOPE
- EXISTING WALL
- NEW WALL

ERILYAN

0 1 2 3 4 5
SCALE 1:100

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Reg Vic: 19340

Project:
Northside West Stage 2

Wentworthville. NSW 2145

Title:
LOWER GROUND - WEST PARKING

Project #:	Scale:	Drw:	Chd:
903	1 : 100 @A1	IK	VM

Drawing #: DA1001
Rev: 5

DA2001
1

BOUNDARY

LINE OF BUILDING ABOVE

LANDSAPCE AND PLANTING TO LANDSCPAE ARCHITECT DETAILS

STAIR 2

LANDSAPCE AND PLANTING TO LANDSCPAE ARCHITECT DETAILS

RL 20500

RL 21000

1419

PADESTRIAN PATH

RL 20751

DA2000
2

B
DA3000

13

12

SWITCH ROOM
43 m²
RL 22100

11 10 9 8 7 6 5

ON GRADE UNDERCOVER PARKING

RL 22000

LINE OF BUILDING ABOVE

1 2 3 4

RL 22100

HYDRANT AND SPRINKLER PUMP

5400

5444

HOT WATER PLANT ROOM

3600

2600

STAIR 1

UP

RL 22000

1:10

RL 22200

1:5

RL 22570

1:10

RL 22770

LINE OF BUILDING ABOVE

EXISTING EASEMENT TO BE RELOCATED

NEW SUBSTATION

EXISTING FIRE HYDRANT BOOSTER

BOUNDARY

EXISTING DRIVEWAY

A
DA3000

1
DA9000

EXISTING DRIVEWAY

LYTTION STREET

EXISTING RETAINING WALL

HIGHLIGHT WINDOW

CONFRIM EXISTING WINDOW

NEW WINDOW

NEW WINDOW

NEW WINDOW

LINE OF BUILDING ABOVE

11 12 13

NEW WINDOW

NEW OFFICE
11 m²

MEDICAL OFFICER
10 m²

OFFICE
6 m²

LIFT
9 m²

3.00°

LIFT

NEW LOBBY

EXISTING COLOUMN TBC

EXISTING TOILET UPGRADES

NEW ART ROOM
85 m²

FEMALE W.C
8 m²

MALE W.C
12 m²

NEW GROUP
1
37 m²

NEW LOUNGE
37 m²

EXISTING/ REROUTED FIRE WALL SHOWN IN RED

OFFICE
10 m²

NEW GROUP
2
37 m²

EXPANDED ECT RECOVERY
38 m²

OFFICE
11 m²

STAGE 1

OFFICE
11 m²

NEW GROUP
3
37 m²

NEW GROUP
4
21 m²

NEW GROUP
5
20 m²

PLANT ROOM
8 m²

NEW INTERVIEW
16 m²

1 DA - Ground Floor Stage 2
Scale: 1 : 100

DRAWING STATUS:

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LEGEND

- NOT IN SCOPE
- EXISTING WALL
- NEW WALL

ERILYAN

0 1 2 3 4 5
SCALE 1:100

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Project:
Northside West Stage 2

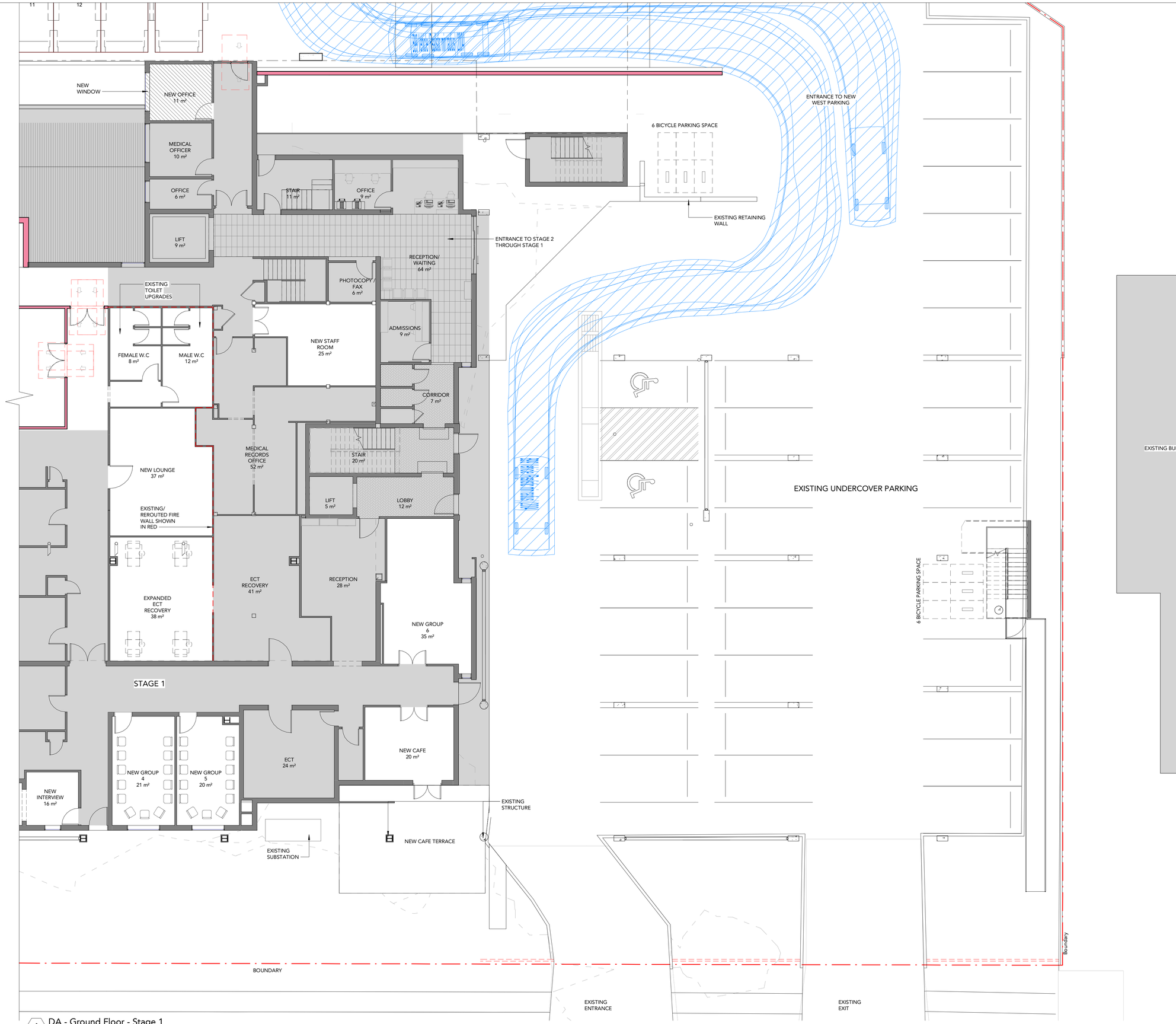
Wentworthville. NSW 2145

Title:
GROUND - STAGE 2

Project #:	Scale:	Drn:	Chd:
903	1 : 100 @A1	IK	VM

Drawing #: DA1002

Rev: 4



1 DA - Ground Floor - Stage 1
Scale: 1 : 100

DRAWING STATUS:

DEVELOPMENT APPLICATION

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LEGEND

- NOT IN SCOPE
- EXISTING WALL
- NEW WALL

ERILYAN

SCALE 1:100

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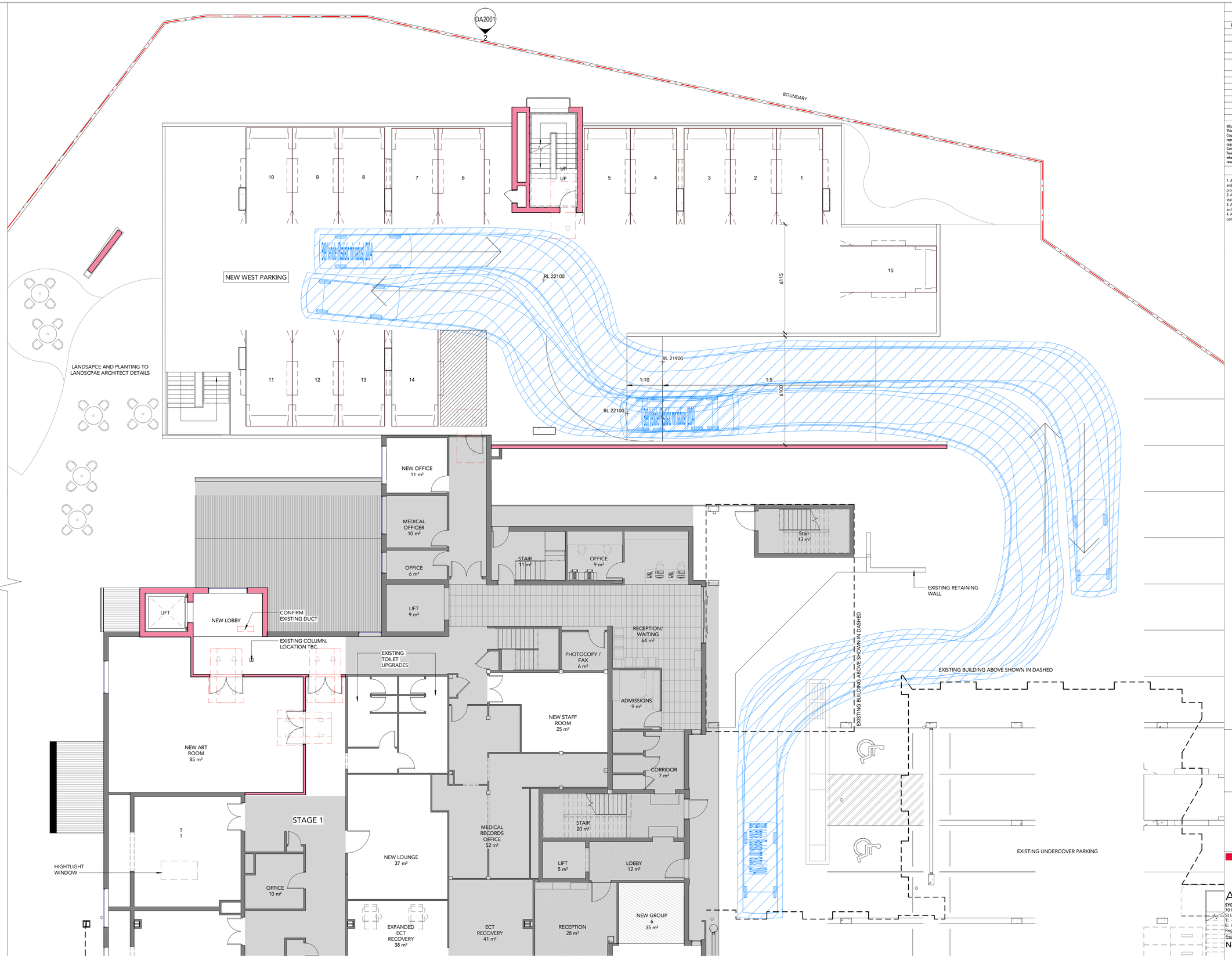
Project:
Northside West Stage 2

Wentworthville. NSW 2145

Title:
GROUND - STAGE 1

Project #:	Scale:	Drw:	Chk:
903	1 : 100 @A1	IK	VM

Drawing #: DA1003 Rev: 4



1 DA - Ground Floor West Parking
Scale: 1 : 100

DRAWING STATUS:

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1	Preliminary Issue	28.07.21
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LEGEND

- NOT IN SCOPE
- EXISTING WALL
- NEW WALL

ERILYAN

SCALE 1:100

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ABN: 72 104 833 507
Reg Vic: 19340

Project:
Northside West Stage 2

Wentworthville. NSW 2145

Title:
GROUND -WEST PARKING

Project #:	Scale:	Drw:	Chd:
903	1 : 100 @A1	IK	VM

Drawing #: DA1004 Rev: 5

1 DA - Level 1
Scale: 1 : 100

DRAWING STATUS:

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1	Preliminary Issue	28.07.21
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LEGEND

- NOT IN SCOPE
- EXISTING WALL
- NEW WALL

FLOOR PLAN LEGEND

- WARD ROOMS
- SUPPORT ROOMS
- UTILITY ROOMS

ERILYAN

0 1 2 3 4 5
SCALE 1:100

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Project:
Northside West Stage 2

Wentworthville. NSW 2145

Title:
LEVEL 1 - STAGE 2

Project #:	Scale:	Drw.	Chk.
903	1 : 100 @A1	IK	VM

Drawing #: DA1005 Rev: 5

1 Level 1 - West Block
Scale: 1 : 100

DRAWING STATUS:

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LEGEND

- NOT IN SCOPE
- EXISTING WALL
- NEW WALL

FLOOR PLAN LEGEND

- WARD ROOMS
- SUPPORT ROOMS
- UTILITY ROOMS

ERILYAN

0 1 2 3 4 5
SCALE 1:100

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Project:
Northside West Stage 2

Wentworthville. NSW 2145

Title:
LEVEL 1 - WEST BLOCK

Project #:	Scale:	Drw:	Chd:
903	1 : 100 @A1	IK	VM

Drawing #: DA1006
Rev: 4

DA2000 2

B DA3000

WARD ROOM: 29 ROOMS (INCL. 2 ACC.)

1 DA - Level 2
Scale: 1 : 100

A DA3000

1 DA9000

DRAWING STATUS:

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LEGEND

- NOT IN SCOPE
- EXISTING WALL
- NEW WALL

FLOOR PLAN LEGEND

- WARD ROOMS
- SUPPORT ROOMS
- UTILITY ROOMS

ERILYAN

0 1 2 3 4 5
SCALE 1:100

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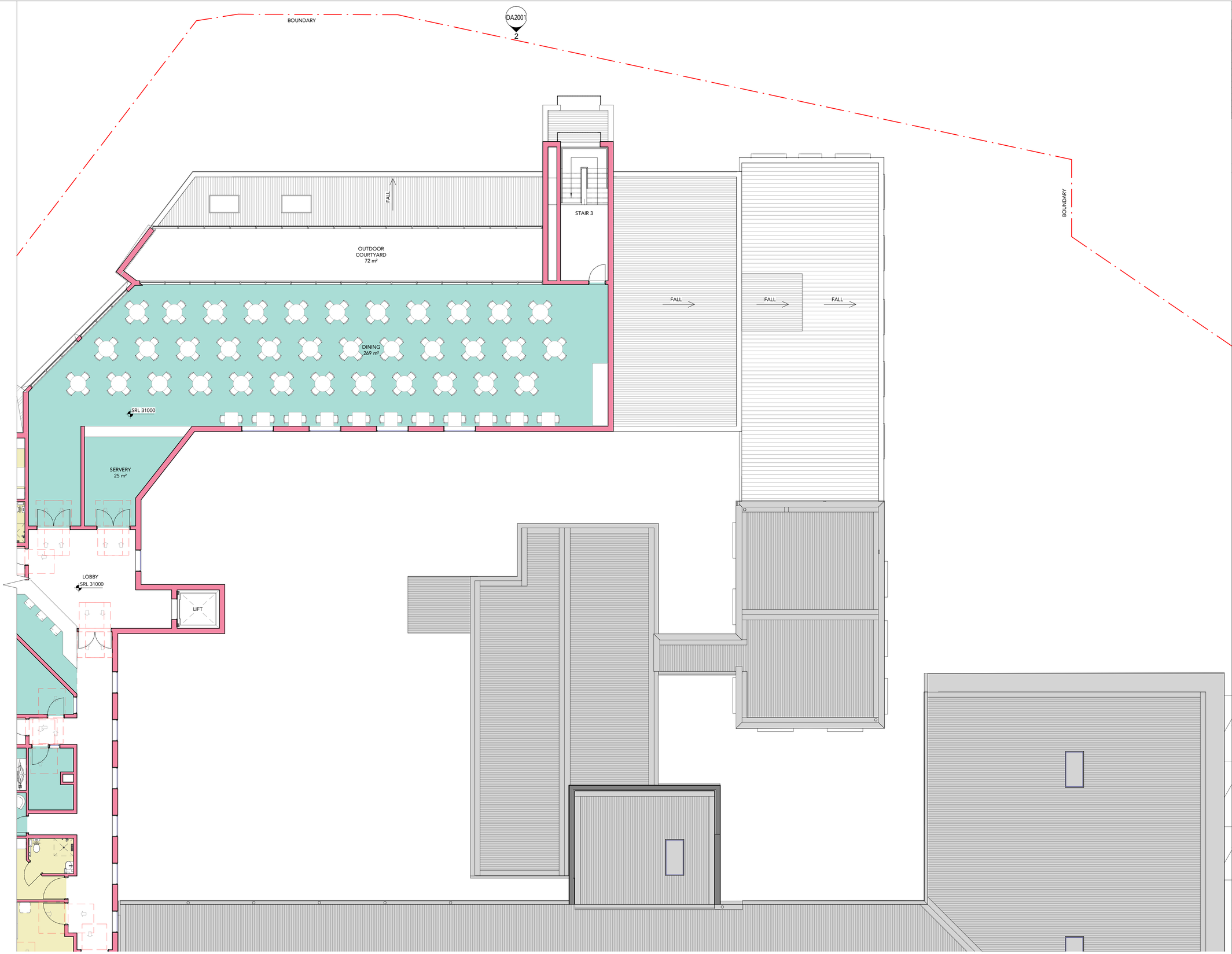
Project:
Northside West Stage 2

Wentworthville. NSW 2145

Title:
LEVEL 2 - STAGE 2

Project #:	Scale:	Drn:	Chd:
903	1 : 100 @A1	IK	VM

Drawing #: DA1007 Rev: 4



1 Level 2 - West Block
Scale: 1 : 100

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LEGEND

- NOT IN SCOPE
- EXISTING WALL
- NEW WALL

FLOOR PLAN LEGEND

- WARD ROOMS
- SUPPORT ROOMS
- UTILITY ROOMS

ERILYAN

0 1 2 3 4 5
SCALE 1:100

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Project:
Northside West Stage 2

Wentworthville. NSW 2145

Title:
LEVEL 2 - WEST BLOCK

Project #:	Scale:	Drw:	Chd:
903	1 : 100 @A1	IK	VM

Drawing #: DA1008
Rev: 4

WARD ROOMS: 25 ROOMS (INCL. 3 ACC.)

1 DA - Level 3
Scale: 1 : 100

DRAWING STATUS:

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0 1 2 3 4 5
SCALE 1:100

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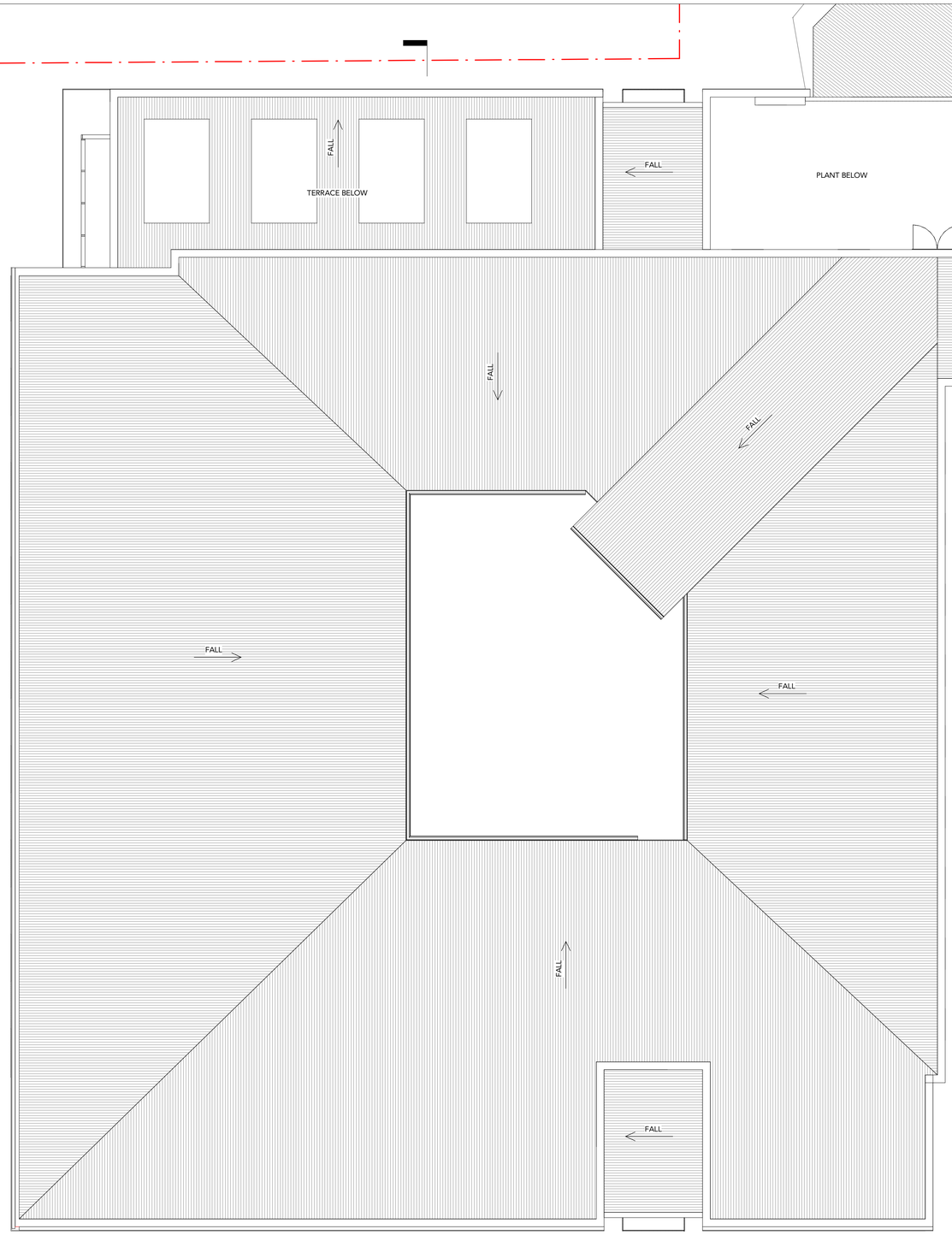
Project:
Northside West Stage 2

Wentworthville. NSW 2145

Title:
LEVEL 3 - STAGE 2

Project #:	Scale:	Drw:	Chk:
903	1 : 100 @A1	IK	VM

Drawing #: DA1009
Rev: 4



DA2000 2

B DA3000

A DA3000

1 DA9000

1 DA - Roof
Scale: 1 : 100

DRAWING STATUS:

DEVELOPMENT APPLICATION

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Reg Vic: 19340

Project:
Northside West Stage 2

Wentworthville. NSW 2145

Title:
ROOF - STAGE 2

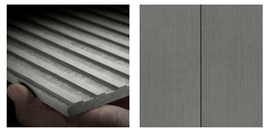
Project #:	Scale:	Drw:	Chd:
903	1 : 100 @A1	IK	VM

Drawing #: DA1010

Rev: 4

MATERIALS AND FINISHES LEGEND

01



EQUITONE LINES PANEL

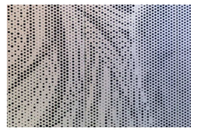
02

SOLID ALUMINUM PANEL

03

SOLID ALUMINUM PANEL

04



PERFORATED METAL SCREENING

1 DA - East Elevation - Lytton St View
Scale: 1 : 100

2 DA - South Elevation
Scale: 1 : 100

DRAWING STATUS:

DEVELOPMENT APPLICATION

Rev	Revision Description	Date
1	Preliminary Issue	28.07.21
2	Preliminary Issue	05.08.21
3	ISSUE FOR DEVELOPMENT APPLICATION	27.10.21
4	ISSUE FOR DEVELOPMENT APPLICATION - UPDATED	05.11.21
5	ISSUE FOR DEVELOPMENT APPLICATION	14.12.21

DRAWING LEGEND:

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SCALE 1:100

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Reg Vic: 19340

Project:
Northside West Stage 2

Wentworthville. NSW 2145

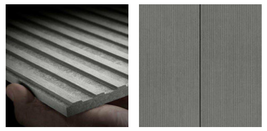
Title:
ELEVATION

Project #:	Scale:	Drw:	Chk:
903	As indicated @A1	IK	VM

Drawing #: DA2000 Rev: 5

MATERIALS AND FINISHES LEGEND

01



EQUITONE LINES PANEL

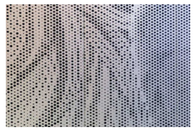
02

SOLID ALUMINUM PANEL

03

SOLID ALUMINUM PANEL

04



PERFORATED METAL SCREENING

1 DA - West Elevation - Lytton Park View
Scale: 1 : 100

2 DA - West Elevation - Lytton Park View 2
Scale: 1 : 100

DRAWING STATUS:

PRELIMINARY

Rev	Revision Description	Date
1	Preliminary Issue	28.07.21
2	Preliminary Issue	05.08.21
3	ISSUE FOR DEVELOPMENT APPLICATION	27.10.21
4	ISSUE FOR DEVELOPMENT APPLICATION - UPDATED	05.11.21
5	ISSUE FOR DEVELOPMENT APPLICATION	14.12.21

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0 1 2 3 4 5
SCALE 1:100

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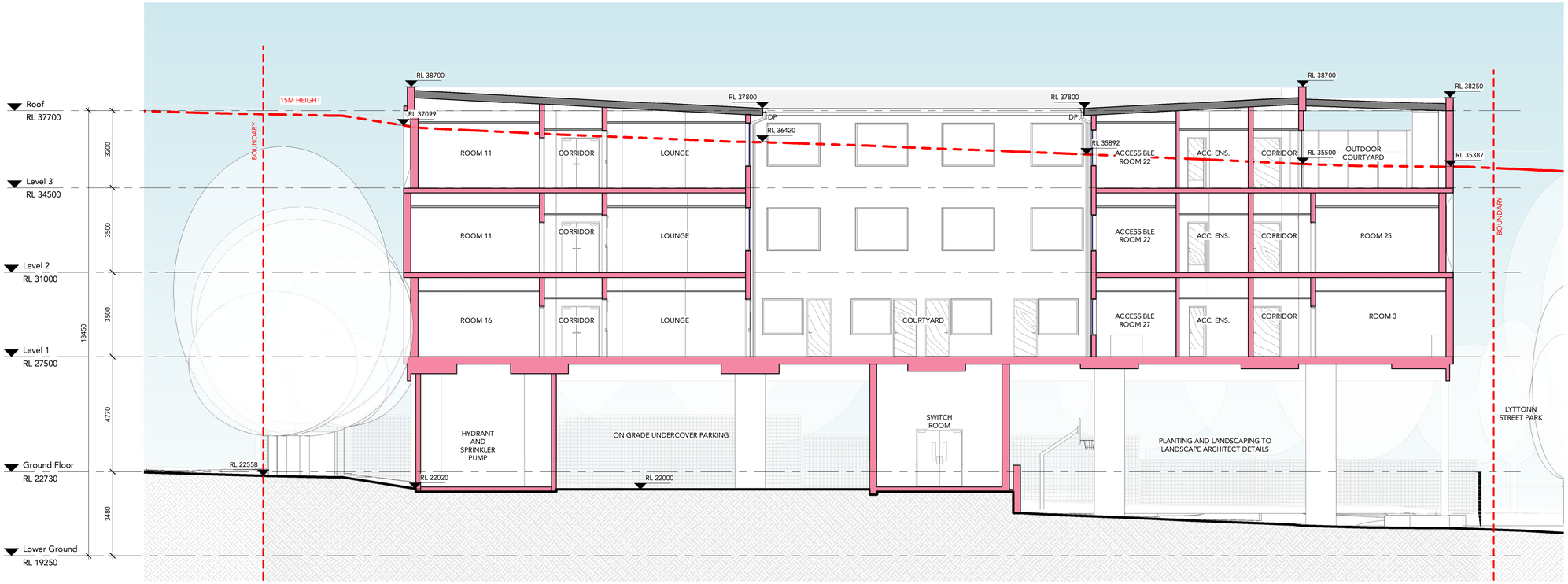
Reg Vic: 19340

Project:
Northside West Stage 2
Wentworthville. NSW 2145

Title:
ELEVATION

Project #:	Scale:	Drw:	Ckd:
903	As indicated @A1	IK	VM

Drawing #: DA2001 Rev: 5



A SECTION A-A
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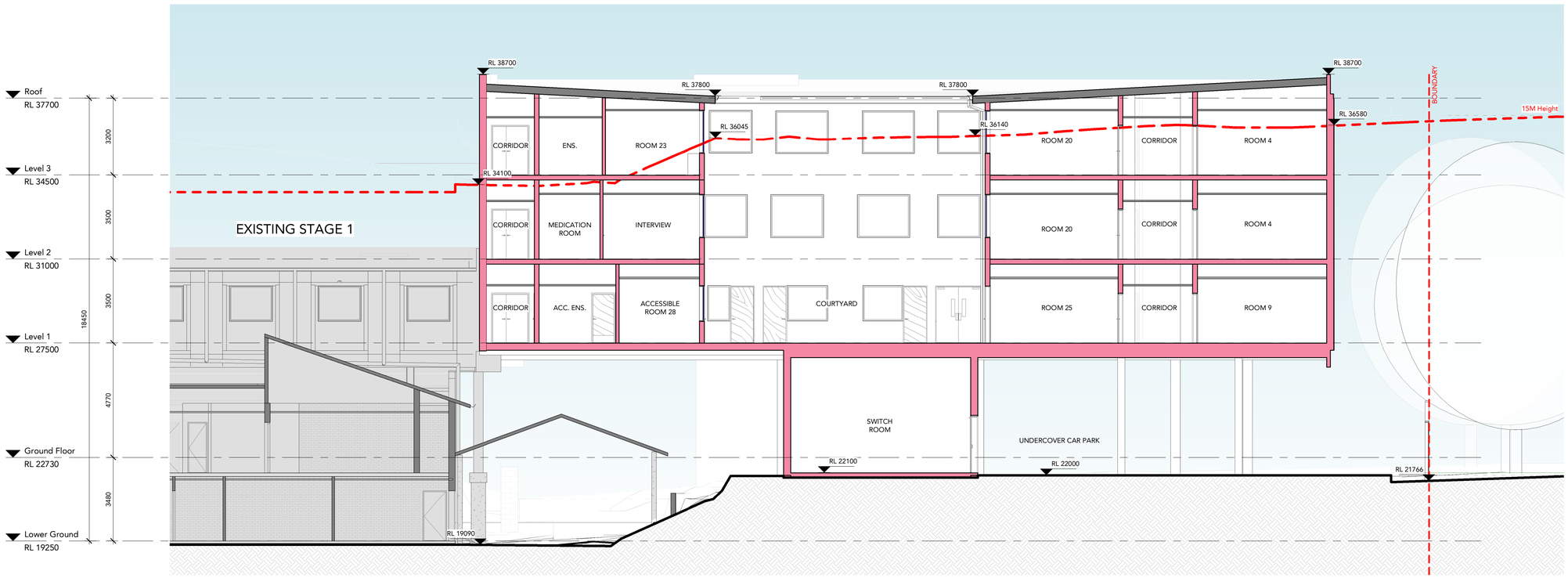

B SECTION B-B
Scale: 1 : 100

DRAWING STATUS:

DEVELOPMENT APPLICATION

Rev	Revision Description	Date
1	Preliminary Issue	28.07.21
2	Preliminary Issue	05.08.21
3	ISSUE FOR DEVELOPMENT APPLICATION	27.10.21
4	ISSUE FOR DEVELOPMENT APPLICATION - UPDATED	05.11.21
5	ISSUE FOR DEVELOPMENT APPLICATION - UPDATED	08.11.21
6	ISSUE FOR DEVELOPMENT APPLICATION	14.12.21

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LEGEND

- NOT IN SCOPE
- EXISTING WALL
- NEW WALL

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0 1 2 3 4 5
SCALE 1:100

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Project:
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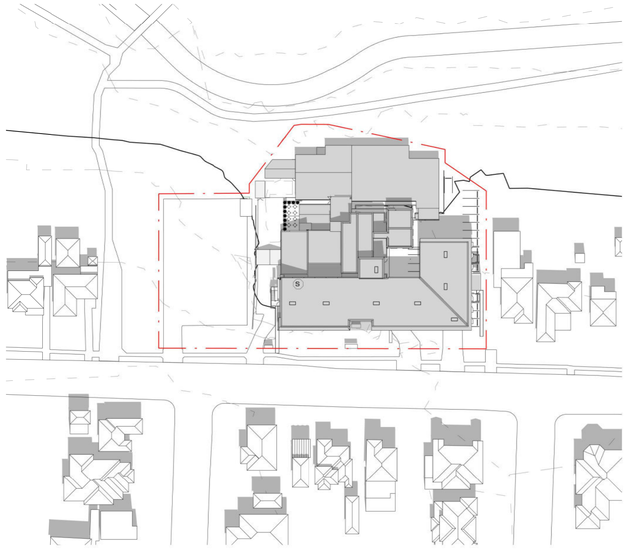
Wentworthville. NSW 2145

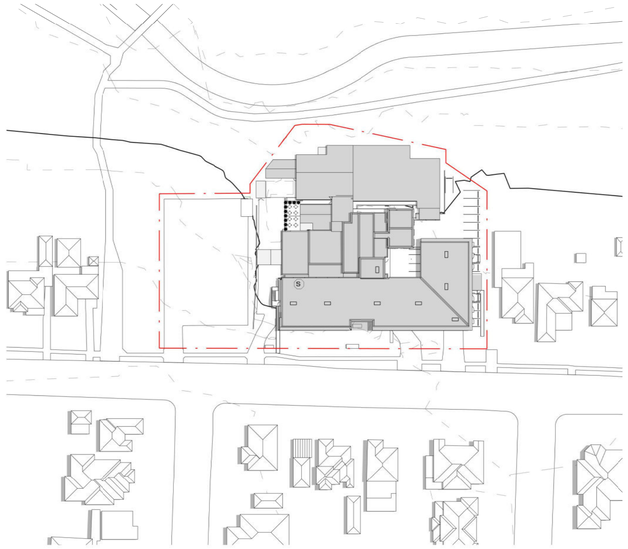
Title:
SECTIONS

Project #:	Scale:	Drw:	Chk:
903	As indicated @A1	IK	VM

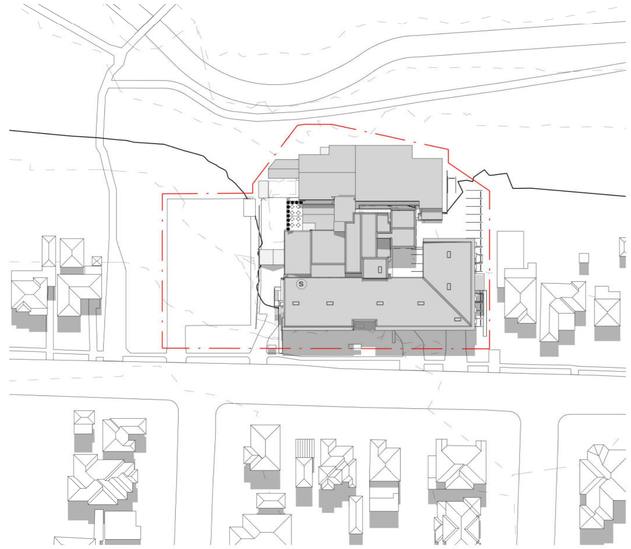
Drawing #: DA3000
Rev: 6



1 Shadow Diagram Existing_Summer Solstice 0900
Scale: 1 : 1000



2 Shadow Diagram Existing_Summer Solstice 1200
Scale: 1 : 1000



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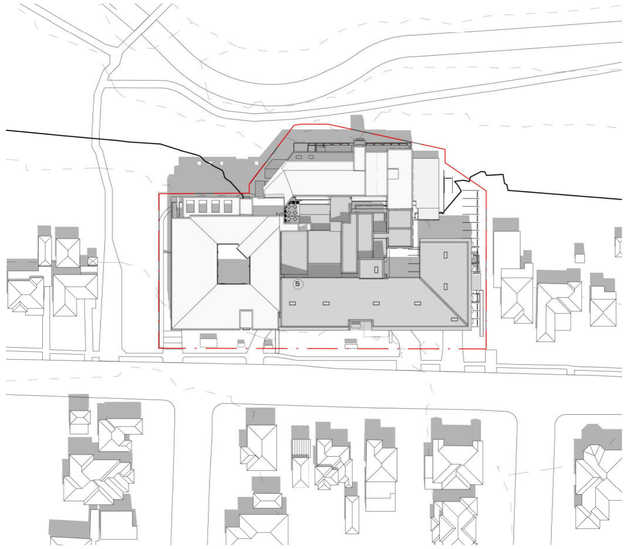

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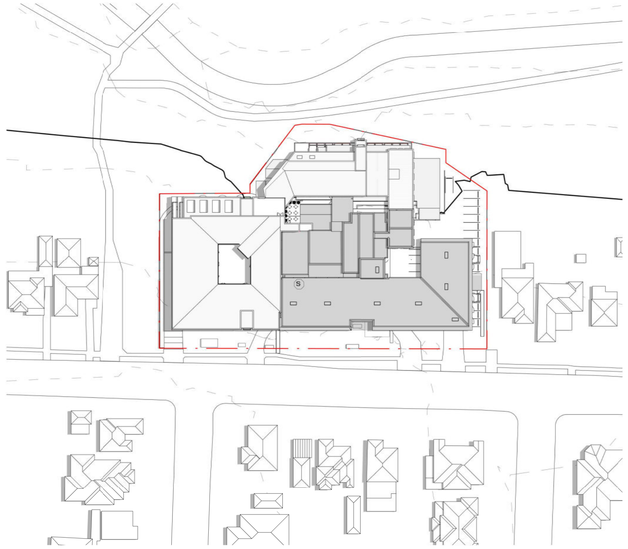
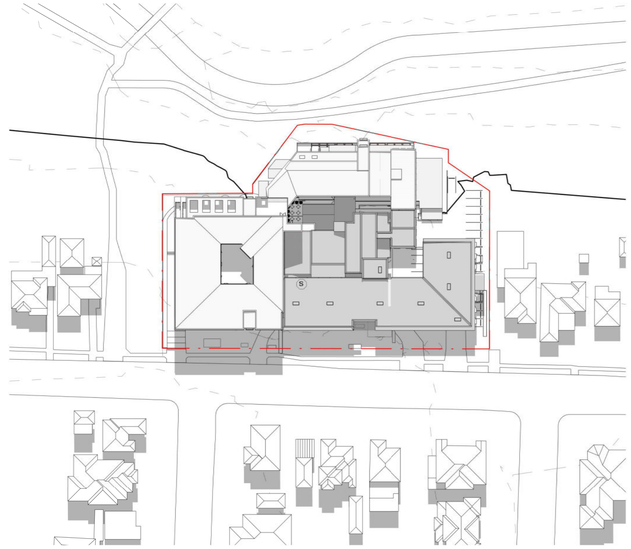
Scale: 1 : 1000



5 Shadow Diagram_Summer Solstice 1200
Scale: 1 : 1000



6 Shadow Diagram_Summer Solstice 1500
Scale: 1 : 1000

DRAWING STATUS:

DEVELOPMENT APPLICATION

Rev	Revision Description	Date
1	Preliminary Issue	28.07.21
2	Preliminary Issue	05.08.21
3	ISSUE FOR DEVELOPMENT APPLICATION	27.10.21
4	ISSUE FOR DEVELOPMENT APPLICATION	14.12.21

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0 5 10 20 30
SCALE 1:500

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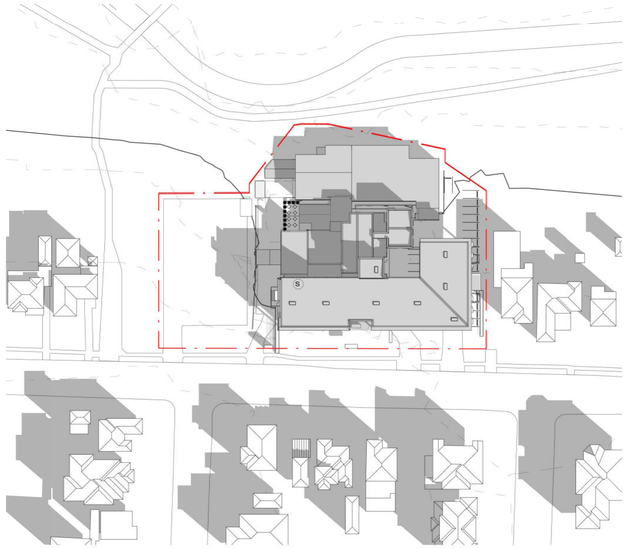
Project:
Northside West Stage 2

Wentworthville. NSW 2145

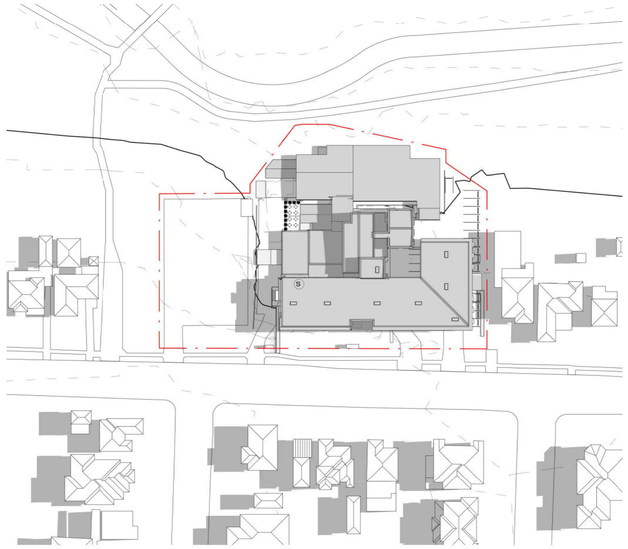
Title:
SHADOW DIAGRAMS - SUMMER SOLSTICE

Job No.	Scale	Drw	Chd
903	1 : 1000 @A1	IK	IK

Drawing #: DA8000
Rev: 4



1 Shadow Diagram Existing_Winter Solstice 0900
Scale: 1 : 1000



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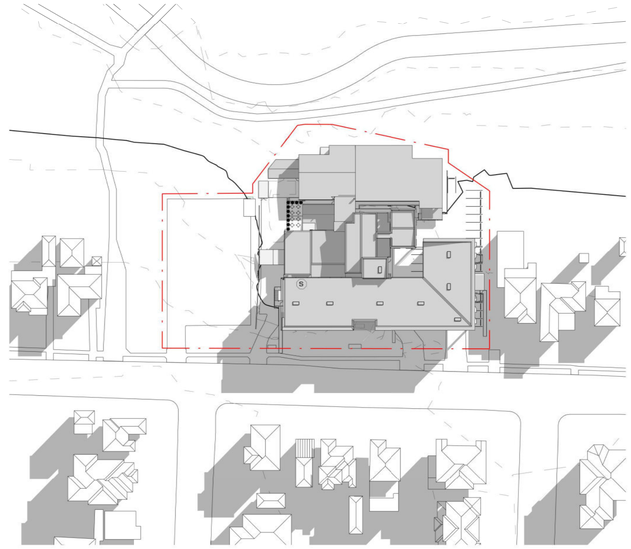
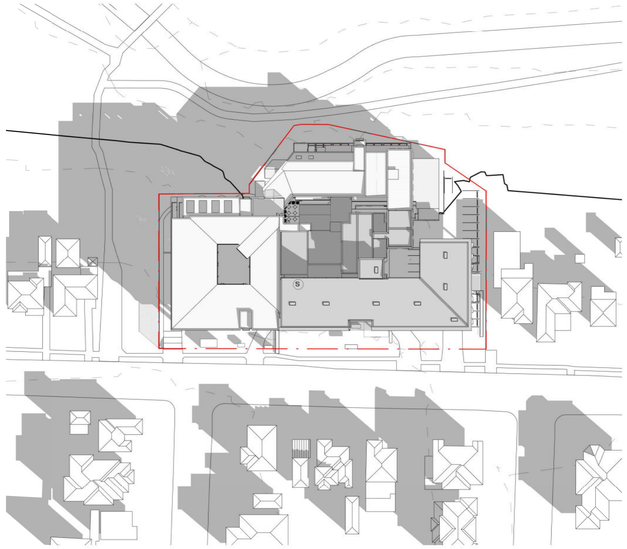
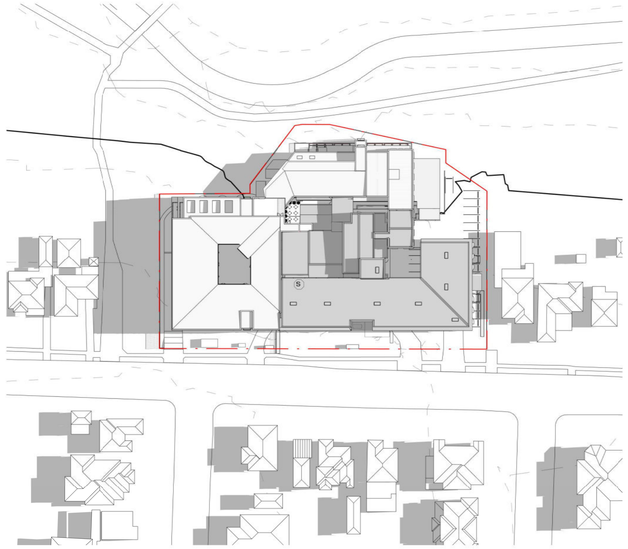
Scale: 1 : 1000



3 Shadow Diagram Existing_Winter Solstice 1500
Scale: 1 : 1000



4 Shadow Diagram_Winter Solstice 0900
Scale: 1 : 1000



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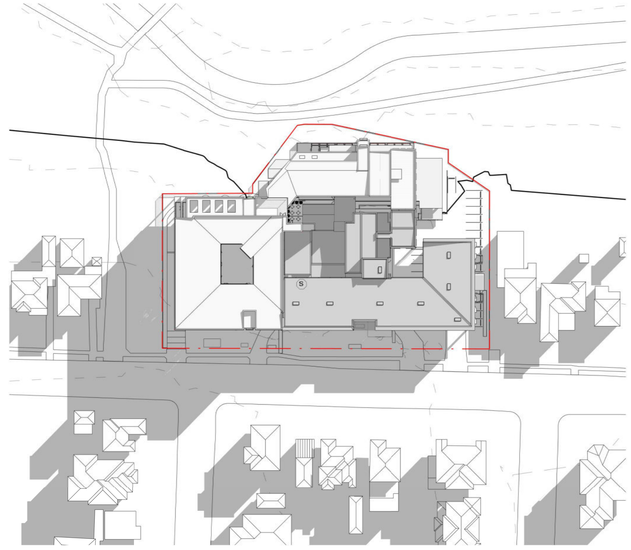
Scale: 1 : 1000



6 Shadow Diagram_Winter Solstice 1500
Scale: 1 : 1000

DRAWING STATUS:

DEVELOPMENT APPLICATION

Rev	Revision Description	Date
1	Preliminary Issue	28.07.21
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3	ISSUE FOR DEVELOPMENT APPLICATION	27.10.21
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SCALE 1:500

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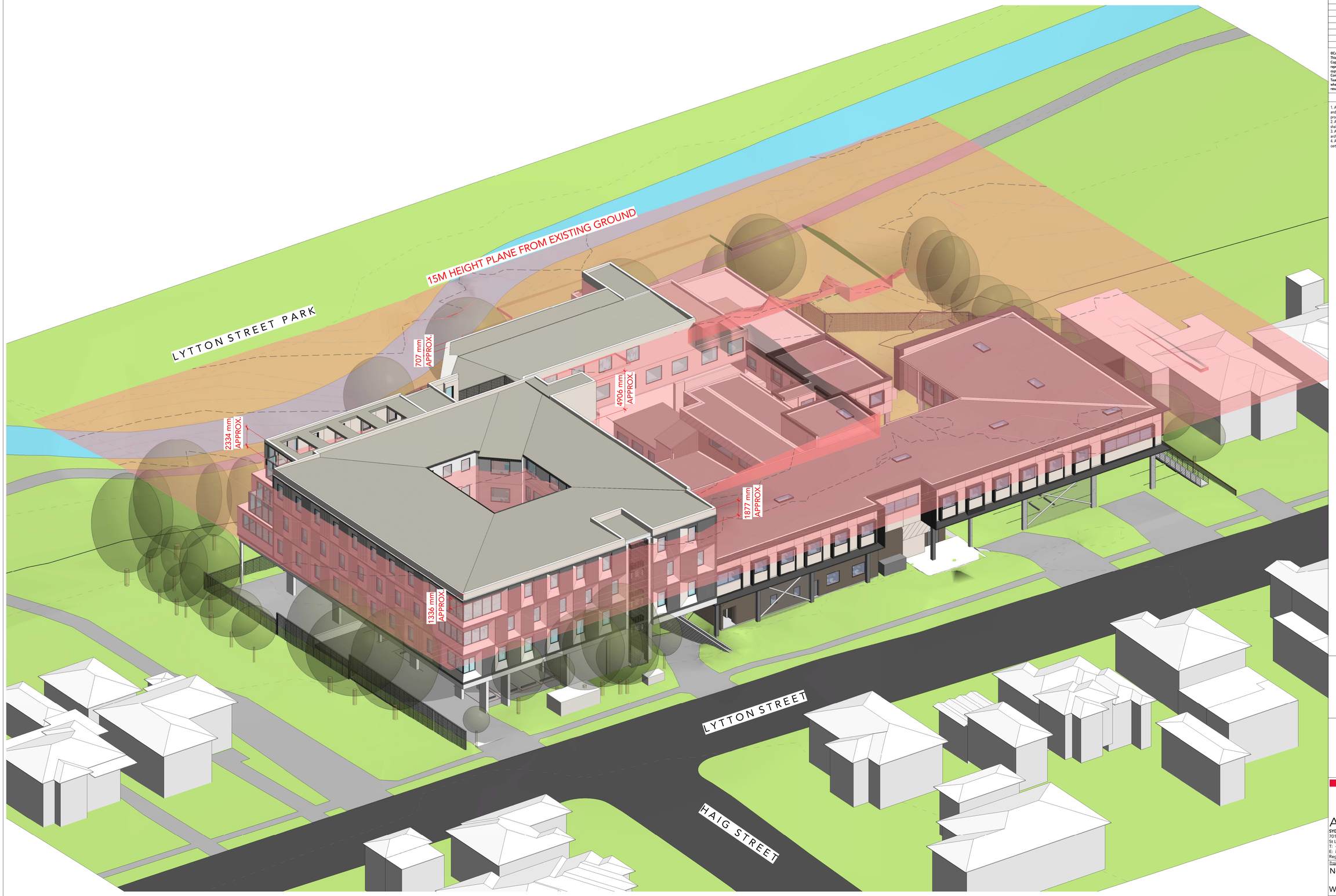
Project:
Northside West Stage 2

Wentworthville. NSW 2145

Title:
SHADOW DIAGRAMS - WINTER SOLSTICE

Job No.	Scale	Drw	Chd
903	1 : 1000 @A1	IK	IK

Drawing #: DA8002
Rev: 4



1 LEP Height - Lytton Street South View
N.T.S

DRAWING STATUS:

DEVELOPMENT APPLICATION

Rev	Revision Description	Date
1	Preliminary Issue - LEP Height	28.09.21
2	ISSUE FOR DEVELOPMENT APPLICATION	27.10.21
3	ISSUE FOR DEVELOPMENT APPLICATION	14.12.21

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Reg Vic: 19340

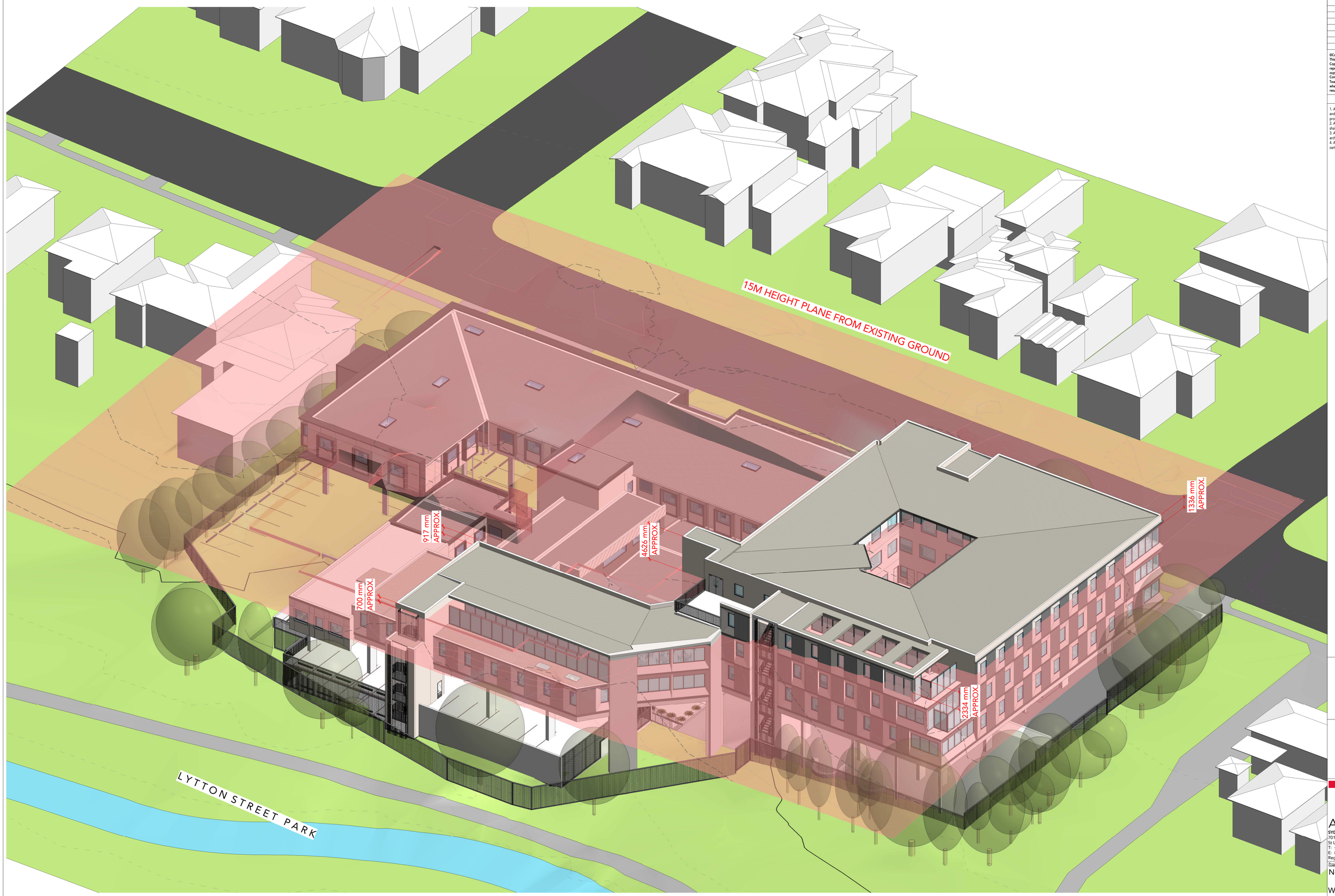
Project:
Northside West Stage 2

Wentworthville. NSW 2145

Title:
LEP Height

Project #:	Scale:	Drw:	Ckd:
903	@A1	IK	IK

Drawing #: DA8100 Rev: 3



1 LEP Height - Lytton Street South West
N.T.S

DRAWING STATUS:

DEVELOPMENT APPLICATION

Rev	Revision Description	Date
1	Preliminary Issue - LEP Height	28.09.21
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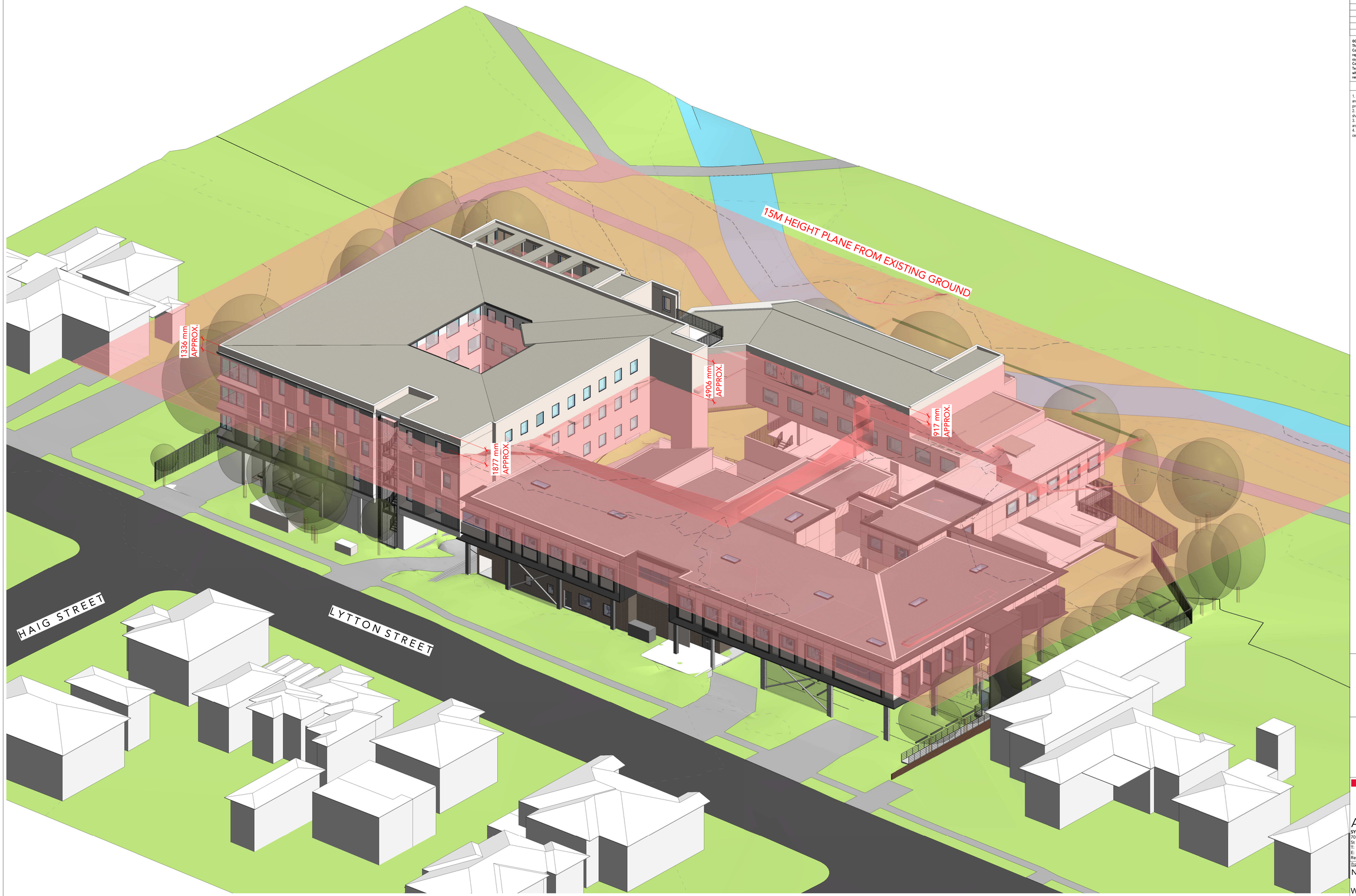
Project:
Northside West Stage 2

Wentworthville. NSW 2145

Title:
LEP Height

Project #:	Scale:	Drw:	Chd:
903	@A1	IK	IK

Drawing #: DA8101 Rev: 3



1 LEP Height - Lytton Street North View
N.T.S

DRAWING STATUS:

DEVELOPMENT APPLICATION

Rev	Revision Description	Date
1	Preliminary Issue - LEP Height	28.09.21
2	ISSUE FOR DEVELOPMENT APPLICATION	27.10.21
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Reg Vic: 19340

Project:
Northside West Stage 2

Wentworthville. NSW 2145

Title:
LEP Height

Project #:	Scale:	Drwn:	Chkd:
903	@A1	IK	IK

Drawing #: DA8102 Rev: 3

1 LEP Height - Lytton Street Park Axo View
Scale:

DRAWING STATUS:

DEVELOPMENT APPLICATION

Rev	Revision Description	Date
1	Preliminary Issue - LEP Height	28.09.21
2	ISSUE FOR DEVELOPMENT APPLICATION	27.10.21
3	ISSUE FOR DEVELOPMENT APPLICATION	14.12.21

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Project:
Northside West Stage 2

Wentworthville. NSW 2145

Title:
LEP Height

Project #:	Scale:	Drw:	Chd:
903	@A1	IK	IK

Drawing #: DA8103 Rev: 3

1 LEP Height - Lytton Street - North East Street View
Scale:

DRAWING STATUS:

DEVELOPMENT APPLICATION

Rev	Revision Description	Date
1	Preliminary Issue - LEP Height	28.09.21
2	ISSUE FOR DEVELOPMENT APPLICATION	27.10.21
3	ISSUE FOR DEVELOPMENT APPLICATION	14.12.21

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Reg Vic: 19340

Project:
Northside West Stage 2

Wentworthville. NSW 2145

Title:
LEP Height

Project #:	Scale:	Drw:	Chd:
903	@A1	IK	IK

Drawing #: DA8104
Rev: 3

1 LEP Height - Lytton Street - South Street View
Scale:

DRAWING STATUS:

DEVELOPMENT APPLICATION

Rev	Revision Description	Date
1	Preliminary Issue - LEP Height	28.09.21
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3	ISSUE FOR DEVELOPMENT APPLICATION	14.12.21

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Reg Vic: 19340

Project:
Northside West Stage 2

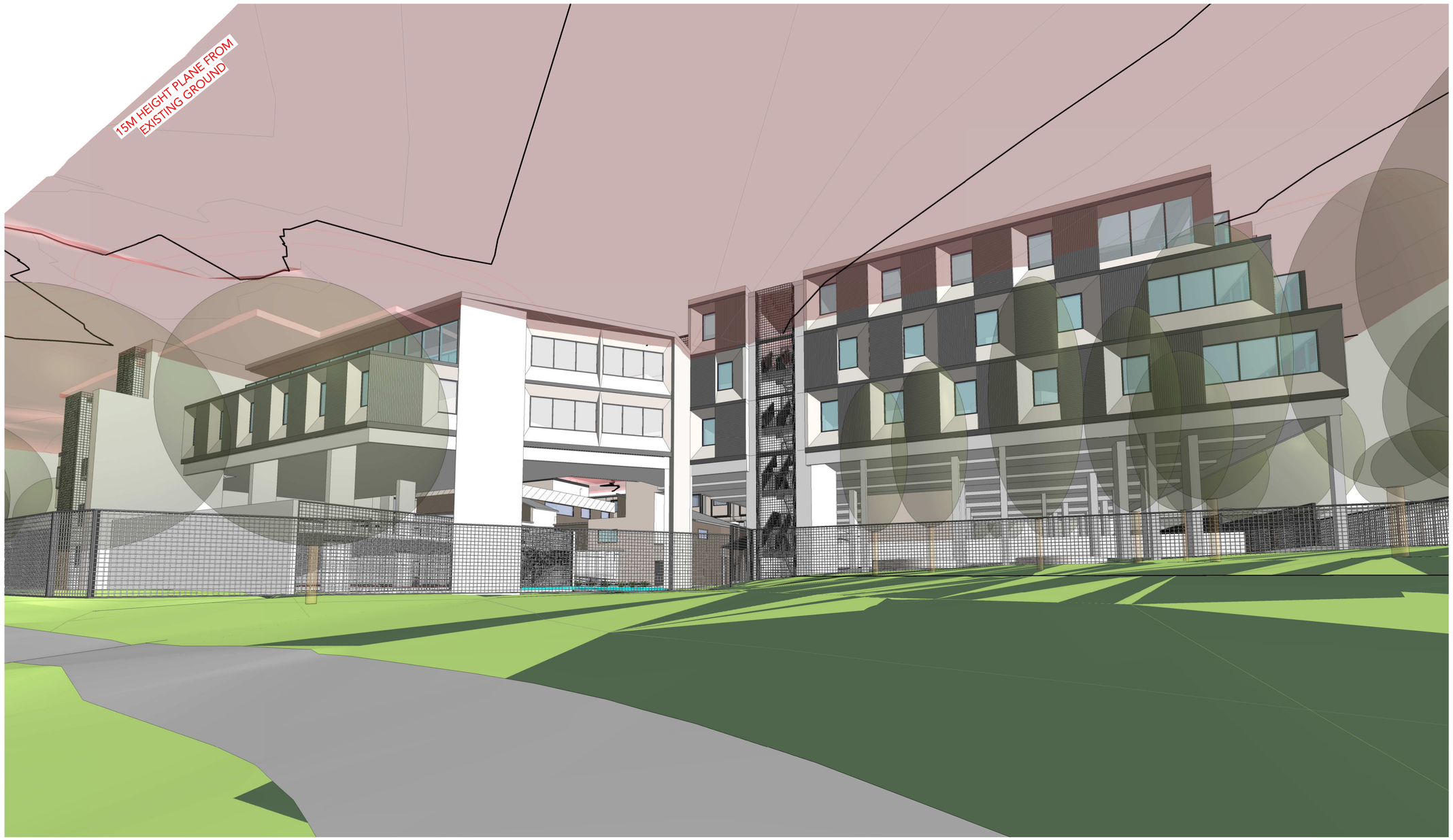
Wentworthville. NSW 2145

Title:
LEP Height

Project #:	Scale:	Drw:	Chd:
903	@A1	IK	IK

Drawing #: DA8105

Rev: 3



1 LEP Height - Lytton Street Park - Street View
Scale:

DRAWING STATUS:

DEVELOPMENT APPLICATION

Rev	Revision Description	Date
1	Preliminary Issue - LEP Height	28.09.21
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3	ISSUE FOR DEVELOPMENT APPLICATION	14.12.21

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Reg Vic: 19340

Project:
Northside West Stage 2

Wentworthville. NSW 2145

Title:
LEP Height

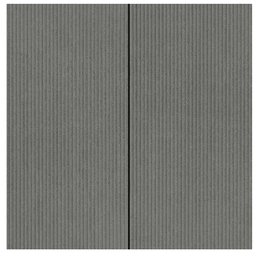
Project #:	Scale:	Drw:	Chk:
903	@A1	IK	IK

Drawing #: DA8106

Rev: 3

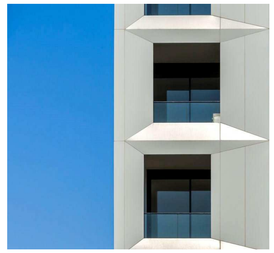
MATERIALS AND FINISHES LEGEND

01



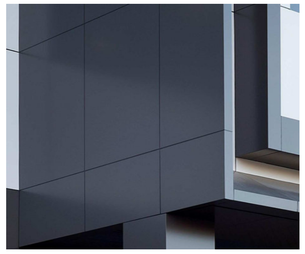
EQUITONE LINES PANEL

02



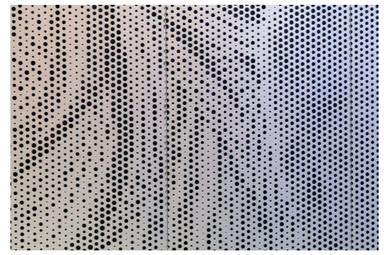
SOLID ALUMINUM PANEL

03



SOLID ALUMINUM PANEL

04



PERFORATED METAL SCREENING

1 DA - East Elevation - Lytton St View External Finishes
Scale: 1 : 100

DRAWING STATUS:

DEVELOPMENT APPLICATION

Rev	Revision Description	Date
1	Preliminary Issue	02.08.21
2	Preliminary Issue	05.08.21
3	ISSUE FOR DEVELOPMENT APPLICATION	27.10.21
4	ISSUE FOR DEVELOPMENT APPLICATION	14.12.21

DRAWING LEGEND:

1. Architectural drawings shall be read in conjunction with other consultant drawings and specifications. Any discrepancies shall be referred to team 2 architects before proceeding with work.
2. All dimensions and levels are in millimeters unless noted otherwise. No dimension shall be obtained by scaling the drawing.
3. All dimensions to be checked on site with any discrepancies referred to team 2 architects before proceeding with work.
4. All work to be carried out in accordance with the requirements of the principal certifying authority, current ncc & australian standards.

ERILYAN

0 1 2 3 4 5
SCALE 1:100

TEAM2 ARCHITECTS
SYDNEY
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Reg Vic: 19340

Project:
Northside West Stage 2

Wentworthville. NSW 2145

Title:
EXTERNAL FINISHES

Project #:	Scale:	Drw:	Chd:
903	1 : 100 @A1	IK	ZA

Drawing #: DA9000

Rev: 4

Appendix E: Borehole Logs

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GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

BOREHOLE LOG

Borehole No. **101** 1/3

Client: ERILYAN PTY LTD

Project: PROPOSED STAGE 2 REHABILITATION CENTRE

Location: NORTHSIDE WEST CLINIC, 23 TO 27 LYTTON STREET, WENTWORTHVILLE, NSW

Job No. 27318SB1 **Method:** SPIRAL AUGER JK350 **R.L. Surface:** ≈ 21.8m

Date: 23-2-15 **Datum:** AHD

Logged/Checked by: M.W./D.B.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION OF AUGER-ING	■					0		-	ASPHALTIC CONCRETE: 30mm.t				
									FILL: Clayey sandy gravel, fine to coarse grained, igneous, fine to coarse grained sand.	D			
	■			■	N = 14 7,7,7			CH	SILTY CLAY: high plasticity, grey mottled red brown, trace of root fibres and coarse grained ironstone gravel.	MC<PL	H	>600 >600 >600	RESIDUAL
						1							
				■	N > 13 14,13/ 75mm REFUSAL			-	SHALE: light grey, with red brown iron indurated bands.	XW	EL	>600 >600	BANDED VERY LOW TO LOW 'TC' BIT RESISTANCE
						2							
ON 25/2/15 ▼				■									
						3							
▼ ON 10/3/15													
				■					SHALE: dark grey, with L strength bands.	XW-DW	EL-VL		LOW RESISTANCE
						4			REFER TO CORED BOREHOLE LOG				
						5							
						6							
						7							

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GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

CORED BOREHOLE LOG

Borehole No. 101 2/3

Client: ERILYAN PTY LTD

Project: PROPOSED STAGE 2 REHABILITATION CENTRE

Location: NORTHSIDE WEST CLINIC, 23 TO 27 LYTTON STREET, WENTWORTHVILLE, NSW

Job No. 27318SB1 **Core Size:** NMLC **R.L. Surface:** ≈ 21.8m

Date: 23-2-15 **Inclination:** VERTICAL **Datum:** AHD

Drill Type: JK350 **Bearing:** - **Logged/Checked by:** M.W./D.B.

Water Loss/Level	Barrel Lift	Depth (m)	Graphic Log	CORE DESCRIPTION (Rock Type, grain characteristics, colour, structure, minor components.)	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_S(50)$ (EL VL L M H VH EH)	DEFECT DETAILS: DEFECT SPACING (mm) (500 300 100 50 30 10)	DEFECT DETAILS: DESCRIPTION (Type, inclination, thickness, planarity, roughness, coating.) Specific / General
		3							
		4		START CORING AT 4.05m					
				CORE LOSS 0.23m					
				SHALE: dark grey and red brown.	XW-DW	EL-VL			- FRAGMENTED ZONE, 0°, 60mm.t NUMEROUS CRUSHED SEAMS AND CLAY SEAMS 1mm TO 20mm.t AT APPROXIMATELY 20mm SPACING FROM 4.4m TO 5.1m
		5							- J, 15°, Un, R - Cr, 0°, 20mm.t
				SHALE: dark grey, with grey laminae.	DW	L-M			- Cr, 0°, 8mm.t CLAY INFILL - CS, 0°, 22mm.t - XWS, 0°, 70mm.t
		6			XW	EL			- J, 65°, Un, R, XW INFILL - FRAGMENTED ZONE, 130mm.t
					DW	M			- J, 60-90°, Un, R, CLAY INFILL
					SW				- Cr, 0°, 10mm.t
		7			FR				- Cr, 0°, 10mm.t - Cr, 0°, 30mm.t
95% RET-URN		8							
		9			SW				- J, 45°, Un, R - J, 80°, Un, R - VL-L STRENGTH BAND, 0°, 60mm.t

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CORED BOREHOLE LOG

Borehole No. 101 3/3

Client: ERILYAN PTY LTD

Project: PROPOSED STAGE 2 REHABILITATION CENTRE

Location: NORTHSIDE WEST CLINIC, 23 TO 27 LYTTON STREET, WENTWORTHVILLE, NSW

Job No. 27318SB1 **Core Size:** NMLC **R.L. Surface:** ≈ 21.8m

Date: 23-2-15 **Inclination:** VERTICAL **Datum:** AHD

Drill Type: JK350 **Bearing:** - **Logged/Checked by:** M.W./D.B.

Water Loss/Level	Barrel Lift	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain character-istics, colour, structure, minor components.	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_S(50)$ EL VL L M H VH EH	DEFECT SPACING (mm) 500 300 100 50 30 10	DEFECT DETAILS DESCRIPTION Type, inclination, thickness, planarity, roughness, coating. Specific / General
				SHALE: dark grey, with grey laminae.	SW	M			- L STRENGTH BAND, 20mm.t - L STRENGTH BAND, 25mm.t - L STRENGTH BAND, 18mm.t - XWS, 0°, 75mm.t - XWS, 0°, 70mm CLAY INFILL
		11		SHALE: dark grey and grey, with clay seams.	XW-DW	EL-VL			- J, 45°, P, R - J, 35°, P, R
				SHALE: dark grey.	SW	M			- XWS, 10°, 100mm.t - XWS, 0°, 10mm.t - XWS, 0°, 30mm.t
				END OF BOREHOLE AT 11.70m					50mm DIA. PVC STANDPIPE INSTALLED TO 11.70m DEPTH, SLOTTED FROM 11.7m TO 2.2m, 2mm SAND FILTER PACK FROM 11.7m TO 2.0m, BENTONITE SEAL FROM 2.2m TO SURFACE, COMPLETED WITH GATIC COVER
		12							
		13							
		14							
		15							
		16							

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BOREHOLE LOG

Borehole No. **103** 1/3

Client: ERILYAN PTY LTD

Project: PROPOSED STAGE 2 REHABILITATION CENTRE

Location: NORTHSIDE WEST CLINIC, 23 TO 27 LYTTON STREET, WENTWORTHVILLE, NSW

Job No. 27318SB1 **Method:** SPIRAL AUGER JK300 **R.L. Surface:** ≈ 21.3m

Date: 25-2-15 **Datum:** AHD

Logged/Checked by: M.W./D.B.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION OF AUGER-ING	■					0		-	ASPHALTIC CONCRETE: 30mm.t	D			
								CH	FILL: Clayey sandy gravel, fine to medium grained, igneous, fine to coarse grained sand.	MC<PL	H		RESIDUAL
	■			■	N = 19 6,8,11				SILTY CLAY: high plasticity, orange brown mottled red brown, trace of root fibres, ash and fine to medium grained ironstone gravel.			>600 >600 >600	
						1			SILTY CLAY: high plasticity, grey and light grey mottled red brown and orange brown, trace of root fibres.				
				■	N = 12 4,5,7							>600 480 >600	
						2		-	SHALE: light grey and grey, with L strength bands and iron indurated bands.	XW-DW	EL-VL		BANDED VERY LOW TO LOW 'TC' BIT RESISTANCE
AFTER 3 HRS ▼						3							
▼ ON 10/3/15									as above, but dark grey, with EL strength bands.	DW	VL-L		HYDROCARBON ODOUR IN GROUNDWATER ON 10/3/15
						4							
						5			SHALE: dark grey.	SW	M		MODERATE RESISTANCE WITH VERY LOW TO LOW BANDS
						6			REFER TO CORED BOREHOLE LOG				
						7							

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GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

CORED BOREHOLE LOG

Borehole No. **103** **2/3**

Client: ERILYAN PTY LTD

Project: PROPOSED STAGE 2 REHABILITATION CENTRE

Location: NORTHSIDE WEST CLINIC, 23 TO 27 LYTTON STREET, WENTWORTHVILLE, NSW

Job No. 27318SB1 **Core Size:** NMLC **R.L. Surface:** ≈ 21.3m

Date: 25-2-15 **Inclination:** VERTICAL **Datum:** AHD

Drill Type: JK300 **Bearing:** - **Logged/Checked by:** M.W./D.B.

Water Loss/Level	Barrel Lift	Depth (m)	Graphic Log	CORE DESCRIPTION: Rock Type, grain characteristics, colour, structure, minor components.	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_S(50)$ EL VL L M H VH EH	DEFECT DETAILS: DEFECT SPACING (mm) 500 300 100 50 30 10	DESCRIPTION: Type, inclination, thickness, planarity, roughness, coating. Specific	General
		5		START CORING AT 5.85m						
FULL RET-URN		6		SHALE: dark grey, with grey laminae.	FR	M				
		7							- Cr, 0°, 15mm.t	
		8							- Cr, 0°, 2mm.t	
		9								
		10							- J, 50°, P, R	
		11							- J, 45-90°, Un, R, Cr INFILL	
									- J, 75°, P, S - J, 80°, P, S	
									- J, 30°, P, R, Cr, INFILL - Cr, 0°, 6mm.t - J, 90°, P, S	

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GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

CORED BOREHOLE LOG

Borehole No. **103** **3/3**

Client: ERILYAN PTY LTD

Project: PROPOSED STAGE 2 REHABILITATION CENTRE

Location: NORTHSIDE WEST CLINIC, 23 TO 27 LYTTON STREET, WENTWORTHVILLE, NSW

Job No. 27318SB1 **Core Size:** NMLC **R.L. Surface:** ≈ 21.3m

Date: 25-2-15 **Inclination:** VERTICAL **Datum:** AHD

Drill Type: JK300 **Bearing:** - **Logged/Checked by:** M.W./D.B.

Water Loss/Level	Barrel Lift	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, structure, minor components.	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_S(50)$ EL VL L M H VH EH	DEFECT DETAILS DEFECT SPACING (mm) 500 300 100 50 30 10	DESCRIPTION Type, inclination, thickness, planarity, roughness, coating. Specific / General
FULL RET-URN				SHALE: dark grey.	FR	M	•		- J, 45°, Un, R - J, 40°, Un, R, Cr INFILL - J, 30°, P, S
				END OF BOREHOLE AT 12.45m					50mm DIA. PVC STANDPIPE INSTALLED TO 12m DEPTH, SLOTTED FROM 12m TO 3m, 2mm SAND FILTER PACK FROM 2.1m TO 2.4m, BENTONITE SEAL FROM 2.4m TO SURFACE, COMPLETED WITH GATIC COVER
		13							
		14							
		15							
		16							
		17							
		18							

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ENVIRONMENTAL LOG

Log No. 201

Environmental logs are not to be used for geotechnical purposes

Client: ERILYAN

Project: PROPOSED NORTHSIDE WEST STAGE 2 DEVELOPMENT

Location: 23-27 LYTTON STREET, WENTWORTHVILLE, NSW

Job No.: E27318PH **Method:** SPIRAL AUGER **R.L. Surface:** ~20.2 m

Date: 20/4/21 **Datum:** AHD

Plant Type: JK205 **Logged/Checked By:** B.Z./A.B.

Groundwater Record	SAMPLES ES	ASS	ASB	SAL	DB	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
DRY ON COMPLETION OF AUGERING							20			-	ASPHALTIC CONCRETE: 80mm.t FILL: Gravelly sand, fine to coarse grained, dark brown, fine to coarse grained sub-angular and angular igneous gravel, with occasional cobbles, trace of ash and clay.	M			ROADBASE TYPE MATERIAL
						N = 13 4,5,8						w<PL			APPEARS MODERATELY COMPACTED
							19	1		CI-CH	FILL: Silty clay, medium plasticity, dark brown mottled red brown, trace of fine to medium grained sub-angular and angular igneous and ironstone gravel.	w~PL	Hd		SCREEN: 4.52kg 0.1-0.5m NO FCF
											Silty CLAY: medium to high plasticity, brown and red brown, trace of fine grained sub-angular ironstone gravel.				SCREEN: 4.05kg 0.5-1.0m NO FCF
						N = 26 7,12,14	18	2			as above, but grey and brown.			>600 >600 >600	RESIDUAL
						N = 21 5,8,13	17	3			as above, but grey, with occasional clayey silt bands.		VSt - Hd	240 320 420	
ON COMPLETION OF CORING						N > 25 6,10,15/ 100mm REFUSAL	16	4			as above. but dark grey.			400 430 350	
							15	5		-	Extremely Weathered siltstone: silty CLAY, medium to high plasticity, grey, with ironstone bands.	XW	Hd	>600	ASHFIELD SHALE VERY LOW 'TC' BIT RESISTANCE BANDS
											SILTSTONE: dark grey, trace of iron indurated bands.	DW	L - M		LOW RESISTANCE
							14	6			as above, but dark grey.		M		MODERATE RESISTANCE

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ENVIRONMENTAL LOG

Log No. 201

Environmental logs are not to be used for geotechnical purposes

Client: ERILYAN

Project: PROPOSED NORTHSIDE WEST STAGE 2 DEVELOPMENT

Location: 23-27 LYTTON STREET, WENTWORTHVILLE, NSW

Job No.: E27318PH **Method:** SPIRAL AUGER **R.L. Surface:** ~20.2 m

Date: 20/4/21 **Datum:** AHD

Plant Type: JK205 **Logged/Checked By:** B.Z./A.B.

Groundwater Record	SAMPLES ES	SAMPLES ASS	SAMPLES ASB	SAMPLES SAL	SAMPLES DB	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
											SILTSTONE: as above REFER TO CORED BOREHOLE LOG				

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CORED ENVIRONMENTAL LOG

Log No. 201 3 / 3

Environmental logs are not to be used for geotechnical purposes

Client: ERILYAN

Project: PROPOSED NORTHSIDE WEST STAGE 2 DEVELOPMENT

Location: 23-27 LYTTON STREET, WENTWORTHVILLE, NSW

Job No.: E27318PH **Core Size:** NMLC **R.L. Surface:** ~20.2 m

Date: 20/4/21 **Inclination:** VERTICAL **Datum:** AHD

Plant Type: JK205 **Bearing:** N/A **Logged/Checked By:** B.Z./A.B.

Water Loss\Level	Barrel Lift	RL (m AHD)	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, texture and fabric, features, inclusions and minor components	Weathering	Strength	POINT LOAD STRENGTH INDEX $I_s(50)$	DEFECT DETAILS SPACING (mm)	DESCRIPTION Type, orientation, defect shape and roughness, defect coatings and seams, openness and thickness Specific / General	Formation
					START CORING AT 7.10m			VL -0.1, L -0.3, M -1, H -3, VH -10, EH	600, 200, 60, 20		
90% RETURN		13			SILTSTONE: dark grey mottled brown, sub-horizontally laminated, with fine grained grey sandstone.	SW	M	0.60		(7.16m) XWS, 0°, 3 mm.t (7.29m) Be, 0°, Un, R, Fe Sn (7.30m) Be, 0°, Un, R, Fe Sn (7.31m) Be, 0°, Un, R, Fe Sn (7.42m) J, 71°, Ir, Vr, Fe Sn (7.51m) J, 45°, Ir, Vr, Fe Sn (7.66m) XWS, 0°, 2 mm.t (7.73m) J, 34°, Un, R, Fe Sn (7.84m) CS, 0°, 2 mm.t (7.85m) CS, 0°, 2 mm.t (7.91m) Cr, 0°, 20 mm.t (8.05m) XWS, 0°, 20 mm.t	Ashfield Shale
								0.30			
		8									
		12			NO CORE 0.26m						
					SILTSTONE: dark grey, sub-horizontally laminated, with fine grained grey sandstone.	SW FR	M	0.50		(8.38m) XWS, 0°, 2 mm.t (8.39m) XWS, 0°, 2 mm.t (8.53m) XWS, 0° (8.68m) J, 34°, Un, R, Clay Ct	Ashfield Shale
								0.20			
		9						0.30		(9.02m) XWS, 0°, 2 mm.t (9.09m) XWS, 0°, 3 mm.t (9.11m) J, 51°, Ir, Vr, Cn	
		11								(9.43m) XWS, 0°, 2 mm.t	
								0.80		(9.75m) XWS, 0°, 2 mm.t	
		10									
		10						0.70		(10.08m) Cr, 0°, 12 mm.t (10.30m) XWS, 0°, 14 mm.t (10.37m) XWS, 0°, 5 mm.t	
								0.50			
		11						0.20		(11.00m) J, 38°, Un, R, Cn	
		9								(11.22m) J, 40°, Un, R, Cn (11.30m) J, 28°, Un, R, Cn	
					END OF ENVIRONMENTAL HOLE AT 11.36 m						
		12									
		8									
		13									
		7									

FRACTURES NOT MARKED ARE CONSIDERED TO BE DRILLING AND HANDLING BREAKS

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ENVIRONMENTAL LOG

Log No. 202 **1 / 1**

Environmental logs are not to be used for geotechnical purposes

Client: ERILYAN

Project: PROPOSED NORTHSIDE WEST STAGE 2 DEVELOPMENT

Location: 23-27 LYTTON STREET, WENTWORTHVILLE, NSW

Job No.: E27318PH **Method:** HAND AUGER **R.L. Surface:** ~19.2 m

Date: 20/4/21 **Datum:** AHD

Plant Type: - **Logged/Checked By:** B.Z./A.B.

Groundwater Record	SAMPLES ES	SAMPLES ASS	SAMPLES ASB	SAMPLES SAL	SAMPLES DB	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
DRY ON COMPLETION						REFER TO DCP TEST RESULTS	19				FILL: Sand, fine to medium grained, dark brown, with fine to medium grained sub-angular and angular igneous gravel. clay, tile and brick fragments.	M			TIMBER MULCH COVER APPEARS POORLY COMPACTED SCREEN: 4.12kg 0-0.5m
											FILL: Silty clay, medium plasticity, dark brown mottled red brown, trace of fine grained igneous and ironstone gravel.	w<PL			
								1		CH	Silty CLAY: high plasticity, brown and red brown, trace of fine grained sub-angular ironstone gravel, and ash.	w>PL	St - VSt	180 190 220	NO FCF RESIDUAL
							18				as above, but yellow brown and grey, without ash.	w~PL			HP READINGS ON DISTURBED SAMPLES FROM HAND AUGER
								2						180 190 220	
							17							180 150 210	
								3			END OF ENVIRONMENTAL HOLE AT 3.00 m				
							16								
								4							
							15								
								5							
							14								
								6							
							13								

JK 9.02.4 LIB:GLB Log JK AUGERHOLE - MASTER E27318PH WENTWORTHVILLE.GPJ <<DrawingFile>> 18/05/2021 10:30 10.01.00.01 Datgel Lab and In Situ Tool - DGD | Lib: JK 9.02.4 2019-05-31 Prj: JK 9.01.0 2018-03-20

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ENVIRONMENTAL LOG

Log No. 203

1 / 1

Environmental logs are not to be used for geotechnical purposes

Client: ERILYAN

Project: PROPOSED NORTHSIDE WEST STAGE 2 DEVELOPMENT

Location: 23-27 LYTTON STREET, WENTWORTHVILLE, NSW

Job No.: E27318PH **Method:** HAND AUGER **R.L. Surface:** ~19.1 m

Date: 20/4/21 **Datum:** AHD

Plant Type: - **Logged/Checked By:** B.Z./A.B.

Groundwater Record	SAMPLES ES	SAMPLES ASS	SAMPLES ASB	SAMPLES SAL	SAMPLES DB	Field Tests	RL (m AHD)	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel Density	Hand Penetrometer Readings (kPa)	Remarks
DRY ON COMPLETION						REFER TO DCP TEST RESULTS	19				FILL: Gravelly sand, fine to coarse grained, dark brown, fine to coarse grained sub-angular and angular igneous gravel, trace of fibre cement fragments.	M			TIMBER MULCH COVER APPEARS MODERATELY COMPACTED
											FILL: Silty clay, medium to high plasticity, dark brown and red brown, trace of fine to medium grained igneous, sandstone and ironstone gravel.	w<PL			SCREEN: 3.4kg 0-0.5m FCF203
							18	1			END OF ENVIRONMENTAL HOLE AT 0.80 m				HAND AUGER REFUSAL
							17	2							
							16	3							
							15	4							
							14	5							
							13	6							

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:

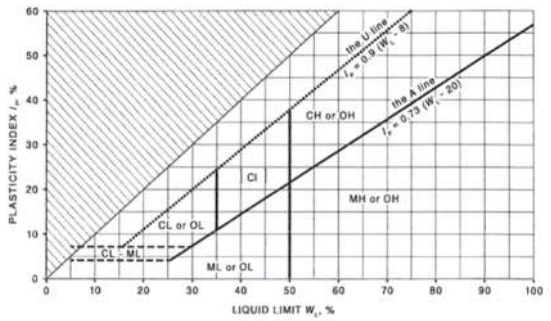
1 For a coarse grained soil with a fines content between 5% and 12%, the soil is given a dual classification comprising the two group symbols separated by a dash; for example, for a poorly graded gravel with between 5% and 12% silt fines, the classification is GP-GM.

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 F: Laboratory Reports & COC Documents

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CERTIFICATE OF ANALYSIS 267374

Client Details

Client	JK Environments
Attention	Harry Leonard
Address	PO Box 976, North Ryde BC, NSW, 1670

Sample Details

Your Reference	**E27318PH, Wentworthville**
Number of Samples	41 Soil, 1 Material
Date samples received	22/04/2021
Date completed instructions received	22/04/2021

Analysis Details

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

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

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

Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	29/04/2021
Date of Issue	29/04/2021

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Results Approved By
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Giovanni Agosti, Group Technical Manager
Lucy Zhu, Asbestos Supervisor
Manju Dewendrage, Chemist
Steven Luong, Organics Supervisor

Authorised By

Nancy Zhang, Laboratory Manager

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		267374-1	267374-3	267374-6	267374-7	267374-9
Your Reference	UNITS	BH201	BH201	BH201	BH202	BH202
Depth		0.1-0.2	0.5-0.6	1.4-1.5	0.1-0.3	0.5-0.6
Date Sampled		20/04/2021	20/04/2021	20/04/2021	20/04/2021	20/04/2021
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	23/04/2021	23/04/2021	23/04/2021	23/04/2021	23/04/2021
Date analysed	-	26/04/2021	26/04/2021	26/04/2021	26/04/2021	26/04/2021
TRH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25	<25	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
naphthalene	mg/kg	<1	<1	<1	<1	<1
Total +ve Xylenes	mg/kg	<3	<3	<3	<3	<3
Surrogate aaa-Trifluorotoluene	%	121	118	116	117	114

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		267374-10	267374-12	267374-39	267374-40	267374-41
Your Reference	UNITS	BH202	BH203	SDUP1	TBS1	TS1
Depth		0.8-0.9	0.1-0.2	-	-	-
Date Sampled		20/04/2021	20/04/2021	20/04/2021	20/04/2021	20/04/2021
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	23/04/2021	23/04/2021	23/04/2021	23/04/2021	23/04/2021
Date analysed	-	26/04/2021	26/04/2021	26/04/2021	26/04/2021	26/04/2021
TRH C_6 - C_9	mg/kg	<25	<25	<25	[NA]	[NA]
TRH C_6 - C_{10}	mg/kg	<25	<25	<25	[NA]	[NA]
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25	[NA]	[NA]
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	82%
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	83%
Ethylbenzene	mg/kg	<1	<1	<1	<1	93%
m+p-xylene	mg/kg	<2	<2	<2	<2	94%
o-Xylene	mg/kg	<1	<1	<1	<1	92%
naphthalene	mg/kg	<1	<1	<1	<1	[NA]
Total +ve Xylenes	mg/kg	<3	<3	<3	<3	[NA]
Surrogate aaa-Trifluorotoluene	%	115	113	119	120	113

svTRH (C10-C40) in Soil						
Our Reference		267374-1	267374-3	267374-6	267374-7	267374-9
Your Reference	UNITS	BH201	BH201	BH201	BH202	BH202
Depth		0.1-0.2	0.5-0.6	1.4-1.5	0.1-0.3	0.5-0.6
Date Sampled		20/04/2021	20/04/2021	20/04/2021	20/04/2021	20/04/2021
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	23/04/2021	23/04/2021	23/04/2021	23/04/2021	23/04/2021
Date analysed	-	23/04/2021	23/04/2021	23/04/2021	23/04/2021	23/04/2021
TRH C_{10} - C_{14}	mg/kg	<50	<50	<50	<50	<50
TRH C_{15} - C_{28}	mg/kg	<100	<100	<100	<100	<100
TRH C_{29} - C_{36}	mg/kg	130	<100	<100	<100	<100
TRH >C_{10} -C_{16}	mg/kg	<50	<50	<50	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50	<50	<50	<50	<50
TRH >C_{16} -C_{34}	mg/kg	<100	<100	<100	<100	<100
TRH >C_{34} -C_{40}	mg/kg	240	<100	<100	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	240	<50	<50	<50	<50
Surrogate o-Terphenyl	%	92	102	94	95	93

svTRH (C10-C40) in Soil				
Our Reference		267374-10	267374-12	267374-39
Your Reference	UNITS	BH202	BH203	SDUP1
Depth		0.8-0.9	0.1-0.2	-
Date Sampled		20/04/2021	20/04/2021	20/04/2021
Type of sample		Soil	Soil	Soil
Date extracted	-	23/04/2021	23/04/2021	23/04/2021
Date analysed	-	24/04/2021	24/04/2021	24/04/2021
TRH C_{10} - C_{14}	mg/kg	<50	<50	76
TRH C_{15} - C_{28}	mg/kg	<100	<100	<100
TRH C_{29} - C_{36}	mg/kg	<100	<100	160
TRH >C_{10} -C_{16}	mg/kg	<50	<50	78
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50	<50	78
TRH >C_{16} -C_{34}	mg/kg	<100	100	120
TRH >C_{34} -C_{40}	mg/kg	<100	<100	270
Total +ve TRH (>C10-C40)	mg/kg	<50	100	470
Surrogate o-Terphenyl	%	98	95	99

PAHs in Soil						
Our Reference		267374-1	267374-3	267374-6	267374-7	267374-9
Your Reference	UNITS	BH201	BH201	BH201	BH202	BH202
Depth		0.1-0.2	0.5-0.6	1.4-1.5	0.1-0.3	0.5-0.6
Date Sampled		20/04/2021	20/04/2021	20/04/2021	20/04/2021	20/04/2021
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	23/04/2021	23/04/2021	23/04/2021	23/04/2021	23/04/2021
Date analysed	-	23/04/2021	23/04/2021	23/04/2021	23/04/2021	23/04/2021
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Pyrene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chrysene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Benzo(a)pyrene	mg/kg	0.06	<0.05	<0.05	<0.05	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve PAH's	mg/kg	0.4	<0.05	<0.05	<0.05	<0.05
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Surrogate p-Terphenyl-d14	%	112	118	116	115	118

PAHs in Soil				
Our Reference		267374-10	267374-12	267374-39
Your Reference	UNITS	BH202	BH203	SDUP1
Depth		0.8-0.9	0.1-0.2	-
Date Sampled		20/04/2021	20/04/2021	20/04/2021
Type of sample		Soil	Soil	Soil
Date extracted	-	23/04/2021	23/04/2021	23/04/2021
Date analysed	-	23/04/2021	23/04/2021	23/04/2021
Naphthalene	mg/kg	<0.1	<0.1	0.2
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	<0.1	0.2
Anthracene	mg/kg	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	<0.1	0.1	<0.1
Pyrene	mg/kg	<0.1	<0.1	<0.1
Benzo(a)anthracene	mg/kg	<0.1	<0.1	<0.1
Chrysene	mg/kg	<0.1	<0.1	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	<0.2	<0.2
Benzo(a)pyrene	mg/kg	<0.05	0.05	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1	<0.1
Total +ve PAH's	mg/kg	<0.05	0.2	0.4
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	<0.5
Surrogate p-Terphenyl-d14	%	117	115	110

Organochlorine Pesticides in soil					
Our Reference		267374-1	267374-3	267374-7	267374-12
Your Reference	UNITS	BH201	BH201	BH202	BH203
Depth		0.1-0.2	0.5-0.6	0.1-0.3	0.1-0.2
Date Sampled		20/04/2021	20/04/2021	20/04/2021	20/04/2021
Type of sample		Soil	Soil	Soil	Soil
Date extracted	-	23/04/2021	23/04/2021	23/04/2021	23/04/2021
Date analysed	-	23/04/2021	23/04/2021	23/04/2021	23/04/2021
alpha-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1
HCB	mg/kg	<0.1	<0.1	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1	<0.1	0.1
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1	<0.1
Total +ve DDT+DDD+DDE	mg/kg	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	88	89	90	89

Organophosphorus Pesticides in Soil					
Our Reference		267374-1	267374-3	267374-7	267374-12
Your Reference	UNITS	BH201	BH201	BH202	BH203
Depth		0.1-0.2	0.5-0.6	0.1-0.3	0.1-0.2
Date Sampled		20/04/2021	20/04/2021	20/04/2021	20/04/2021
Type of sample		Soil	Soil	Soil	Soil
Date extracted	-	23/04/2021	23/04/2021	23/04/2021	23/04/2021
Date analysed	-	23/04/2021	23/04/2021	23/04/2021	23/04/2021
Dichlorvos	mg/kg	<0.1	<0.1	<0.1	<0.1
Dimethoate	mg/kg	<0.1	<0.1	<0.1	<0.1
Diazinon	mg/kg	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos-methyl	mg/kg	<0.1	<0.1	<0.1	<0.1
Ronnel	mg/kg	<0.1	<0.1	<0.1	<0.1
Fenitrothion	mg/kg	<0.1	<0.1	<0.1	<0.1
Malathion	mg/kg	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos	mg/kg	<0.1	<0.1	<0.1	<0.1
Parathion	mg/kg	<0.1	<0.1	<0.1	<0.1
Bromophos-ethyl	mg/kg	<0.1	<0.1	<0.1	<0.1
Ethion	mg/kg	<0.1	<0.1	<0.1	<0.1
Azinphos-methyl (Guthion)	mg/kg	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	88	89	90	89

PCBs in Soil					
Our Reference		267374-1	267374-3	267374-7	267374-12
Your Reference	UNITS	BH201	BH201	BH202	BH203
Depth		0.1-0.2	0.5-0.6	0.1-0.3	0.1-0.2
Date Sampled		20/04/2021	20/04/2021	20/04/2021	20/04/2021
Type of sample		Soil	Soil	Soil	Soil
Date extracted	-	23/04/2021	23/04/2021	23/04/2021	23/04/2021
Date analysed	-	23/04/2021	23/04/2021	23/04/2021	23/04/2021
Aroclor 1016	mg/kg	<0.1	<0.1	<0.1	<0.1
Aroclor 1221	mg/kg	<0.1	<0.1	<0.1	<0.1
Aroclor 1232	mg/kg	<0.1	<0.1	<0.1	<0.1
Aroclor 1242	mg/kg	<0.1	<0.1	<0.1	<0.1
Aroclor 1248	mg/kg	<0.1	<0.1	<0.1	<0.1
Aroclor 1254	mg/kg	<0.1	<0.1	<0.1	<0.1
Aroclor 1260	mg/kg	<0.1	<0.1	<0.1	<0.1
Total +ve PCBs (1016-1260)	mg/kg	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	88	89	90	89

Acid Extractable metals in soil						
Our Reference		267374-1	267374-3	267374-6	267374-7	267374-9
Your Reference	UNITS	BH201	BH201	BH201	BH202	BH202
Depth		0.1-0.2	0.5-0.6	1.4-1.5	0.1-0.3	0.5-0.6
Date Sampled		20/04/2021	20/04/2021	20/04/2021	20/04/2021	20/04/2021
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	23/04/2021	23/04/2021	23/04/2021	23/04/2021	23/04/2021
Date analysed	-	26/04/2021	26/04/2021	26/04/2021	26/04/2021	26/04/2021
Arsenic	mg/kg	<4	<4	6	<4	<4
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	45	12	10	10	11
Copper	mg/kg	25	9	12	16	12
Lead	mg/kg	4	9	11	34	32
Mercury	mg/kg	<0.1	<0.1	<0.1	0.1	0.1
Nickel	mg/kg	45	6	4	7	4
Zinc	mg/kg	37	11	11	140	59

Acid Extractable metals in soil				
Our Reference		267374-10	267374-12	267374-39
Your Reference	UNITS	BH202	BH203	SDUP1
Depth		0.8-0.9	0.1-0.2	-
Date Sampled		20/04/2021	20/04/2021	20/04/2021
Type of sample		Soil	Soil	Soil
Date prepared	-	23/04/2021	23/04/2021	23/04/2021
Date analysed	-	26/04/2021	26/04/2021	26/04/2021
Arsenic	mg/kg	<4	<4	<4
Cadmium	mg/kg	<0.4	<0.4	<0.4
Chromium	mg/kg	14	11	40
Copper	mg/kg	10	17	23
Lead	mg/kg	22	22	5
Mercury	mg/kg	<0.1	0.2	<0.1
Nickel	mg/kg	5	6	40
Zinc	mg/kg	25	140	38

Moisture						
Our Reference		267374-1	267374-3	267374-6	267374-7	267374-9
Your Reference	UNITS	BH201	BH201	BH201	BH202	BH202
Depth		0.1-0.2	0.5-0.6	1.4-1.5	0.1-0.3	0.5-0.6
Date Sampled		20/04/2021	20/04/2021	20/04/2021	20/04/2021	20/04/2021
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	23/04/2021	23/04/2021	23/04/2021	23/04/2021	23/04/2021
Date analysed	-	26/04/2021	26/04/2021	26/04/2021	26/04/2021	26/04/2021
Moisture	%	5.9	17	13	8.8	17

Moisture				
Our Reference		267374-10	267374-12	267374-39
Your Reference	UNITS	BH202	BH203	SDUP1
Depth		0.8-0.9	0.1-0.2	-
Date Sampled		20/04/2021	20/04/2021	20/04/2021
Type of sample		Soil	Soil	Soil
Date prepared	-	23/04/2021	23/04/2021	23/04/2021
Date analysed	-	26/04/2021	26/04/2021	26/04/2021
Moisture	%	21	14	6.7

Asbestos ID - soils NEPM - ASB-001					
Our Reference		267374-2	267374-4	267374-8	267374-13
Your Reference	UNITS	BH201	BH201	BH202	BH203
Depth		0.1-0.5	0.5-1.0	0.05-0.5	0-0.5
Date Sampled		20/04/2021	20/04/2021	20/04/2021	20/04/2021
Type of sample		Soil	Soil	Soil	Soil
Date analysed	-	29/04/2021	29/04/2021	29/04/2021	29/04/2021
Sample mass tested	g	833.36	545.24	657.62	620.95
Sample Description	-	Grey coarse-grained soil & rocks	Grey coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks
Asbestos ID in soil (AS4964) >0.1g/kg	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected Synthetic mineral fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Trace Analysis	-	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected
Total Asbestos[#1]	g/kg	<0.1	<0.1	<0.1	<0.1
Asbestos ID in soil <0.1g/kg*	-	No visible asbestos detected	No visible asbestos detected	No visible asbestos detected	No visible asbestos detected
ACM >7mm Estimation*	g	–	–	–	–
FA and AF Estimation*	g	–	–	–	–
ACM >7mm Estimation*	%(w/w)	<0.01	<0.01	<0.01	<0.01
FA and AF Estimation*#2	%(w/w)	<0.001	<0.001	<0.001	<0.001

Misc Inorg - Soil						
Our Reference		267374-18	267374-20	267374-23	267374-24	267374-27
Your Reference	UNITS	BH201	BH201	BH201	BH201	BH201
Depth		1.0-1.2	1.8-2.0	3.35-3.45	4.0-4.1	6.1-6.5
Date Sampled		20/04/2021	20/04/2021	20/04/2021	20/04/2021	20/04/2021
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	26/04/2021	26/04/2021	26/04/2021	26/04/2021	26/04/2021
Date analysed	-	26/04/2021	26/04/2021	26/04/2021	26/04/2021	26/04/2021
pH 1:5 soil:water	pH Units	5.3	5.9	5.8	6.0	7.2
Chloride, Cl 1:5 soil:water	mg/kg	390	300	990	1,100	630
Sulphate, SO4 1:5 soil:water	mg/kg	270	430	140	170	110
Resistivity in soil*	ohm m	25	23	15	14	20

Misc Inorg - Soil					
Our Reference		267374-30	267374-33	267374-35	267374-38
Your Reference	UNITS	BH202	BH202	BH202	BH203
Depth		0.8-0.9	1.4-1.6	2.4-2.5	0.5-0.7
Date Sampled		20/04/2021	20/04/2021	20/04/2021	20/04/2021
Type of sample		Soil	Soil	Soil	Soil
Date prepared	-	26/04/2021	26/04/2021	26/04/2021	26/04/2021
Date analysed	-	26/04/2021	26/04/2021	26/04/2021	26/04/2021
pH 1:5 soil:water	pH Units	6.8	5.4	5.5	7.8
Chloride, Cl 1:5 soil:water	mg/kg	120	280	790	47
Sulphate, SO4 1:5 soil:water	mg/kg	140	130	180	130
Resistivity in soil*	ohm m	60	39	16	70

CEC						
Our Reference		267374-18	267374-24	267374-27	267374-30	267374-35
Your Reference	UNITS	BH201	BH201	BH201	BH202	BH202
Depth		1.0-1.2	4.0-4.1	6.1-6.5	0.8-0.9	2.4-2.5
Date Sampled		20/04/2021	20/04/2021	20/04/2021	20/04/2021	20/04/2021
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	27/04/2021	27/04/2021	27/04/2021	27/04/2021	27/04/2021
Date analysed	-	27/04/2021	27/04/2021	27/04/2021	27/04/2021	27/04/2021
Exchangeable Ca	meq/100g	1.4	0.1	0.3	7.5	0.8
Exchangeable K	meq/100g	0.1	<0.1	0.2	0.2	0.1
Exchangeable Mg	meq/100g	4.7	1.7	3.7	5.2	3.3
Exchangeable Na	meq/100g	1.4	0.81	1.6	0.50	0.75
Cation Exchange Capacity	meq/100g	7.6	2.6	5.9	13	4.9

CEC		
Our Reference		267374-38
Your Reference	UNITS	BH203
Depth		0.5-0.7
Date Sampled		20/04/2021
Type of sample		Soil
Date prepared	-	27/04/2021
Date analysed	-	27/04/2021
Exchangeable Ca	meq/100g	9.7
Exchangeable K	meq/100g	0.3
Exchangeable Mg	meq/100g	4.5
Exchangeable Na	meq/100g	0.23
Cation Exchange Capacity	meq/100g	15

Texture and Salinity*						
Our Reference		267374-18	267374-20	267374-23	267374-24	267374-27
Your Reference	UNITS	BH201	BH201	BH201	BH201	BH201
Depth		1.0-1.2	1.8-2.0	3.35-3.45	4.0-4.1	6.1-6.5
Date Sampled		20/04/2021	20/04/2021	20/04/2021	20/04/2021	20/04/2021
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	23/04/2021	23/04/2021	23/04/2021	23/04/2021	23/04/2021
Date analysed	-	23/04/2021	23/04/2021	23/04/2021	23/04/2021	23/04/2021
Electrical Conductivity 1:5 soil:water	µS/cm	400	430	680	720	500
Texture Value	-	7.0	7.0	7.0	8.0	9.0
Texture	-	MEDIUM CLAY	MEDIUM CLAY	MEDIUM CLAY	LIGHT MEDIUM CLAY	CLAY LOAM
ECe	dS/m	2.8	3.0	4.8	5.8	4.5
Class	-	SLIGHTLY SALINE	SLIGHTLY SALINE	MODERATELY SALINE	MODERATELY SALINE	MODERATELY SALINE

Texture and Salinity*					
Our Reference		267374-30	267374-33	267374-35	267374-38
Your Reference	UNITS	BH202	BH202	BH202	BH203
Depth		0.8-0.9	1.4-1.6	2.4-2.5	0.5-0.7
Date Sampled		20/04/2021	20/04/2021	20/04/2021	20/04/2021
Type of sample		Soil	Soil	Soil	Soil
Date prepared	-	23/04/2021	23/04/2021	23/04/2021	23/04/2021
Date analysed	-	23/04/2021	23/04/2021	23/04/2021	23/04/2021
Electrical Conductivity 1:5 soil:water	µS/cm	170	260	630	140
Texture Value	-	7.0	7.0	7.0	7.0
Texture	-	MEDIUM CLAY	MEDIUM CLAY	MEDIUM CLAY	MEDIUM CLAY
ECe	dS/m	<2	<2	4.4	<2
Class	-	NON SALINE	NON SALINE	MODERATELY SALINE	NON SALINE

Asbestos ID - materials		
Our Reference		267374-42
Your Reference	UNITS	FCF203
Depth		0-0.5
Date Sampled		20/04/2021
Type of sample		Material
Date analysed	-	27/04/2021
Mass / Dimension of Sample	-	25x15x5mm
Sample Description	-	Beige fibre cement material
Asbestos ID in materials	-	Chrysotile asbestos detected Amosite asbestos detected Crocidolite asbestos detected
Trace Analysis	-	[NT]

Method ID	Methodology Summary
ASB-001	Asbestos ID - Qualitative identification of asbestos in bulk samples using Polarised Light Microscopy and Dispersion Staining Techniques including Synthetic Mineral Fibre and Organic Fibre as per Australian Standard 4964-2004.
ASB-001	Asbestos ID - Identification of asbestos in soil samples using Polarised Light Microscopy and Dispersion Staining Techniques. Minimum 500mL soil sample was analysed as recommended by "National Environment Protection (Assessment of site contamination) Measure, Schedule B1 and "The Guidelines from the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia - May 2009" with a reporting limit of 0.1g/kg (0.01% w/w) as per Australian Standard AS4964-2004. Results reported denoted with * are outside our scope of NATA accreditation. **NOTE** #1 Total Asbestos g/kg was analysed and reported as per Australian Standard AS4964 (This is the sum of ACM >7mm, <7mm and FA/AF) **NOTE** #2 The screening level of 0.001% w/w asbestos in soil for FA and AF only applies where the FA and AF are able to be quantified by gravimetric procedures. This screening level is not applicable to free fibres. Estimation = Estimated asbestos weight Results reported with "--" is equivalent to no visible asbestos identified using Polarised Light microscopy and Dispersion Staining Techniques.
Inorg-001	pH - Measured using pH meter and electrode in accordance with APHA latest edition, 4500-H+. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times.
Inorg-002	Conductivity and Salinity - measured using a conductivity cell at 25°C in accordance with APHA latest edition 2510 and Rayment & Lyons.
Inorg-002	Conductivity and Salinity - measured using a conductivity cell at 25oC in accordance with APHA 22nd ED 2510 and Rayment & Lyons. Resistivity is calculated from Conductivity (non NATA). Resistivity (calculated) may not correlate with results otherwise obtained using Resistivity-Current method, depending on the nature of the soil being analysed.
Inorg-008	Moisture content determined by heating at 105+/-5 °C for a minimum of 12 hours.
Inorg-081	Anions - a range of Anions are determined by Ion Chromatography, in accordance with APHA latest edition, 4110-B. Waters samples are filtered on receipt prior to analysis. Alternatively determined by colourimetry/turbidity using Discrete Analyser.
INORG-123	Determined using a "Texture by Feel" method.
Metals-020	Determination of various metals by ICP-AES.
Metals-020	Determination of exchangeable cations and cation exchange capacity in soils using 1M Ammonium Chloride exchange and ICP-AES analytical finish.
Metals-021	Determination of Mercury by Cold Vapour AAS.

Method ID	Methodology Summary
Org-020	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
Org-020	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis. Note, the Total +ve TRH PQL is reflective of the lowest individual PQL and is therefore "Total +ve TRH" is simply a sum of the positive individual TRH fractions (>C10-C40).
Org-021	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD.
Org-021	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD. Note, the Total +ve PCBs PQL is reflective of the lowest individual PQL and is therefore" Total +ve PCBs" is simply a sum of the positive individual PCBs.
Org-022	Determination of VOCs sampled onto coconut shell charcoal sorbent tubes, that can be desorbed using carbon disulphide, and analysed by GC-MS.
Org-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS/GC-MSMS.
Org-022/025	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-MS/GC-MSMS. Note, the Total +ve reported DDD+DDE+DDT PQL is reflective of the lowest individual PQL and is therefore simply a sum of the positive individually report DDD+DDE+DDT.
Org-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS and/or GC-MS/MS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013. For soil results:- 1. 'EQ PQL'values are assuming all contributing PAHs reported as <PQL are actually at the PQL. This is the most conservative approach and can give false positive TEQs given that PAHs that contribute to the TEQ calculation may not be present. 2. 'EQ zero'values are assuming all contributing PAHs reported as <PQL are zero. This is the least conservative approach and is more susceptible to false negative TEQs when PAHs that contribute to the TEQ calculation are present but below PQL. 3. 'EQ half PQL'values are assuming all contributing PAHs reported as <PQL are half the stipulated PQL. Hence a mid-point between the most and least conservative approaches above. Note, the Total +ve PAHs PQL is reflective of the lowest individual PQL and is therefore "Total +ve PAHs" is simply a sum of the positive individual PAHs.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS.

Method ID	Methodology Summary
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater. Note, the Total +ve Xylene PQL is reflective of the lowest individual PQL and is therefore "Total +ve Xylenes" is simply a sum of the positive individual Xylenes.

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-3	[NT]
Date extracted	-			23/04/2021	1	23/04/2021	23/04/2021		23/04/2021	[NT]
Date analysed	-			26/04/2021	1	26/04/2021	26/04/2021		26/04/2021	[NT]
TRH C_6 - C_9	mg/kg	25	Org-023	<25	1	<25	<25	0	83	[NT]
TRH C_6 - C_{10}	mg/kg	25	Org-023	<25	1	<25	<25	0	83	[NT]
Benzene	mg/kg	0.2	Org-023	<0.2	1	<0.2	<0.2	0	85	[NT]
Toluene	mg/kg	0.5	Org-023	<0.5	1	<0.5	<0.5	0	78	[NT]
Ethylbenzene	mg/kg	1	Org-023	<1	1	<1	<1	0	80	[NT]
m+p-xylene	mg/kg	2	Org-023	<2	1	<2	<2	0	86	[NT]
o-Xylene	mg/kg	1	Org-023	<1	1	<1	<1	0	82	[NT]
naphthalene	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-023	121	1	121	120	1	119	[NT]

QUALITY CONTROL: svTRH (C10-C40) in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-3	[NT]
Date extracted	-			26/04/2021	1	23/04/2021	23/04/2021		23/04/2021	[NT]
Date analysed	-			27/04/2021	1	23/04/2021	23/04/2021		23/04/2021	[NT]
TRH C_{10} - C_{14}	mg/kg	50	Org-020	<50	1	<50	<50	0	130	[NT]
TRH C_{15} - C_{28}	mg/kg	100	Org-020	<100	1	<100	<100	0	93	[NT]
TRH C_{29} - C_{36}	mg/kg	100	Org-020	<100	1	130	210	47	92	[NT]
TRH >C_{10} -C_{16}	mg/kg	50	Org-020	<50	1	<50	<50	0	130	[NT]
TRH >C_{16} -C_{34}	mg/kg	100	Org-020	<100	1	<100	170	52	93	[NT]
TRH >C_{34} -C_{40}	mg/kg	100	Org-020	<100	1	240	370	43	92	[NT]
Surrogate o-Terphenyl	%		Org-020	90	1	92	93	1	120	[NT]

QUALITY CONTROL: PAHs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-3	[NT]
Date extracted	-			23/04/2021	1	23/04/2021	23/04/2021		23/04/2021	[NT]
Date analysed	-			23/04/2021	1	23/04/2021	23/04/2021		23/04/2021	[NT]
Naphthalene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	83	[NT]
Acenaphthylene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	86	[NT]
Fluorene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	88	[NT]
Phenanthrene	mg/kg	0.1	Org-022/025	<0.1	1	0.1	0.1	0	103	[NT]
Anthracene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-022/025	<0.1	1	0.1	<0.1	0	93	[NT]
Pyrene	mg/kg	0.1	Org-022/025	<0.1	1	0.1	<0.1	0	102	[NT]
Benzo(a)anthracene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	73	[NT]
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-022/025	<0.05	1	0.06	<0.05	18	92	[NT]
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	121	1	112	114	2	120	[NT]

QUALITY CONTROL: Organochlorine Pesticides in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-3	[NT]
Date extracted	-			23/04/2021	1	23/04/2021	23/04/2021		23/04/2021	[NT]
Date analysed	-			23/04/2021	1	23/04/2021	23/04/2021		23/04/2021	[NT]
alpha-BHC	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	90	[NT]
HCB	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
beta-BHC	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	89	[NT]
gamma-BHC	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Heptachlor	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	93	[NT]
delta-BHC	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aldrin	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	86	[NT]
Heptachlor Epoxide	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	91	[NT]
gamma-Chlordane	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
alpha-chlordane	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Endosulfan I	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
pp-DDE	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	108	[NT]
Dieldrin	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	95	[NT]
Endrin	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	93	[NT]
Endosulfan II	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
pp-DDD	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	81	[NT]
Endrin Aldehyde	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
pp-DDT	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Endosulfan Sulphate	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	78	[NT]
Methoxychlor	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-022/025	91	1	88	90	2	96	[NT]

QUALITY CONTROL: Organophosphorus Pesticides in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-3	[NT]
Date extracted	-			23/04/2021	1	23/04/2021	23/04/2021		23/04/2021	[NT]
Date analysed	-			23/04/2021	1	23/04/2021	23/04/2021		23/04/2021	[NT]
Dichlorvos	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	86	[NT]
Dimethoate	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Diazinon	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Chlorpyriphos-methyl	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Ronnel	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	82	[NT]
Fenitrothion	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	73	[NT]
Malathion	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	98	[NT]
Chlorpyriphos	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	103	[NT]
Parathion	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	71	[NT]
Bromophos-ethyl	mg/kg	0.1	Org-022	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Ethion	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	73	[NT]
Azinphos-methyl (Guthion)	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-022/025	91	1	88	90	2	96	[NT]

QUALITY CONTROL: PCBs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-3	[NT]
Date extracted	-			23/04/2021	1	23/04/2021	23/04/2021		23/04/2021	[NT]
Date analysed	-			23/04/2021	1	23/04/2021	23/04/2021		23/04/2021	[NT]
Aroclor 1016	mg/kg	0.1	Org-021	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1221	mg/kg	0.1	Org-021	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1232	mg/kg	0.1	Org-021	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1242	mg/kg	0.1	Org-021	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1248	mg/kg	0.1	Org-021	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1254	mg/kg	0.1	Org-021	<0.1	1	<0.1	<0.1	0	115	[NT]
Aroclor 1260	mg/kg	0.1	Org-021	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-021	91	1	88	90	2	96	[NT]

QUALITY CONTROL: Acid Extractable metals in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-3	[NT]
Date prepared	-			23/04/2021	1	23/04/2021	23/04/2021		23/04/2021	[NT]
Date analysed	-			26/04/2021	1	26/04/2021	26/04/2021		26/04/2021	[NT]
Arsenic	mg/kg	4	Metals-020	<4	1	<4	<4	0	102	[NT]
Cadmium	mg/kg	0.4	Metals-020	<0.4	1	<0.4	<0.4	0	93	[NT]
Chromium	mg/kg	1	Metals-020	<1	1	45	48	6	106	[NT]
Copper	mg/kg	1	Metals-020	<1	1	25	18	33	95	[NT]
Lead	mg/kg	1	Metals-020	<1	1	4	3	29	101	[NT]
Mercury	mg/kg	0.1	Metals-021	<0.1	1	<0.1	<0.1	0	99	[NT]
Nickel	mg/kg	1	Metals-020	<1	1	45	42	7	100	[NT]
Zinc	mg/kg	1	Metals-020	<1	1	37	30	21	105	[NT]

QUALITY CONTROL: Misc Inorg - Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-3	267374-33
Date prepared	-			26/04/2021	30	26/04/2021	26/04/2021		26/04/2021	26/04/2021
Date analysed	-			26/04/2021	30	26/04/2021	26/04/2021		26/04/2021	26/04/2021
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	30	6.8	6.8	0	102	[NT]
Chloride, Cl 1:5 soil:water	mg/kg	10	Inorg-081	<10	30	120	110	9	109	104
Sulphate, SO4 1:5 soil:water	mg/kg	10	Inorg-081	<10	30	140	130	7	108	#
Resistivity in soil*	ohm m	1	Inorg-002	<1	30	60	63	5	[NT]	[NT]

QUALITY CONTROL: CEC						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	267374-38
Date prepared	-			27/04/2021	35	27/04/2021	27/04/2021		27/04/2021	27/04/2021
Date analysed	-			27/04/2021	35	27/04/2021	27/04/2021		27/04/2021	27/04/2021
Exchangeable Ca	meq/100g	0.1	Metals-020	<0.1	35	0.8	0.8	0	102	100
Exchangeable K	meq/100g	0.1	Metals-020	<0.1	35	0.1	0.1	0	129	103
Exchangeable Mg	meq/100g	0.1	Metals-020	<0.1	35	3.3	3.4	3	126	113
Exchangeable Na	meq/100g	0.1	Metals-020	<0.1	35	0.75	0.75	0	128	98

QUALITY CONTROL: Texture and Salinity*					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-3	[NT]
Date prepared	-			23/04/2021	30	23/04/2021	23/04/2021		23/04/2021	[NT]
Date analysed	-			23/04/2021	30	23/04/2021	23/04/2021		23/04/2021	[NT]
Electrical Conductivity 1:5 soil:water	µS/cm	1	Inorg-002	<1	30	170	160	6	99	[NT]
Texture Value	-		INORG-123	[NT]	30	7.0	7.0	0	[NT]	[NT]

Result Definitions

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

Quality Control Definitions

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

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

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

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

Laboratory Acceptance Criteria

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

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

Spikes for Physical and Aggregate Tests are not applicable.

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

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

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

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

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

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

Measurement Uncertainty estimates are available for most tests upon request.

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

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

Report Comments

MISC_INORG_DRY
Percent recovery is not possible to report due to the high concentration of the element/s in the sample/s. However an acceptable recovery was obtained for the LCS.

Asbestos-ID in soil: NEPM
This report is consistent with the reporting recommendations in the National Environment Protection (Assessment of Site Contamination) Measure, Schedule B1, May 2013. This is reported outside our scope of NATA accreditation.

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

SAMPLE RECEIPT ADVICE

Client Details

Client	JK Environments
Attention	Harry Leonard

Sample Login Details

Your reference	E27318PH, Wentworthville
Envirolab Reference	267374
Date Sample Received	22/04/2021
Date Instructions Received	22/04/2021
Date Results Expected to be Reported	29/04/2021

Sample Condition

Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	41 Soil, 1 Material
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	6
Cooling Method	Ice Pack
Sampling Date Provided	YES

Comments

Nil

Please direct any queries to:

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

Analysis Underway, details on the following page:

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Sample ID	vTRH(C6-C10)/BTEXN in Soil	svTRH (C10-C40) in Soil	PAHs in Soil	Organochlorine Pesticides in soil	Organophosphorus Pesticides in Soil	PCBsin Soil	Acid Extractable metalsin soil	Asbestos ID - soils NEPM - ASB-001	Misc Inorg - Soil	CEC	Texture and Salinity*	Asbestos ID - materials	On Hold
BH201-0.1-0.2	✓	✓	✓	✓	✓	✓	✓						
BH201-0.1-0.5								✓					
BH201-0.5-0.6	✓	✓	✓	✓	✓	✓	✓						
BH201-0.5-1.0								✓					
BH201-0.9-1.0													✓
BH201-1.4-1.5	✓	✓	✓				✓						
BH202-0.1-0.3	✓	✓	✓	✓	✓	✓	✓						
BH202-0.05-0.5								✓					
BH202-0.5-0.6	✓	✓	✓				✓						
BH202-0.8-0.9	✓	✓	✓				✓						
BH202-1.1-1.3													✓
BH203-0.1-0.2	✓	✓	✓	✓	✓	✓	✓						
BH203-0-0.5								✓					
BH203-0.5-0.7													✓
BH201-0.1-0.2													✓
BH201-0.5-0.6													✓
BH201-0.9-1.0													✓
BH201-1.0-1.2									✓	✓	✓		
BH201-1.4-1.5													✓
BH201-1.8-2.0									✓		✓		
BH201-2.5-2.6													✓
BH201-2.9-3.0													✓
BH201-3.35-3.45									✓		✓		
BH201-4.0-4.1									✓	✓	✓		
BH201-4.4-4.5													✓
BH201-5.5-5.6													✓
BH201-6.1-6.5									✓	✓	✓		
BH202-0.1-0.3													✓
BH202-0.5-0.7													✓
BH202-0.8-0.9									✓	✓	✓		
BH202-1.0-1.1													✓
BH202-1.1-1.3													✓

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Sample ID	vTRH(C6-C10)/BTEXN in Soil	svTRH (C10-C40) in Soil	PAHs in Soil	Organochlorine Pesticides in soil	Organophosphorus Pesticides in Soil	PCBsin Soil	Acid Extractable metalsin soil	Asbestos ID - soils NEPM - ASB-001	Misc Inorg - Soil	CEC	Texture and Salinity*	Asbestos ID - materials	On Hold
BH202-1.4-1.6									✓		✓		
BH202-1.8-1.9													✓
BH202-2.4-2.5									✓	✓	✓		
BH202-2.9-3.0													✓
BH203-0.1-0.2													✓
BH203-0.5-0.7									✓	✓	✓		
SDUP1	✓	✓	✓				✓						
TBS1	✓												
TS1	✓												
FCF203-0-0.5												✓	

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

Additional Info

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

SAMPLE AND CHAIN OF CUSTODY FORM

TO:		FROM:
ENVIROLAB SERVICES PTY LTD 12 ASHLEY STREET CHATSWOOD NSW 2067 P: (02) 99106200 F: (02) 99106201 Attention: Aileen	JKE Job Number: E27318PH Date Results Required: STANDARD Page: 1 of 2	JKEnvironments REAR OF 115 WICKS ROAD MACQUARIE PARK, NSW 2113 P: 02-9888 5000 F: 02-9888 5001 Attention: Harry Leonard

Location:	Wentworthville						Sample Preserved in Esky on Ice											
Sampler:	BZ						Tests Required											
Date Sampled	Lab Ref:	Sample Number	Depth (m)	Sample Container	PID	Sample Description	Combo 6	Combo 3	WA Asbestos (500mL)	Asbestos	BTEX	CEC	pH	ECe (texture)	Sulphate	Chloride	Resistivity	
20/04/2021	1	BH201	0.1-0.2	G		F: Gravelly sand	X											
20/04/2021	2	BH201	0.1-0.5	A	-	F: Gravelly sand			X									
20/04/2021	3	BH201	0.5-0.6	G		F: Silty clay	X											
20/04/2021	4	BH201	0.5-1.0	A	-	F: Silty clay			X									
20/04/2021	5	BH201	0.9-1.0	G		F: Silty clay												
20/04/2021	6	BH201	1.4-1.5	G		Clay		X										
20/04/2021	7	BH202	0.1-0.3	G		F: Sand	X											
20/04/2021	8	BH202	0.05-0.5	A		F: Sand			X									
20/04/2021	9	BH202	0.5-0.6	G		F: Silty clay		X										
20/04/2021	10	BH202	0.8-0.9	G		Clay		X										
20/04/2021	11	BH202	1.1-1.3	G		Clay												
20/04/2021	12	BH203	0.1-0.2	G		F: Gravelly sand	X											
20/04/2021	13	BH203	0-0.5	A		F: Gravelly sand			X									
20/04/2021	14	BH203	0.5-0.7	G		F: Silty clay												
20/04/2021	15	BH201	0.1-0.2	P		F: Gravelly sand												
20/04/2021	16	BH201	0.5-0.6	P		F: Silty clay												
20/04/2021	17	BH201	0.9-1.0	P		F: Silty clay												
20/04/2021	18	BH201	1.0-1.2	P		Clay						X	X	X	X	X	X	
20/04/2021	19	BH201	1.4-1.5	P		Clay												
20/04/2021	20	BH201	1.8-2.0	P		Clay							X	X	X	X	X	
20/04/2021	21	BH201	2.5-2.6	P		Clay												
20/04/2021	22	BH201	2.9-3.0	P		Clay												
20/04/2021	23	BH201	3.35-3.45	P		Clay							X	X	X	X	X	
20/04/2021	24	BH201	4.0-4.1	P		Clay						X	X	X	X	X	X	
20/04/2021	25	BH201	4.4-4.5	P		Clay												

ENVIROLAB GROUP
Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: (02) 9910 6200
Job No: 267374
Date Received: 22/4/21
Time Received: 1225
Received by: JD
Temp: Cool/Ambient
Cooling: Ice/Icepack
Security: Intact/Broken/None

Remarks (comments/detection limits required):	Sample Containers:
SDUP1 - Intra-laboratory duplicate	G - 250mg Glass Jar A - Ziplock Asbestos Bag P - Plastic Bag

Relinquished By: HL	Date: 22/04/2021	Time:	Received By: Jason Day	Date: 22/4/21 1225 6°C

SAMPLE AND CHAIN OF CUSTODY FORM

TO:		FROM:
ENVIROLAB SERVICES PTY LTD 12 ASHLEY STREET CHATSWOOD NSW 2067 P: (02) 99106200 F: (02) 99106201 Attention: Aileen	JKE Job Number: E27318PH Date Results Required: STANDARD Page: 1 of 2	JKEnvironments REAR OF 115 WICKS ROAD MACQUARIE PARK, NSW 2113 P: 02-9888 5000 F: 02-9888 5001 Attention: Harry Leonard

Location:	Wentworthville						Sample Preserved in Esky on Ice										
Sampler:	BZ						Tests Required										
Date Sampled	Lab Ref:	Sample Number	Depth (m)	Sample Container	PID	Sample Description	Combo 6	Combo 3	WA Asbestos (500mL)	Asbestos	BTEX	CEC	pH	ECe (texture)	Sulphate	Chloride	Resistivity
20/04/2021	26	BH201	5.5-5.6	P	-	Clay											
20/04/2021	27	BH201	6.1-6.5	P	-	Clay						X	X	X	X	X	X
20/04/2021	28	BH202	0.1-0.3	P	-	F: Sand											
20/04/2021	29	BH202	0.5-0.7	P	-	F: Slity clay											
20/04/2021	30	BH202	0.8-0.9	P	-	Clay						X	X	X	X	X	X
20/04/2021	31	BH202	1.0-1.1	P	-	Clay											
20/04/2021	32	BH202	1.1-1.3	P	-	Clay											
20/04/2021	33	BH202	1.4-1.6	P	-	Clay							X	X	X	X	X
20/04/2021	34	BH202	1.8-1.9	P	-	Clay											
20/04/2021	35	BH202	2.4-2.5	P	-	Clay						X	X	X	X	X	X
20/04/2021	36	BH202	2.9-3.0	P	-	Clay											
20/04/2021	37	BH203	0.1-0.2	P	-	F: Gravelly sand											
20/04/2021	38	BH203	0.5-0.7	P	-	F: Silty clay						X	X	X	X	X	X
20/04/2021	39	SDUP1	-	G	-	-		X									
20/04/2021	40	TBS1	-	G	-	-					X						
20/04/2021	41	TS1	-	V	-	-					X						
20/04/2021	42	FCF203	0-0.5	A	-	Material				X							

Remarks (comments/detection limits required):	Sample Containers:
SDUP1 - Intra-laboratory duplicate	G - 250mg Glass Jar A - Ziplock Asbestos Bag P - Plastic Bag

Relinquished By: HL	Date: 22/04/2021	Time:	Received By: Jason Day	Date: 22/4/21 1225

267374

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CERTIFICATE OF ANALYSIS 267802

Client Details

Client	JK Environments
Attention	Harry Leonard
Address	PO Box 976, North Ryde BC, NSW, 1670

Sample Details

Your Reference	**E27813PH, Wentworthville**
Number of Samples	4 Water
Date samples received	28/04/2021
Date completed instructions received	28/04/2021

Analysis Details

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

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

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

Report Details

Date results requested by	05/05/2021
Date of Issue	04/05/2021

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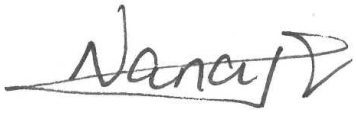
Accredited for compliance with ISO/IEC 17025 - Testing. **Tests not covered by NATA are denoted with ***

Results Approved By
Giovanni Agosti, Group Technical Manager
Priya Samarawickrama, Senior Chemist
Steven Luong, Organics Supervisor

Authorised By



Nancy Zhang, Laboratory Manager

VOCs in water			
Our Reference		267802-1	267802-2
Your Reference	UNITS	MW101	MW103
Date Sampled		28/04/2021	28/04/2021
Type of sample		Water	Water
Date extracted	-	28/04/2021	28/04/2021
Date analysed	-	29/04/2021	29/04/2021
Dichlorodifluoromethane	µg/L	<10	<10
Chloromethane	µg/L	<10	<10
Vinyl Chloride	µg/L	<10	<10
Bromomethane	µg/L	<10	<10
Chloroethane	µg/L	<10	<10
Trichlorofluoromethane	µg/L	<10	<10
1,1-Dichloroethene	µg/L	<1	<1
Trans-1,2-dichloroethene	µg/L	<1	<1
1,1-dichloroethane	µg/L	<1	<1
Cis-1,2-dichloroethene	µg/L	<1	<1
Bromochloromethane	µg/L	<1	<1
Chloroform	µg/L	<1	<1
2,2-dichloropropane	µg/L	<1	<1
1,2-dichloroethane	µg/L	<1	<1
1,1,1-trichloroethane	µg/L	<1	<1
1,1-dichloropropene	µg/L	<1	<1
Cyclohexane	µg/L	<1	<1
Carbon tetrachloride	µg/L	<1	<1
Benzene	µg/L	<1	<1
Dibromomethane	µg/L	<1	<1
1,2-dichloropropane	µg/L	<1	<1
Trichloroethene	µg/L	<1	<1
Bromodichloromethane	µg/L	<1	<1
trans-1,3-dichloropropene	µg/L	<1	<1
cis-1,3-dichloropropene	µg/L	<1	<1
1,1,2-trichloroethane	µg/L	<1	<1
Toluene	µg/L	<1	<1
1,3-dichloropropane	µg/L	<1	<1
Dibromochloromethane	µg/L	<1	<1
1,2-dibromoethane	µg/L	<1	<1
Tetrachloroethene	µg/L	<1	<1
1,1,1,2-tetrachloroethane	µg/L	<1	<1
Chlorobenzene	µg/L	<1	<1
Ethylbenzene	µg/L	<1	<1

VOCs in water			
Our Reference		267802-1	267802-2
Your Reference	UNITS	MW101	MW103
Date Sampled		28/04/2021	28/04/2021
Type of sample		Water	Water
Bromoform	µg/L	<1	<1
m+p-xylene	µg/L	<2	<2
Styrene	µg/L	<1	<1
1,1,2,2-tetrachloroethane	µg/L	<1	<1
o-xylene	µg/L	<1	<1
1,2,3-trichloropropane	µg/L	<1	<1
Isopropylbenzene	µg/L	<1	<1
Bromobenzene	µg/L	<1	<1
n-propyl benzene	µg/L	<1	<1
2-chlorotoluene	µg/L	<1	<1
4-chlorotoluene	µg/L	<1	<1
1,3,5-trimethyl benzene	µg/L	<1	<1
Tert-butyl benzene	µg/L	<1	<1
1,2,4-trimethyl benzene	µg/L	<1	<1
1,3-dichlorobenzene	µg/L	<1	<1
Sec-butyl benzene	µg/L	<1	<1
1,4-dichlorobenzene	µg/L	<1	<1
4-isopropyl toluene	µg/L	<1	<1
1,2-dichlorobenzene	µg/L	<1	<1
n-butyl benzene	µg/L	<1	<1
1,2-dibromo-3-chloropropane	µg/L	<1	<1
1,2,4-trichlorobenzene	µg/L	<1	<1
Hexachlorobutadiene	µg/L	<1	<1
1,2,3-trichlorobenzene	µg/L	<1	<1
Surrogate Dibromofluoromethane	%	101	103
Surrogate toluene-d8	%	82	94
Surrogate 4-BFB	%	105	103

vTRH(C6-C10)/BTEXN in Water					
Our Reference	UNITS	267802-1	267802-2	267802-3	267802-4
Your Reference		MW101	MW103	WDUP1	TB-W1
Date Sampled		28/04/2021	28/04/2021	28/04/2021	28/04/2021
Type of sample		Water	Water	Water	Water
Date extracted	-	28/04/2021	28/04/2021	28/04/2021	28/04/2021
Date analysed	-	29/04/2021	29/04/2021	29/04/2021	29/04/2021
TRH C_6 - C_9	µg/L	<10	<10	<10	[NA]
TRH C_6 - C_{10}	µg/L	<10	<10	<10	[NA]
TRH C_6 - C_{10} less BTEX (F1)	µg/L	<10	<10	<10	[NA]
Benzene	µg/L	<1	<1	<1	<1
Toluene	µg/L	<1	<1	<1	<1
Ethylbenzene	µg/L	<1	<1	<1	<1
m+p-xylene	µg/L	<2	<2	<2	<2
o-xylene	µg/L	<1	<1	<1	<1
Naphthalene	µg/L	<1	<1	<1	<1
Surrogate Dibromofluoromethane	%	101	103	113	99
Surrogate toluene-d8	%	82	94	101	78
Surrogate 4-BFB	%	105	103	104	104

svTRH (C10-C40) in Water				
Our Reference		267802-1	267802-2	267802-3
Your Reference	UNITS	MW101	MW103	WDUP1
Date Sampled		28/04/2021	28/04/2021	28/04/2021
Type of sample		Water	Water	Water
Date extracted	-	29/04/2021	29/04/2021	29/04/2021
Date analysed	-	30/04/2021	30/04/2021	30/04/2021
TRH C_{10} - C_{14}	µg/L	<50	<50	<50
TRH C_{15} - C_{28}	µg/L	<100	<100	<100
TRH C_{29} - C_{36}	µg/L	<100	<100	<100
TRH >C_{10} - C_{16}	µg/L	<50	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	µg/L	<50	<50	<50
TRH >C_{16} - C_{34}	µg/L	<100	<100	<100
TRH >C_{34} - C_{40}	µg/L	<100	<100	<100
Surrogate o-Terphenyl	%	96	102	101

PAHs in Water - Low Level				
Our Reference	UNITS	267802-1	267802-2	267802-3
Your Reference		MW101	MW103	WDUP1
Date Sampled		28/04/2021	28/04/2021	28/04/2021
Type of sample		Water	Water	Water
Date extracted	-	29/04/2021	29/04/2021	29/04/2021
Date analysed	-	29/04/2021	29/04/2021	29/04/2021
Naphthalene	µg/L	<0.2	<0.2	<0.2
Acenaphthylene	µg/L	<0.1	<0.1	<0.1
Acenaphthene	µg/L	<0.1	<0.1	<0.1
Fluorene	µg/L	<0.1	<0.1	<0.1
Phenanthrene	µg/L	<0.1	<0.1	<0.1
Anthracene	µg/L	<0.1	<0.1	<0.1
Fluoranthene	µg/L	<0.1	<0.1	<0.1
Pyrene	µg/L	<0.1	<0.1	<0.1
Benzo(a)anthracene	µg/L	<0.1	<0.1	<0.1
Chrysene	µg/L	<0.1	<0.1	<0.1
Benzo(b,j+k)fluoranthene	µg/L	<0.2	<0.2	<0.2
Benzo(a)pyrene	µg/L	<0.1	<0.1	<0.1
Indeno(1,2,3-c,d)pyrene	µg/L	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	µg/L	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	µg/L	<0.1	<0.1	<0.1
Benzo(a)pyrene TEQ	µg/L	<0.5	<0.5	<0.5
Total +ve PAH's	µg/L	<0.1	<0.1	<0.1
Surrogate p-Terphenyl-d14	%	114	138	108

HM in water - dissolved				
Our Reference	UNITS	267802-1	267802-2	267802-3
Your Reference		MW101	MW103	WDUP1
Date Sampled		28/04/2021	28/04/2021	28/04/2021
Type of sample		Water	Water	Water
Date prepared	-	29/04/2021	29/04/2021	29/04/2021
Date analysed	-	29/04/2021	29/04/2021	29/04/2021
Arsenic-Dissolved	µg/L	<1	<1	<1
Cadmium-Dissolved	µg/L	<0.1	0.2	0.2
Chromium-Dissolved	µg/L	<1	<1	<1
Copper-Dissolved	µg/L	<1	<1	<1
Lead-Dissolved	µg/L	<1	<1	<1
Mercury-Dissolved	µg/L	<0.05	<0.05	<0.05
Nickel-Dissolved	µg/L	22	6	6
Zinc-Dissolved	µg/L	18	13	14

Miscellaneous Inorganics			
Our Reference	UNITS	267802-1	267802-2
Your Reference		MW101	MW103
Date Sampled		28/04/2021	28/04/2021
Type of sample		Water	Water
Date prepared	-	28/04/2021	28/04/2021
Date analysed	-	28/04/2021	28/04/2021
pH	pH Units	6.3	6.4
Electrical Conductivity	µS/cm	12,000	8,300

Method ID	Methodology Summary
Inorg-001	pH - Measured using pH meter and electrode in accordance with APHA latest edition, 4500-H+. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times.
Inorg-002	Conductivity and Salinity - measured using a conductivity cell at 25°C in accordance with APHA latest edition 2510 and Rayment & Lyons.
Metals-021	Determination of Mercury by Cold Vapour AAS.
Metals-022	Determination of various metals by ICP-MS.
Org-020	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
Org-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS/GC-MSMS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013.
Org-023	Water samples are analysed directly by purge and trap GC-MS.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.

QUALITY CONTROL: VOCs in water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	[NT]
Date extracted	-			28/04/2021	1	28/04/2021	29/04/2021		28/04/2021	[NT]
Date analysed	-			29/04/2021	1	29/04/2021	30/04/2021		29/04/2021	[NT]
Dichlorodifluoromethane	µg/L	10	Org-023	<10	1	<10	<10	0	[NT]	[NT]
Chloromethane	µg/L	10	Org-023	<10	1	<10	<10	0	[NT]	[NT]
Vinyl Chloride	µg/L	10	Org-023	<10	1	<10	<10	0	[NT]	[NT]
Bromomethane	µg/L	10	Org-023	<10	1	<10	<10	0	[NT]	[NT]
Chloroethane	µg/L	10	Org-023	<10	1	<10	<10	0	[NT]	[NT]
Trichlorofluoromethane	µg/L	10	Org-023	<10	1	<10	<10	0	[NT]	[NT]
1,1-Dichloroethene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Trans-1,2-dichloroethene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,1-dichloroethane	µg/L	1	Org-023	<1	1	<1	<1	0	80	[NT]
Cis-1,2-dichloroethene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Bromochloromethane	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Chloroform	µg/L	1	Org-023	<1	1	<1	<1	0	107	[NT]
2,2-dichloropropane	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,2-dichloroethane	µg/L	1	Org-023	<1	1	<1	<1	0	92	[NT]
1,1,1-trichloroethane	µg/L	1	Org-023	<1	1	<1	<1	0	76	[NT]
1,1-dichloropropene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Cyclohexane	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Carbon tetrachloride	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Benzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Dibromomethane	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,2-dichloropropane	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Trichloroethene	µg/L	1	Org-023	<1	1	<1	<1	0	105	[NT]
Bromodichloromethane	µg/L	1	Org-023	<1	1	<1	<1	0	76	[NT]
trans-1,3-dichloropropene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
cis-1,3-dichloropropene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,1,2-trichloroethane	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Toluene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,3-dichloropropane	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Dibromochloromethane	µg/L	1	Org-023	<1	1	<1	<1	0	107	[NT]
1,2-dibromoethane	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Tetrachloroethene	µg/L	1	Org-023	<1	1	<1	<1	0	112	[NT]
1,1,1,2-tetrachloroethane	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Chlorobenzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Ethylbenzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Bromoform	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
m+p-xylene	µg/L	2	Org-023	<2	1	<2	<2	0	[NT]	[NT]
Styrene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,1,2,2-tetrachloroethane	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]

QUALITY CONTROL: VOCs in water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	[NT]
o-xylene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,2,3-trichloropropane	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Isopropylbenzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Bromobenzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
n-propyl benzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
2-chlorotoluene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
4-chlorotoluene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,3,5-trimethyl benzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Tert-butyl benzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,2,4-trimethyl benzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,3-dichlorobenzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Sec-butyl benzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,4-dichlorobenzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
4-isopropyl toluene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,2-dichlorobenzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
n-butyl benzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,2-dibromo-3-chloropropane	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,2,4-trichlorobenzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Hexachlorobutadiene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,2,3-trichlorobenzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Surrogate Dibromofluoromethane	%		Org-023	95	1	101	88	14	105	[NT]
Surrogate toluene-d8	%		Org-023	100	1	82	91	10	94	[NT]
Surrogate 4-BFB	%		Org-023	104	1	105	107	2	99	[NT]

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	[NT]
Date extracted	-			28/04/2021	1	28/04/2021	29/04/2021		28/04/2021	[NT]
Date analysed	-			29/04/2021	1	29/04/2021	30/04/2021		29/04/2021	[NT]
TRH C_6 - C_9	µg/L	10	Org-023	<10	1	<10	<10	0	84	[NT]
TRH C_6 - C_{10}	µg/L	10	Org-023	<10	1	<10	<10	0	84	[NT]
Benzene	µg/L	1	Org-023	<1	1	<1	<1	0	85	[NT]
Toluene	µg/L	1	Org-023	<1	1	<1	<1	0	96	[NT]
Ethylbenzene	µg/L	1	Org-023	<1	1	<1	<1	0	77	[NT]
m+p-xylene	µg/L	2	Org-023	<2	1	<2	<2	0	82	[NT]
o-xylene	µg/L	1	Org-023	<1	1	<1	<1	0	82	[NT]
Naphthalene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Surrogate Dibromofluoromethane	%		Org-023	95	1	101	88	14	99	[NT]
Surrogate toluene-d8	%		Org-023	100	1	82	91	10	100	[NT]
Surrogate 4-BFB	%		Org-023	104	1	105	107	2	99	[NT]

QUALITY CONTROL: svTRH (C10-C40) in Water					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	[NT]
Date extracted	-			29/04/2021	[NT]	[NT]	[NT]	[NT]	29/04/2021	[NT]
Date analysed	-			29/04/2021	[NT]	[NT]	[NT]	[NT]	29/04/2021	[NT]
TRH C_{10} - C_{14}	µg/L	50	Org-020	<50	[NT]	[NT]	[NT]	[NT]	116	[NT]
TRH C_{15} - C_{28}	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	122	[NT]
TRH C_{29} - C_{36}	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	132	[NT]
TRH >C_{10} - C_{16}	µg/L	50	Org-020	<50	[NT]	[NT]	[NT]	[NT]	116	[NT]
TRH >C_{16} - C_{34}	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	122	[NT]
TRH >C_{34} - C_{40}	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	132	[NT]
Surrogate o-Terphenyl	%		Org-020	99	[NT]	[NT]	[NT]	[NT]	72	[NT]

QUALITY CONTROL: PAHs in Water - Low Level						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	267802-2
Date extracted	-			29/04/2021	[NT]	[NT]	[NT]	[NT]	29/04/2021	29/04/2021
Date analysed	-			29/04/2021	[NT]	[NT]	[NT]	[NT]	29/04/2021	29/04/2021
Naphthalene	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	85	85
Acenaphthylene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Acenaphthene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	82	75
Fluorene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	93	80
Phenanthrene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	110	96
Anthracene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Fluoranthene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	110	86
Pyrene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	118	93
Benzo(a)anthracene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Chrysene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	82	72
Benzo(b,j+k)fluoranthene	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(a)pyrene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	117	90
Indeno(1,2,3-c,d)pyrene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Dibenzo(a,h)anthracene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(g,h,i)perylene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	123	[NT]	[NT]	[NT]	[NT]	74	112

QUALITY CONTROL: HM in water - dissolved						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W3	[NT]
Date prepared	-			29/04/2021	[NT]	[NT]	[NT]	[NT]	29/04/2021	[NT]
Date analysed	-			29/04/2021	[NT]	[NT]	[NT]	[NT]	29/04/2021	[NT]
Arsenic-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	91	[NT]
Cadmium-Dissolved	µg/L	0.1	Metals-022	<0.1	[NT]	[NT]	[NT]	[NT]	91	[NT]
Chromium-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	86	[NT]
Copper-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	86	[NT]
Lead-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	93	[NT]
Mercury-Dissolved	µg/L	0.05	Metals-021	<0.05	[NT]	[NT]	[NT]	[NT]	98	[NT]
Nickel-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	89	[NT]
Zinc-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	89	[NT]

QUALITY CONTROL: Miscellaneous Inorganics						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date prepared	-			28/04/2021	[NT]	[NT]	[NT]	[NT]	28/04/2021	[NT]
Date analysed	-			28/04/2021	[NT]	[NT]	[NT]	[NT]	28/04/2021	[NT]
pH	pH Units		Inorg-001	[NT]	[NT]	[NT]	[NT]	[NT]	99	[NT]
Electrical Conductivity	µS/cm	1	Inorg-002	<1	[NT]	[NT]	[NT]	[NT]	103	[NT]

Result Definitions

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

Quality Control Definitions

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

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

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

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

Laboratory Acceptance Criteria

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

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

Spikes for Physical and Aggregate Tests are not applicable.

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

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

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

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

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

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

Measurement Uncertainty estimates are available for most tests upon request.

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

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

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

SAMPLE RECEIPT ADVICE

Client Details

Client	JK Environments
Attention	Harry Leonard

Sample Login Details

Your reference	E27813PH, Wentworthville
Envirolab Reference	267802
Date Sample Received	28/04/2021
Date Instructions Received	28/04/2021
Date Results Expected to be Reported	05/05/2021

Sample Condition

Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	4 Water
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	9.0
Cooling Method	Ice
Sampling Date Provided	YES

Comments

Nil

Please direct any queries to:

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

Analysis Underway, details on the following page:

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
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Sample ID	VOCs in water	vTRH(C6-C10)/BTEXN in Water	svTRH (C10-C40) in Water	PAHs in Water - Low Level	HM in water - dissolved	pH	Electrical Conductivity
MW101	✓	✓	✓	✓	✓	✓	✓
MW103	✓	✓	✓	✓	✓	✓	✓
WDUP1		✓	✓	✓	✓		
TB-W1		✓					

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

Additional Info

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

SAMPLE AND CHAIN OF CUSTODY FORM

TO:		FROM:
ENVIROLAB SERVICES PTY LTD 12 ASHLEY STREET CHATSWOOD NSW 2067 P: (02) 99106200 F: (02) 99106201 Attention: Aileen	JKE Job Number: E27813PH Date Results Required: STANDARD Page: 1 of 1	JKEnvironments REAR OF 115 WICKS ROAD MACQUARIE PARK, NSW 2113 P: 02-9888 5000 F: 02-9888 5001 Attention: Harry Leonard hleonard@jkenvironments.com.au

Location:	Wentworthville	Sample Preserved in Esky on Ice
Sampler:	HW	Tests Required

Date Sampled	Lab Ref:	Sample Number	Sample Containers	PID	Sample Description	Combo 2	Combo 3L	VOCs	pH / EC	8 Metals	PAHs	TRH/BTEX	BTEX	Hardness			
28/04/2021	1	MW101	2xG1, 4xV, H, PVC	2	Water		X	X	X								
28/04/2021	2	MW103	2xG1, 4xV, H, PVC	98	Water		X	X	X								
28/04/2021	3	WDUP1	2xG1, 4xV, H, PVC	NA	Water		X										
28/04/2021	4	TB-W1	V	NA	Water blank								X				

ENVIROLAB Environmental Services 12 Ashley St Chatswood NSW 2067 Ph: (02) 9910 6200

Job No: 207802

Date Received: 28/4/21

Time Received: 1500

Received By: LM

Temp: Cool/Ambient

Cooling: Ice/Icepack

Security: Intact/Broken/None

Remarks (comments/detection limits required):	Sample Containers:
All analysis PQLs to ANZECC (2000) Detection Limits Please	G1 - 100mL Amber Glass Bottle V - BTEX Vial H - HNO3 Wash PVC PVC - HDPE Plastic Bottles

Relinquished By:	Date:	Time:	Received By:	Date:
LM	28/4/21.	1500.	CMcLean	28/4/21

Envirolab Services Pty Ltd
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CERTIFICATE OF ANALYSIS 271340

Client Details

Client	JK Environments
Attention	Todd Hore
Address	PO Box 976, North Ryde BC, NSW, 1670

Sample Details

Your Reference	**E27318PH, Wentworthville**
Number of Samples	2 Water
Date samples received	10/06/2021
Date completed instructions received	10/06/2021

Analysis Details

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

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

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

Report Details

Date results requested by	18/06/2021
Date of Issue	18/06/2021

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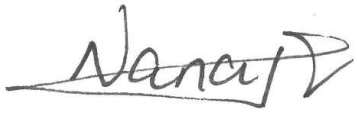
Results Approved By
Diego Bigolin, Team Leader, Inorganics

Authorised By



Nancy Zhang, Laboratory Manager

Miscellaneous Inorganics			
Our Reference		271340-1	271340-2
Your Reference	UNITS	MW101	MW103
Date Sampled		09/06/2021	09/06/2021
Type of sample		Water	Water
Date prepared	-	17/06/2021	17/06/2021
Date analysed	-	17/06/2021	17/06/2021
Chloride, Cl	mg/L	3,000	2,100
Sulphate, SO4	mg/L	660	570

Method ID	Methodology Summary
Inorg-081	Anions - a range of Anions are determined by Ion Chromatography, in accordance with APHA latest edition, 4110-B. Waters samples are filtered on receipt prior to analysis. Alternatively determined by colourimetry/turbidity using Discrete Analyser.

QUALITY CONTROL: Miscellaneous Inorganics						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date prepared	-			17/06/2021	[NT]	[NT]	[NT]	[NT]	17/06/2021	[NT]
Date analysed	-			17/06/2021	[NT]	[NT]	[NT]	[NT]	17/06/2021	[NT]
Chloride, Cl	mg/L	1	Inorg-081	<1	[NT]	[NT]	[NT]	[NT]	108	[NT]
Sulphate, SO4	mg/L	1	Inorg-081	<1	[NT]	[NT]	[NT]	[NT]	114	[NT]

Result Definitions

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

Quality Control Definitions

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

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

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

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

Laboratory Acceptance Criteria

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

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

Spikes for Physical and Aggregate Tests are not applicable.

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

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

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

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

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

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

Measurement Uncertainty estimates are available for most tests upon request.

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

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

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

SAMPLE RECEIPT ADVICE

Client Details

Client	JK Environments
Attention	Todd Hore

Sample Login Details

Your reference	E27318PH, Wentworthville
Envirolab Reference	271340
Date Sample Received	10/06/2021
Date Instructions Received	10/06/2021
Date Results Expected to be Reported	18/06/2021

Sample Condition

Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	2 Water
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	14
Cooling Method	Ice Pack
Sampling Date Provided	YES

Comments

#2 sample ID incorrect on COC.

Please direct any queries to:

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

Analysis Underway, details on the following page:

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

Sample ID	Sulphate, SO41:5 soil:water	Chloride, Cl
MW101	✓	✓
MW103	✓	✓

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

Additional Info

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

SAMPLE AND CHAIN OF CUSTODY FORM

TO:		FROM:
ENVIROLAB SERVICES PTY LTD 12 ASHLEY STREET CHATSWOOD NSW 2067 P: (02) 99106200 F: (02) 99106201 Attention: Aileen	JKE Job Number: E27318PH Date Results Required: STANDARD Page: 1	JKEnvironments REAR OF 115 WICKS ROAD MACQUARIE PARK, NSW 2113 P: 02-9888 5000 F: 02-9888 5001 Attention: Todd Hore

Location:	Wentworthville					Sample Preserved in Esky on Ice												
Sampler:	AM					Tests Required												
Date Sampled	Lab Ref:	Sample Number	Sample Containers	PID	Sample Description	Sulphate	Chloride											
9.6.21	1	MW101	G1	-	Water	X	X											
9.6.21	2	MW101	G1	-	Water	X	X											

Environlab Services
12 Ashley St
Chatsworth NSW 2067
Ph: (02) 9910 6200

Job No: E27340
Date Received: 10/06/21
Time Received: 1005
Received By:
Temp: Cool/Ambient
Cooling: Ice/Icepack
Security: Intact/Broken/None

14°C

Remarks (comments/detection limits required):	Sample Containers:
All analysis PQLs to ANZECC (2000) Detection Limits Please	G1 - 125mL Amber Glass Bottle G2 - 1L Amber Glass Bottle V - BTEX Vial H - HNO3 Wash PVC PVC - HDPE Plastic Bottles

Relinquished By:	Date:	Time:	Received By:	Date:
	Received by Christine BCS 10/06/21 1005			

Appendix G: Report Explanatory Notes

Standard Sampling Procedure (SSP)

These protocols specify the basic procedures to be used when sampling soils or groundwater for environmental site assessments undertaken by JKE.

The purpose of these protocols is to provide standard methods for: sampling, decontamination procedures for sampling equipment, sample preservation, sample storage and sample handling. Deviations from these procedures must be recorded.

A. <u>Soil Sampling:</u>

- Prepare a borehole/test pit log or made a note of the sample description for stockpiles.
- Layout sampling equipment on clean plastic sheeting to prevent direct contact with ground surface. The work area should be at a distance from the drill rig/excavator such that the machine can operate in a safe manner.
- Ensure all sampling equipment has been decontaminated prior to use.
- Remove any surface debris from the immediate area of the sampling location.
- Collect samples and place in glass jar with a Teflon seal. This should be undertaken as quickly as possible to prevent the loss of any volatiles. If possible, fill the glass jars completely.
- Collect samples for asbestos analysis and place in a zip-lock plastic bag.
- Label the sampling containers with the JKE job number, sample location (eg. BH1), sampling depth interval and date. If more than one sample container is used, this should also be indicated (eg. 2 = Sample jar 1 of 2 jars).
- Photoionisation detector (PID) screening of volatile organic compounds (VOCs) should be undertaken on samples using the soil sample headspace method. Headspace measurements are taken following equilibration of the headspace gasses in partly filled zip-lock plastic bags. PID headspace data is recorded on the borehole/test pit log and the chain of custody forms.
- Record the lithology of the sample and sample depth on the borehole/test pit log generally in accordance with AS1726-1993[18].
- Store the sample in a sample container cooled with ice or chill packs. On completion of the sampling the sample container should be delivered to the lab immediately or stored in the refrigerator prior to delivery to the lab. All samples are preserved in accordance with the standards outlined in the report.
- Check for the presence of groundwater after completion of each borehole using an electronic dip metre or water whistle. Boreholes should be left open until the end of fieldwork. All groundwater levels in the boreholes should be rechecked on the completion of the fieldwork.
- Backfill the boreholes/test pits with the excavation cuttings or clean sand prior to leaving the site.

B. <u>Decontamination Procedures for Soil Sampling Equipment</u>

- All sampling equipment should be decontaminated between every sampling location. This excludes single use PVC tubing used for push tubes etc. Equipment and materials required for the decontamination include:
  - Phosphate free detergent (Decon 90);
  - Potable water;
  - Stiff brushes; and
  - Plastic sheets.
- Ensure the decontamination materials are clean prior to proceeding with the decontamination.
- Fill both buckets with clean potable water and add phosphate free detergent to one bucket.

[18] Standards Australia, (1993), *Geotechnical Site Investigations.* (AS1726-1993)

- In the bucket containing the detergent, scrub the sampling equipment until all the material attached to the equipment has been removed.
- Rinse sampling equipment in the bucket containing potable water.
- Place cleaned equipment on clean plastic sheets.

If all materials are not removed by this procedure, high-pressure water cleaning is recommended. If any equipment is not completely decontaminated by both these processes, then the equipment should not be used until it has been thoroughly cleaned.

C. Groundwater Sampling

Groundwater samples are more sensitive to contamination than soil samples and therefore adhesion to this protocol is particularly important to obtain reliable, reproducible results. The recommendations detailed in AS/NZS 5667.1:1998 are considered to form a minimum standard.

The basis of this protocol is to maintain the security of the borehole and obtain accurate and representative groundwater samples. The following procedure should be used for collection of groundwater samples from previously installed groundwater monitoring wells.

- After monitoring well installation, at least three bore volumes should be pumped from the monitoring wells (well development) to remove any water introduced during the drilling process and/or the water that is disturbed during installation of the monitoring well. This should be completed prior to purging and sampling.
- Groundwater monitoring wells should then be left to recharge for at least three days before purging and sampling. Prior to purging or sampling, the condition of each well should observed and any anomalies recorded on the field data sheets. The following information should be noted: the condition of the well, noting any signs of damage, tampering or complete destruction; the condition and operation of the well lock; the condition of the protective casing and the cement footing (raised or cracked); and, the presence of water between protective casing and well.
- Take the groundwater level from the collar of the piezometer/monitoring well using an electronic dip meter. The collar level should be taken (if required) during the site visit using a dumpy level and staff.
- Purging and sampling of piezometers/monitoring wells is done on the same site visit when using micro-purge (or other low flow) techniques.
- Layout and organize all equipment associated with groundwater sampling in a location where they will not interfere with the sampling procedure and will not pose a risk of contaminating samples. Equipment generally required includes:
  - Micropore filtration system or Stericup single-use filters (for heavy metals samples);
  - Filter paper for Micropore filtration system; Bucket with volume increments;
  - Sample containers: teflon bottles with 1 ml nitric acid, 75mL glass vials with 1 mL hydrochloric acid, 1 L amber glass bottles;
  - Bucket with volume increments;
  - Flow cell;
  - pH/EC/Eh/T meters;
  - Plastic drums used for transportation of purged water;
  - Esky and ice;
  - Nitrile gloves;
  - Distilled water (for cleaning);
  - Electronic dip meter;
  - Low flow pump pack and associated tubing; and
  - Groundwater sampling forms.

- If single-use stericup filtration is not used, clean the Micropore filtration system thoroughly with distilled water prior to use and between each sample. Filter paper should be changed between samples. 0.45um filter paper should be placed below the glass fibre filter paper in the filtration system.
- Ensure all non-disposable sampling equipment is decontaminated or that new disposable equipment is available prior to any work commencing at a new location. The procedure for decontamination of groundwater equipment is outlined at the end of this section.
- Disposable gloves should be used whenever samples are taken to protect the sampler and to assist in avoidance of contamination.
- Groundwater samples are obtained from the monitoring wells using low flow/micro-purge sampling equipment to reduce the disturbance of the water column and loss of volatiles.
- During pumping to purge the well, the pH, temperature, conductivity, dissolved oxygen, redox potential and groundwater levels are monitored (where possible) using calibrated field instruments to assess the development of steady state conditions. Steady state conditions are generally considered to have been achieved when the difference in the pH measurements was less than 0.2 units and the difference in conductivity was less than 10%.
- All measurements are recorded on specific data sheets.
- Once steady state conditions are considered to have been achieved, groundwater samples are obtained directly from the pump tubing and placed in appropriate glass bottles or plastic bottles.
- All samples are preserved in accordance with water sampling requirements detailed in the NEPM 2013 and placed in an insulated container with ice. Groundwater samples are preserved by immediate storage in an insulated sample container with ice as outlined in the report text.
- Record the sample on the appropriate log in accordance with AS1726:1993. At the end of each water sampling complete a chain of custody form.

D. <u>Decontamination Procedures for Groundwater Sampling Equipment</u>

- All equipment associated with the groundwater sampling procedure (other than single-use items) should be decontaminated between every sampling location.
- The following equipment and materials are required for the decontamination procedure:
  - Phosphate free detergent;
  - Potable water;
  - Distilled water; and
  - Plastic Sheets or bulk bags (plastic bags).
- Fill one bucket with clean potable water and phosphate free detergent, and one bucket with distilled water.
- Flush potable water and detergent through pump head. Wash sampling equipment and pump head using brushes in the bucket containing detergent until all materials attached to the equipment are removed.
- Flush pump head with distilled water.
- Change water and detergent solution after each sampling location.
- Rinse sampling equipment in the bucket containing distilled water.
- Place cleaned equipment on clean plastic sheets.
- If all materials are not removed by this procedure that equipment should not be used until it has been thoroughly cleaned

Appendix H: Groundwater Field Records

JKEnvironments

Client:	Erilyan	**Job No.:**	E27318PH
Project:	Proposed Northside West Clinic Stage 2 Development	**Well No.:**	MW101
Location:	23-27 Lytton Street, Wentworthville, NSW	**Depth (m):**	7.35

WELL FINISH DETAILS

	Gatic Cover ☒	Standpipe ☐	Other (describe) ☐

WELL DEVELOPMENT DETAILS

Method:	Development Pump	**SWL – Before (m):**	4.38
Date:	20.4.21	**Time – Before:**	
Undertaken By:	AVB	**SWL – After (m):**	DRY
Total Vol. Removed:	~30L	**Time – After:**	
PID Reading (ppm):			

Comments:

DEVELOPMENT MEASUREMENTS

Volume Removed (L)	Temp (°C)	DO (mg/L)	EC (µS/cm)	pH	Eh (mV)
10L	21	1.3	10859	6.81	-61.4
20L	20.9	3.3	11047	6.64	-36.1
29L	20.9	3.0	11086	6.93	-36.8
	Pumped dry (Good recharge)				

Comments: Odours (YES / NO), NAPL/PSH (YES / NO), Sheen (YES / NO), Steady State Achieved (YES / NO)

organic

YSI Used: 5

Pumped Dry

Tested By:	AVB	**Remarks:**
Date Tested:	20.4.21	- Steady state conditions - Difference in the pH less than 0.2 units, difference in the conductiveity less than 10% and SWL stable/not in drawdown
Checked By:	HL	- Minimum 3 monitoring well volumes purged, unless well purged until it is effectively dry
Date:	12/5/2021	

JKEnvironments

Client:	Erilyan	Job No.:	E27318PH
Project:	Proposed Northside West Clinic Stage 2 Development	Well No.:	NW103
Location:	23-27 Lytton Street, Wentworthville, NSW	Depth (m):	11.24

WELL FINISH DETAILS

	Gatic Cover ☒	Standpipe ☐	Other (describe) ☐

WELL DEVELOPMENT DETAILS

Method:	Development pump	SWL – Before (m):	3.93
Date:	20.4.21	Time – Before:	
Undertaken By:	AVB	SWL – After (m):	4.38
Total Vol. Removed:	~100L	Time – After:	
PID Reading (ppm):			

Comments:

DEVELOPMENT MEASUREMENTS

Volume Removed (L)	Temp (°C)	DO (mg/L)	EC (µS/cm)	pH	Eh (mV)
10L	21.2	3.1	7675	6.52	-9.6
20L	20.8	2.3	8225	6.84	-18.0
30L	20.6	2.1	9184	6.47	-24.7
40L	20.5	1.2	9764	7.07	-29.0
50L	20.5	1.2	9388	7.06	-25.9
60L	20.5	1.0	9420	7.05	-23.6
70L	20.5	0.9	9553	6.61	3.6
80L	20.4	1.1	9520	6.59	-10.7
90L	20.5	1.2	9642	6.52	-11.4
100L	20.5	1.4	9700	6.58	-11.2

Comments: Odours (YES / NO), NAPL/PSH (YES / NO), Sheen (YES / NO) Steady State Achieved (YES / NO)

YSI Used: 5

Tested By:	AVB	**Remarks:**
Date Tested:	20.4.21	- Steady state conditions - Difference in the pH less than 0.2 units, difference in the conductiveity less than 10% and SWL stable/not in drawdown - Minimum 3 monitoring well volumes purged, unless well purged until it is effectively dry
Checked By:	HL	
Date:	12/5/2021	

JKEnvironments

Client:	Erilyan	**Job No.:**	E27318PH
Project:	Proposed Northside West Clinic Stage 2 Development	**Well No.:**	MW103
Location:	23-27 Lytton Street, Wentworthville, NSW	**Depth (m):**	11.24

WELL FINISH

	Gatic Cover ✓		Standpipe		Other (describe)

WELL PURGE DETAILS:

Method:	Low flow Peristaltic pump	**SWL – Before:**	4.17
Date:	28/4/21	**Time – Before:**	8:30am
Undertaken By:	HW	**Total Vol Removed:**	~5.0L
Pump Program No:	3.29	**PID (ppm):**	98

PURGING / SAMPLING MEASUREMENTS

Time (min)	SWL (m)	Vol (L)	Notes	Temp (°C)	DO (mg/L)	EC (µS/cm)	pH	Eh (mV)
6	4.20	0.5	clear	20.9	0.7	7102	6.02	-0.9
12	4.20	1.5	"	21.0	0.5	7125	6.03	-4.1
15	4.20	2.0	"	21.1	0.4	7138	6.04	-6.2
20	4.20	2.5	"	21.1	0.4	7158	6.04	-8.0
25	4.20	3.0	"	21.1	0.3	7135	6.04	-9.6
30	4.20	3.5	"	21.2	0.3	7180	6.03	-9.7
35	4.20	4.0	"	21.2	0.3	7184	6.04	-11.5
40	4.20	4.5	"	21.2	0.3	7182	6.04	-12.9
45	4.20	5.0	"	21.3	0.3	7205	6.04	-14.2
			Start sampling					

Comments: Odours (YES / NO), NAPL/PSH (YES / NO), Sheen (YES / NO) Steady State Achieved (YES) / NO)

Field Duplicate: [WDUP1]

Sampling Containers Used: 4x glass amber, 8x BTEX vials, 2x HNO3 plastic, -x H2SO4 plastic, 2x unpreserved plastic

YSI used: 5

Tested By: ~~Todd Hore~~ HW	**Remarks:**
Date Tested: 28/4/21	- Steady state conditions - difference in the pH less than 0.2 units, difference in conductivity less than 10% 10% and SWL stable/not in drawdown
Checked By: HL	
Date: 13/5/2021	

JKEnvironments

Client:	Erilyan	**Job No.:**	E27318PH
Project:	Proposed Northside West Clinic Stage 2 Development	**Well No.:**	MW101
Location:	23-27 Lytton Street, Wentworthville, NSW	**Depth (m):**	7.35

WELL FINISH

	Gatic Cover ✓		**Standpipe**		**Other (describe)**

WELL PURGE DETAILS:

Method:	Low flow peristaltic pump	**SWL – Before:**	4.535
Date:	28/4/21	**Time – Before:**	9:55am
Undertaken By:	HW	**Total Vol Removed:**	~3.0L
Pump Program No:	2.43	**PID (ppm):**	2

PURGING / SAMPLING MEASUREMENTS

Time (min)	SWL (m)	Vol (L)	Notes	Temp (°C)	DO (mg/L)	EC (µS/cm)	pH	Eh (mV)
6	4.62	0.5	clear	21.1	1.3	9563	6.12	-24.8
15	4.63	0.8	"	21.1	0.5	9695	5.97	-30.1
18	4.63	1.3	"	21.0	0.4	9772	5.96	-32.3
23	4.63	1.5	"	21.1	0.4	9839	5.96	-36.9
30	4.63	1.8	"	21.0	0.3	9851	5.96	-38.3
37	4.63	2.5	"	21.1	0.3	9896	5.96	-41.1
42	4.63	2.8	"	21.1	0.3	9959	5.96	-45.3
45	4.63	3.0	"	21.0	0.3	9997	5.96	-47.8
			start sampling.					

Comments: Odours (YES / (NO)) NAPL/PSH (YES / (NO)) Sheen (YES / (NO)) Steady State Achieved ((YES) / NO)

Sampling Containers Used: 2 x glass amber, 4 x BTEX vials, 1 x HNO3 plastic, - x H2SO4 plastic, 2 x unpreserved plastic

YSI used: 5

Tested By: ~~Todd Hore~~ HW	**Remarks:**
Date Tested: 28/4/21	- Steady state conditions - difference in the pH less than 0.2 units, difference in conductivity less than 10% 10% and SWL stable/not in drawdown
Checked By: HL	
Date: 13/5/2021	

JKEnvironments

WATER QUALITY METER CALIBRATION FORM

Client:	Erilyan		
Project:	Proposed Northside West Clinic Stage 2 Development		
Location:	23-27 Lytton Street, Webtworthville, NSW		
Job Number:	E27318PH		
DISSOLVED OXYGEN			
Make: YSI 5	Model: Pro Plus		
Date of calibration: 19.4.21	Name of Calibrator: AVB		
Span value: 70% to 130%			
Measured value: 97%			
Measured reading Acceptable (Yes/No):			
pH			
Make: YSI 5	Model: Pro Plus		
Date of calibration: 19.4.21	Name of Calibrator: AVB		
Buffer 1: Theoretical pH = 7.01± 0.01	Expiry date: 06/21	Lot No: 349208	
Buffer 2: Theoretical pH = 4.01± 0.01	Expiry date: 07/21	Lot No: 336594	
Measured reading of Buffer 1: 7.03			
Measured reading of Buffer 2: 4.00			
Slope: —	Measured reading Acceptable (Yes/No):		
EC			
Make: YSI 5	Model: Pro Plus		
Date: 19.4.21	Name of Calibrator: AVB	Temperature: 23.5 °C	
Calibration solution: Conductivity Standard	Expiry date: 04/21	Lot No: 344507	
Theoretical conductivity at temperature (see solution container): 1370 µS/cm			
Measured conductivity: 1377 µS/cm	Measured reading Acceptable (Yes/No):		
REDOX			
Make: YSI 5	Model: Pro Plus		
Date of calibration: 19.4.21	Name of Calibrator: AVB		
Calibration solution: ORP Test	Expiry date: 05/25	Lot No: 5348	
Theoretical redox value: 240mV			
Measured redox reading: 240.1 mV	Measured reading Acceptable (Yes/No):		

JKEnvironments

WATER QUALITY METER CALIBRATION FORM

Client:	Ramssay Health Care		
Project:	Proposed Alterations & Additions		
Location:	23-27 Lytton Street, WENTWORTHVILLE, NSW		
Job Number:	E27318PH		
DISSOLVED OXYGEN			
Make: YSI	Model: Professional plus		
Date of calibration: 28/4/21	Name of Calibrator: HW		
Span value: 70% to 130%			
Measured value: ~~108%~~ 102%			
Measured reading Acceptable (Yes/No):			
pH			
Make: YSI	Model: Professional plus		
Date of calibration: 28/4/21	Name of Calibrator: HW		
Buffer 1: Theoretical pH = 7.01± 0.01	Expiry date: 06/21	Lot No: 249208	
Buffer 2: Theoretical pH = 4.01± 0.01	Expiry date: 03/22	Lot No: 360389	
Measured reading of Buffer 1: 7.28			
Measured reading of Buffer 2: 4.38			
Slope:	Measured reading Acceptable (Yes/No):		
EC			
Make: YSI	Model: Professional plus		
Date: 28/4/21	Name of Calibrator: HW	Temperature: 15.4 °C	
Calibration solution: Conductivity Standard	Expiry date: 04/21	Lot No: 344907	
Theoretical conductivity at temperature (see solution container): 1143 µS/cm			
Measured conductivity: 1305 µS/cm	Measured reading Acceptable (Yes/No):		
REDOX			
Make: YSI	Model: Professional plus		
Date of calibration: 28/4/21	Name of Calibrator: HW		
Calibration solution: ORP Test Solution	Expiry date: 05/25	Lot No: 5348	
Theoretical redox value: 240mV			
Measured redox reading: 236.5 mV	Measured reading Acceptable (Yes/No):		

11.24