



REPORT TO  
**NEXTDC LIMITED**

ON  
**DRYLAND SALINITY AND ACID SULFATE SOIL  
ASSESSMENT**

FOR  
**PROPOSED DATA STORAGE CENTRE**

AT  
**16 JOHNSTON CRESCENT, HORSLEY PARK, NSW**

Date: 30 April 2024

Ref: E36628BRrpt2

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## ABBREVIATIONS

Australian Height Datum	AHD
Acid Sulfate Soil	ASS
Acid Sulfate Soil Management Advisory Committee	ASSMAC
Acid Sulfate Soil Management Plan	AMP
Below Ground Level	BGL
Borehole	BH
Cation Exchange Capacity	CEC
Calcium	Ca
Cement, Concrete and Aggregates Australia	CCAA
Central Business District	CBD
Chain of Custody	COC
Damp Proof Course	DPC
Department of Infrastructure, Planning and Natural Resources	DIPNR
Department of Land and Water Conservation	DLWC
Dissolved Oxygen	DO
Douglas Partners	DP
Electric Conductivity	EC
Electric Conductivity Extract	ECE
Environmental Impact Statements	EIS
Environmental Resources Management	ERM
Global Positioning System	GPS
JK Environments	JKE
Local Government Authority	LGA
Magnesium	Mg
Monitoring Well	MW
National Association of Testing Authorities	NATA
New South Wales	NSW
Polyvinyl Chloride	PVC
Potassium	K
Potential Acid Sulfate Soil	PASS
Redox Potential	Eh
Salinity Management Plan	SMP
Secretary's Environmental Assessment Requirements	SEARs
Site Assessment Criteria	SAC
Standard Penetration Test	SPT
Standard Sampling Procedure	SSP
Standing Water Level	SWL
State Significant Development Application	SSDA
Sodium	Na
Sulfate	SO <sub>4</sub>
Western Sydney International Airport	WSI
Western Sydney Regional Organisation of Councils	WSROC



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**Units**

deci Siemens per Metre	dS/m
Electrical Conductivity	EC
Exchangeable Sodium Percentage (Sodicity)	ESP%
Grams	g
Hectares	Ha
Kilometers	km
Litres	L
Metres	m
Meters Cubed	m <sup>3</sup>
Metres Below Ground Level	mBGL
Millilitres	ml
Milliequivalents	meq
Milligrams per Litre	mg/L
Milligrams per Kilogram	mg/kg
Millimetres	mm
ohm Centimetres	ohm.cm
Parts Per Million	ppm
micro Siemens per Centimetre	µS/cm

## 1 INTRODUCTION

This dryland salinity and acid sulfate soil (ASS) assessment has been prepared by JK Environments (JKE) on behalf of NEXTDC Limited to accompany a detailed State Significant Development Application (SSDA) for the S4 data centre development at 16 Johnston Crescent, Horsley Park, NSW (SSD-63741210). The site location is shown on Figure 1 and the assessment was confined to the site boundaries as shown on Figure 2 attached in the appendices.

The application seeks consent for construction and operation of a data centre development and includes site preparation works, bulk earthworks and infrastructure, and construction of the buildings, ancillary facilities, and associated site works.

Specifically, the Project comprises the redevelopment of the site as summarised below:

- Site preparation works, including earthworks, excavation and retaining walls;
- Construction and operation of a data centre development, comprising:
  - (5x) data centre buildings with the following maximum heights:
    - ‘Hyperscale 1 Typical Building’ = 39 metres;
    - ‘Hyperscale 2 Typical Building’ = 39 metres;
    - ‘Enterprise Building’ = 32 metres;
- Vehicle access via Johnston Crescent; and
- On-site car parking and loading within at-grade hardstand areas.

This report has been prepared in response to the requirements contained within the Secretary’s Environmental Assessment Requirements (SEARs) dated 27 October 2023 issued for the SSDA (SSD-63741210). Specifically, this report has been prepared to respond to the SEARs Requirement issued below.

Table 1-1: SEARs Compliance

Item	Description of Requirement	Section Reference (this Report)
13. Ground and Water Conditions	<ul style="list-style-type: none"> <li>• Assess potential impacts on soil resources and related infrastructure and riparian lands on and near the site, including soil erosion, salinity and acid sulfate soils (ASS).</li> <li>• Prepare a Salinity Management Plan (SMP).</li> </ul>	<p>The assessment of ASS is presented in Section 3 and the assessment of salinity and soil erosion is presented in Section 7. Conclusions and recommendations are presented in Section 8.</p> <p>The SMP is presented in Sections 9 and 10.</p>

JKE understand that this report accompanies an Environmental Impact Statement (EIS) pursuant to Part 4 of the Environmental Planning and Assessment Act 1979 (EP&A Act), in support of the SSDA for the proposed development.



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JKE previously prepared a desktop ASS, salinity and surface and groundwater assessment for this site in 2024<sup>1</sup>. The relevant information presented in the desktop report has been included in the relevant sections of this report, where appropriate.

## 1.1 The Site

The site is located at 16, Johnston Crescent, Horsley Park within the Fairfield Local Government Area (LGA). The site is legally described as Lot 305 in Deposited Plan 1275011.

An aerial photograph of the site is provided in the following Figure (Figure A). The site comprises vacant land which has been cleared of vegetation and does not contain any existing built form structures. Bulk earthworks approved under DA-893-2013 have been completed on the site.

The site will be well serviced by infrastructure. The signalised intersection of Lenore Drive and Old Wallgrove Road at Eastern Creek is approximately 2 kilometres to the north, providing access to Wallgrove Road and the Westlink M7 Motorway to the east and Erskine Park Road and Mamre Road to the west. Each of these roads provides access to the M4 Motorway to the north and M5 Motorway to the south. A utilities and site services report will accompany the EIS.

The site is located approximately 35 kilometres west of the Sydney Central Business District (CBD), 17 kilometres west of the Parramatta CBD and 10 kilometres north-east of the future Western Sydney International (WSI) airport.

The site is within a developing employment precinct, including the ESR Horsley Logistics Park, Oakdale Central, Oakdale South and Horsley Park Employment Precinct. It is also close to other established and emerging employment-generating precincts, including Eastern Creek to the north, Huntingwood to the north-east, Wetherill Park and Mamre Road West to the north-west and Wetherill Park to the east.

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<sup>1</sup> JKE, (2024). *Report to NextDC Limited on Desktop Acid Sulfate Soil, Salinity and Surface and Groundwater Assessment for Proposed Data Storage Centre at 16 Johnston Crescent, Horsley Park, NSW.* (Ref: E36628BRrpt, dated 4 April 2024) (referred to as Desktop Report)



Source: Nearmap (2023)

## 1.2 Proposed Development Details

The proposed development includes the staged construction of five data storage centre buildings, associated internal roadways, and a substation. The preliminary bulk earthworks plan indicate that cut and fill of depths up to approximately 5m will be required, though excavations and filling will typically be less (generally 0.5m to 2m). The plans indicate the south and east of the site will generally be lowered (i.e. cut), whilst the north and west (including the existing sediment basin) will be raised (i.e. filled).

Selected plans issued for the preparation of this report are attached in the appendices. Any changes to the bulk earthworks or development details should be reviewed by JKE with reference to the recommendations outlined in this report.

## 1.3 Aim and Objectives

The primary aim of the assessment was to characterise the broad scale dryland salinity and ASS 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 potential for ASS conditions to be encountered during the proposed development;
- Assess the soil and groundwater salinity conditions via implementation of a preliminary sampling and analysis program; and
- Provide salinity and/or ASS management recommendations (if/where required).

## 1.4 Scope of Work

The assessment was undertaken generally in accordance with a JKE proposal (Ref: EP60162BRrev1) of 5 March 2024 and the consultancy agreement between JKE and the client of 14 March 2024. The scope of work included the following:

- Review of previous relevant investigation reports prepared for the site (prepared by JKE);
- Review site information including topography, soils maps, salinity risk maps, ASS risk maps, ASS planning maps, regional geology and hydro-geology in the vicinity of the site;
- A walkover site inspection to identify obvious visual indicators of dryland 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;
- Preparation of a report presenting the results of the assessment; and
- Preparation of a site-specific salinity management plan (SMP) for the proposed development.

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 1-2: Guidelines

Guidelines/Regulations/Documents
Site Investigations for Urban Salinity (2002) <sup>2</sup>
Salinity Code of Practice (2004) <sup>3</sup>
Managing Urban Stormwater – Soil and Construction (4 <sup>th</sup> ed.) (2004) <sup>4</sup>
Salinity Potential in Western Sydney Map (2002) <sup>5</sup>
Piling – Design and Installation AS2159-2009 (2009) <sup>6</sup>
Industry Guide T56: Residential Slabs and Footings in Saline Environments (2018) <sup>7</sup>
National Acid Sulfate Soils Sampling and Identification Methods Manual (2018) <sup>8</sup>
National Acid Sulfate Soils Identification and Laboratory Methods Manual (2018) <sup>9</sup>
Acid Sulfate Soil Manual (1998) <sup>10</sup>

<sup>2</sup> Department of Land and Water Conservation (DLWC), (2002). *Site Investigations for Urban Salinity*, (referred to as DLWC 2002)

<sup>3</sup> 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)

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

<sup>5</sup> DIPNR, (2002). *1:100,000 Map – Salinity Potential in Western Sydney*, (referred to as Salinity Potential Map)

<sup>6</sup> Standards Australia, (2009). *Piling – Design and Installation, AS2159-2009* (referred to as AS2159-2009)

<sup>7</sup> Cement, Concrete and Aggregates Australia (CCAA), (2018). *Industry Guide T56: Residential Slabs and Footings in Saline Environments* (referred to as CCAA 2018)

<sup>8</sup> Sullivan. L (et al), (2018). *National Acid Sulfate Soils guidance: National acid sulfate soils sampling and identification methods manual*

<sup>9</sup> Sullivan. L (et al), (2018). *National Acid Sulfate Soils guidance: National acid sulfate soils identification and laboratory methods manual*

<sup>10</sup> Acid Sulfate Soils Management Advisory Committee (ASSMAC), (1998). *Acid Sulfate Soils Manual* (referred to as ASS Manual 1998)



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## 2 SITE INFORMATION

### 2.1 Previous Investigations

#### 2.1.1 Remediation Validation Report

A remediation validation report was prepared for the site by ERM Services Australia (ERM) in 2023<sup>11</sup>. The validation report has been reviewed for salinity, ASS and filling-related information and summarised below.

The validation report indicated that the site and the wider development area had been previously subject to extensive excavation and earthworks, with little resemblance to the previous natural soil landscape. The geological and soil information summarised within the validation report indicated that the site was underlain by the Blacktown Soil landscape, which is associated with known dryland salinity and dispersive hazards. The ASS information indicated that the site was located in an area of no known occurrences of ASS. Further, no visual indicators of ASS and Potential (PASS) conditions were observed during the course of the validation works.

Based on the summaries provided within the validation report, approximately 114,100m<sup>3</sup> of site-won material was used as fill within the subject site. Additionally, approximately 88,900m<sup>3</sup> of clay, shale and sandstone was imported from approved properties for use within retaining walls and general fill. No ASS or salinity data for the imported and/or site won soils was reported in the validation report.

As part of the validation works, groundwater monitoring was undertaken. Three monitoring wells were installed within the Stage 3B site boundaries. The groundwater monitoring indicated the following:

- The standing water level (SWL) recorded in the monitoring wells ranged from approximately 77.7mAHD to 78.7mAHD;
- The pH of the groundwater (measured with field equipment) ranged from pH 6.78 to pH 7.8;
- The electrical conductivity of the groundwater (measured with field equipment) ranged from 8,434µS/cm to 18,105 µS/cm;
- The chloride concentrations of the groundwater reported by the laboratory ranged from 2,980mg/L to 6,620mg/L; and
- Sulfur odours were encountered from the groundwater during several monitoring events.

JKE note that the above information indicates that the groundwater may be classed as non-aggressive to buried steel and mildly aggressive towards buried concrete. JKE note that the pH and EC data are based on field readings using hand-held equipment, and that sulphate concentrations for the groundwater were not reported.

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<sup>11</sup> ERM, (2023). *Validation Report, Stage 3B, 16 Johnston Crescent, Horsley Park NSW 2175*. (Ref: 0449086\_S011426, dated 2 November 2023)

### 2.1.2 Earthworks Summary

An earthworks summary report was prepared for the site by Douglas Partners (DP) in 2023<sup>12</sup>. The summary report included earthworks undertaken at the site between January 2021 to October 2023 inclusive. The site was stripped to remove vegetation, highly organic topsoil and uncontrolled fill. The stripped surface was variable, comprising previously placed and compacted fill, silty clay, and/or siltstone bedrock.

The fill material used to raise the site to the desired levels were sourced from site-won material from excavations within the greater development area, and clay, sandstone and siltstone imported from approved properties in Willoughby and Merrylands, NSW. Based on the provided summary, 63,738m<sup>3</sup> of material was imported. The balance of the fill was obtained from on-site excavations within the wider development area.

JKE note that no salinity and/or ASS data were presented within the earthworks summary report.

## 2.2 Site Identification

Table 2-1: Site Identification

<b>Site Address:</b>	16 Johnston Crescent, Horsley Park, NSW
<b>Lot &amp; Deposited Plan:</b>	Lot 305 in DP1275011
<b>Current Land Use:</b>	Vacant
<b>Proposed Land Use:</b>	Data Centre
<b>Local Government Authority (LGA):</b>	Fairfield City Council
<b>Site Area (Ha) (approx.):</b>	8.206
<b>RL (AHD in m) (approx.):</b>	82-86
<b>Geographical Location (decimal degrees) (approx. north-east corner of site):</b>	Latitude: -33.828417 Longitude: 150.829011

## 2.3 Site Location and Regional Setting

The site is located in a predominantly commercial/industrial of Horsley Park. The site is bound by Johnston Crescent to the west, and a closed portion of Burley Road to the north. The site is located approximately 550m to the west of Reddy Creek. An ephemeral tributary of Ropes Creek was mapped approximately 120m to the west of the site. However, this tributary was not identified during the inspection of the surrounds and filling of the surrounds was observed.

<sup>12</sup> DP, (2023). *Earthworks Summary Report. Proposed Commercial Subdivision. Stage 3B, CSR Quarry, Horsley Park.* (Ref: 76582.22, dated 31 October 2023)

## 2.4 Topography

The regional topography is characterised by undulating terrain and low hills. The site itself has been cut into the southern face of a low hill. The site appeared to have been levelled to account for the slope and accommodate the existing development.

## 2.5 Site Inspection

A walkover inspection of the site was undertaken by JKE on 18 March 2024. The inspection was limited to accessible areas of the site and was focussed on assessing the site conditions relevant to ASS and salinity-related factors only. Selected site photographs obtained during the inspection are attached in the appendices.

At the time of the inspection, the site was vacant (undeveloped) land and was generally level. The site was void of buildings, though keystone block retaining walls were observed along the northern, eastern and western site boundaries. The retaining walls ranged from approximately 0.5m to 8.5m in height. No evidence of salt wicking was observed on the face of the retaining walls. However, it is acknowledged that earthworks were completed relatively recently and longer-term impacts are unknown.

The site was accessed via an unsealed driveway and ramp which ran parallel to the southern boundary, extending east for Johnston Crescent.

A large sediment basin was located in the north-west of the site. Drainage channels were located along the eastern, northern and southern site boundaries, which flowed into the sediment basin. The drainage channels were generally lined with sandstone spalls, cobbles and boulders, though some areas were clay-lined. Surface water was observed in the sediment basin and appeared turbid based on visual observations. Measurements of the volume and quality of the surface water were not undertaken. Minor ponding of water was also observed within parts of the drainage channels and was associated with recent rainfall events.

A vegetated embankment was observed in the south-east of the site. Vegetation comprised of low-grasses had also been planted along the high-side of the northern retaining wall. Sprinkler and hose systems were observed throughout the vegetated areas. The vegetation appeared to comprise of low grasses which had been planted relatively recently and was not fully established.

A fenced area marked as 'Environmental Protection Area' was observed at the crest of the south-eastern embankment with remnant Cumberland wood-plain forest beyond.

## 2.6 Surrounding Land Use

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

- North – A closed road (Burley Road), with overgrown vegetation and commercial warehouses beyond;
- South – vacant (undeveloped) commercial/industrial land, with commercial warehouses beyond;
- East – A high-voltage power cable easement, with rural residential properties beyond; and
- West – Johnston Crescent, with vacant (undeveloped) commercial/industrial land beyond.

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### **3 GEOLOGY AND HYDROGEOLOGY**

#### **3.1 Regional Geology and Soils**

Regional geological and soil landscape information was reviewed for the investigation. The information was sourced from the Lotsearch report attached in the appendices. The report indicates that the site is underlain by Bringelly Shale of the Wianamatta Group, which typically consists of shale, carbonaceous claystone, claystone, laminite, lithic sandstone, and rare coal.

The report 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**

The site is located within the area of Western Sydney included in the Salinity Potential in Western Sydney Map (2002)<sup>13</sup>. Based upon interpretation from the geological formations and soil groups presented on the map, the site is located in a region of moderate to high 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.

Areas of high potential occur where soil, geology, topography and groundwater conditions predispose a site to salinity. These areas most commonly occur on lower slopes and drainage systems where water accumulation is high. These areas are most likely to occur in lower slopes, foot slopes, floodplains and creek lines where run-off is high, resulting in seasonally high water tables and soil saturation.

JKE note that the site has also been filled with clay, siltstone and sandstone sourced from other developments within Greater Sydney, including from properties in Willoughby, Merrylands and Castle Hill, along with site-won materials.

Review of the Salinity Potential Map indicates that Castle Hill is mapped in an area of very low to moderate salinity potential and Merrylands is mapped in an area of moderate salinity potential. Willoughby is not located within the mapped boundaries of the Salinity Potential Map.

#### **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.

ASS planning information presented in the Lotsearch report indicated that the site is not located within an ASS risk area. ASS risk areas were not identified within 500m of the site.

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<sup>13</sup> DIPNR, (2002). *1:100,000 Map – Salinity Potential in Western Sydney*, (referred to as Salinity Potential Map)

### 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 eight registered bores within the report buffer of 2km. In summary:

- The nearest registered bore was located approximately 800m to the west of the site. This included four nested wells;
- All of the bores were registered for monitoring purposes;
- There were no nearby bores (i.e. within 2km) registered for domestic or irrigation uses;
- The drillers log information from the closest registered bores typically identified fill and/or clay soil to depths of approximately 1mBGL, underlain by siltstone and sandstone bedrock. The standing water level (SWL) reported for the nested wells was approximately 2.89mBGL; and
- The reported salinity concentrations for groundwater in the nearest bores ranged from 1,970mg/L to 22,900mg/L.

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 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.

Based on multiple lines of evidence (topographic mapping, historical maps and imagery, site observations), JKE is of the opinion that the groundwater is likely to flow to the north-west, towards Ropes Creek. A groundwater contour plan has been prepared based on the SWLs recorded during groundwater sampling. The contour plan indicates the groundwater generally flows to the west, with localised flows towards the north-west and south-west. The contour plan is shown on Figure 3 attached in Appendix A. The localised flow towards the south-west may be attributable to the locality of a former ephemeral creek (discussed further in Section 3.5) and the considerable landform changes that have historically occurred on-site and in the surrounding areas.

### 3.5 Receiving Water Bodies and Surface Water Run-off

Surface water bodies were not identified in the immediate vicinity of the site. The man-made sediment detention basin located in the north-west corner of the site is not considered to be a naturally occurring water body. A review of the historical aerial photographs presented in the Lotsearch report indicate that prior to the extensive development of the site circa 1961, there were no naturally occurring water bodies on the subject site. The closest surface water body is Reddy Creek, located approximately 550m to the east of the site. This is up-gradient from the site and is not considered to be a potential receptor.

An ephemeral tributary of Ropes Creek is mapped approximately 120m to the west of the site. However, the tributary was not identified during the inspection of the immediate surrounds. Evidence of filling was observed in the surrounds within the vicinity of the mapped ephemeral tributary.



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As noted above, the groundwater generally flows towards Ropes Creek, which may be a potential receptor for groundwater movement.

Based on the current site conditions, rainfall is expected to infiltrate the site surface. In periods of heavy and/or prolonged rainfall, surface water run-off is expected to eventuate in the drainage channels along perimeter of the levelled area and flow to the sediment basin located in the north-west corner of the site.

## 4 SAMPLING AND ANALYSIS PLAN

### 4.1 Soil Sampling Rationale

The investigation included soil sampling from 20 locations placed on a regular grid pattern as shown on Figure 2 attached in the appendices. This density is equivalent to approximately 2-3 sampling points per hectare (the area of the site is approximately 8.206 hectares) and meets the requirements for an 'initial site investigation' recommended in the DLWC 2002 document for 'moderately intensive construction'. 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 12m below existing ground level. This was considered adequate as the proposed development includes cut and filling to approximately 1.5m (cut to a depth of approximately 1.5m in the south of the site, and approximately 1.5m of filling in the north of the site), with localised deeper cutting to approximately 4m in the south-west of the site and localised thicker filling up to approximately 3.5-4m in the existing detention basin located in the north-west of the site.

The borehole depths typically targeted approximately 1m below the maximum depth of cut proposed (or prior auger refusal). Selected boreholes were drilled to approximately 12m below existing ground level (or prior auger refusal) for the installation of groundwater monitoring wells.

The following areas were excluded from the assessment:

Table 4-1: Exclusion Areas

Area	Description
Dam sediments and dam walls	The sediments and walls of the existing on-site detention basin (Dam 1) were not sampled due to access limitations. Once the walls and sediments are accessible (i.e. after dewatering of the dam), additional sampling should be undertaken prior to filling to confirm the salinity and aggressivity classification of the soils.
Vegetated areas	The vegetated areas along the northern, eastern and south-eastern boundaries were not assessed. The vegetated areas were located on the high-side of retaining walls along the northern and eastern boundaries, whilst the south-eastern boundary comprised a vegetated batter slope, with an environmental protection area beyond. These areas are not proposed to be disturbed as part of the proposed development and further work is not recommended in these areas.

### 4.2 Soil Sampling Methods

Fieldwork for this investigation was undertaken between 18 March 2024 and 20 March 2024. Sampling locations were set out using a differential GPS unit (with a typical accuracy of  $\pm 30$ mm). Locations were marked using spray paint and were cleared for underground services prior to drilling.

The sample locations were drilled using a truck-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.

Soil samples were collected from the fill soils and natural soil and rock 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 glass jars with plastic caps and Teflon seals with minimal headspace. 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**

The assessment included the installation of three groundwater monitoring wells (MW1, MW2 and MW15) and sampling from three existing groundwater monitoring wells (S3-06 to S3-08) spread across the site as shown on Figure 2 attached in the appendices. The wells were positioned for site coverage to establish baseline conditions.

### **4.4 Surface Water Sampling Rationale**

The assessment included surface water sampling from one sediment basin (Dam 1) located in the north-west of the site, as shown on Figure 2 attached in the appendices. No other surface waters were identified on-site or in the immediate vicinity of the site.

### **4.5 Monitoring Well Installation**

The monitoring well construction details are documented on appropriate borehole logs presented in the appendices. The wells installed by JKE were constructed to depths of approximately 9.5m to 12mBGL. The wells were generally constructed as follows:

- 50mm diameter Class 18 PVC (machine slotted screen) was installed in the lower section of the well to intersect groundwater;
- 50mm diameter Class 18 PVC casing was installed in the upper section of the well (screw fixed);
- A 2mm sand filter pack was used around the screen section for groundwater infiltration;
- A hydrated bentonite seal/plug was used on top of the sand pack to seal the well; and
- A gatic cover was installed at the surface with a concrete plug to limit the inflow of surface water.

The monitoring well heads were surveyed using a differential GPS unit (typical accuracy of  $\pm 30$ mm) by JKE on 20 March 2024. The locations were recorded with reference to GDA2020. The surface levels are shown on the borehole logs attached in the appendices and summarised in the following table:



Table 4-2: Monitoring Well Head Survey Summary

MW ID	Eastings	Northings	Surface RL (mAHD)
BH/MW1	298739.618	6254588.42	83.9m
BH/MW2	298761.703	6254705.612	83.1m
BH/MW15	298956.848	6254617.395	84.5m
S3-06	298804.395	6254612.315	84.0m
S3-07	298868.503	6254765.515	82.6m
S3-08	299072.729	6254736.588	83.7m

#### 4.6 Monitoring Well Development and Water Sampling

The monitoring wells were developed using a submersible electric pump on 21 March 2024. A secondary round of development was undertaken using the same methods on 25 March 2024. Groundwater samples were obtained from the monitoring wells using low-flow sampling equipment (a peristaltic pump and a bladder pump) on 27 March 2024. A grab sample of the surface water within the detention basin was obtained using a dedicated disposable polyethylene bailer on 27 March 2024.

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 and field calibration information are attached in the appendices. The samples were preserved in accordance with the requirements detailed in AS/NZS 5667.1-1998<sup>14</sup> 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.

#### 4.7 Laboratory Analysis

Samples were analysed by Envirolab Services Pty Ltd (NATA accreditation number 2901). Reference should be made to the laboratory reports (Ref: 347259 and 347659) attached in the appendices for further details of the analytical methods.

#### 4.8 Analytical Schedule

The analytical schedule is outlined in the following table:

<sup>14</sup> 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)



Table 4-3: Analytical Schedule

Analyte	Fill Samples	Natural Soil Samples	Natural Bedrock Samples	Groundwater Samples	Surface Water Samples
pH	71	2	44	6	1
EC	71	2	44	6	1
Resistivity	71	2	44	-	-
Texture (used to determine EC extract – ECe)	71	2	44	-	-
Sulphate	71	2	44	6	1
Chloride	71	2	44	6	1
Cation Exchange Capacity (CEC)	35	1	6	-	-

## 5 SITE ASSESSMENT CRITERIA (SAC)

### 5.1 Soil Salinity and Plant Growth

The 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 <sup>1</sup>
<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)<sup>15</sup> presented below:

Table 5-2: Plant Response to Soil pH

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

<sup>15</sup> 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)<sup>16</sup> 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)<sup>17</sup>. 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.

<sup>16</sup> Metson, A.J, (1961). *Methods of Chemical Analysis for Soil Survey Samples* (referred to as Metson 1961)

<sup>17</sup> 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<sup>18</sup>) 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<sup>19</sup>) 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 ( $\mu\text{S}/\text{cm}$ )
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:

<sup>18</sup> Charman, P.E.V and Murphy, B.W (eds), (2000). *Soils: Their Management and Properties*, (referred to as Charman and Murphy 2000)

<sup>19</sup> 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 <sup>1</sup>
<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 <sub>4</sub> )		pH	Chlorides in Groundwater (ppm)	Soil Conditions A <sup>1</sup>	Soil Conditions B <sup>2</sup>
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 (e.g. sands and gravels) which are in groundwater

2 - Low permeability soils (e.g. 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 <sup>1</sup>	Soil Conditions B <sup>2</sup>
	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



Exposure Conditions				Exposure Classifications	
pH	Chlorides		Resistivity (ohm.cm)	Soil Conditions A <sup>1</sup>	Soil Conditions B <sup>2</sup>
	In Soil (ppm)	In Groundwater (ppm)			
<3	>50,000	>20,000	<1,000	Severe	Moderate

**Notes:**

1 - High permeability soils (e.g. sands and gravels) which are in groundwater

2 – Low permeability soils (e.g. 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)
Fill	<p>Fill material was encountered at the surface in all boreholes and extended to depths of approximately 0.2mBGL to 8mBGL.</p> <p>The fill typically comprised of: silty clay; sandy clay; gravelly sand; and clayey sand. The fill contained inclusions of: igneous, sandstone and siltstone gravel; metal fragments; sand; and ash.</p> <p>No odorous or stained fill soils were encountered during the investigation.</p>
Natural Soil	Residual silty clay was encountered beneath the fill in BH4 at a depth of approximately 1mBGL. The silty clay profile extended to a depth of approximately 2.2mBGL. No odorous or stained residual soils were encountered during the investigation.
Bedrock	Extremely weathered siltstone was encountered beneath the fill and residual soils and extended to the maximum terminal depth of the boreholes at approximately 12mBGL.
Groundwater	Groundwater seepage was encountered in BH15 at a depth of approximately 9mBGL. All remaining boreholes remained dry on completion of drilling and a short time after.

### 6.2 Salinity Results

A summary of the results is presented below.

Table 6-2: Summary of Laboratory Results

Analyte	Results
EC & ECe	<p>The EC results ranged from 73<math>\mu</math>S/m to 770<math>\mu</math>S/m.</p> <p>The ECe results ranged from &lt;2dS/m to 7.8dS/m.</p>
Resistivity	Resistivity values were calculated based on the raw EC values. The resistivity values for the soil samples ranged from 1,299ohm.cm to 13,699ohm.cm.
pH	The results of the analysis ranged from 4.4 to 9.8.
CEC	<p>The results of the analysis ranged from:</p> <ul style="list-style-type: none"> <li>• CEC – &lt;1meq/100g to 27meq/100g;</li> <li>• Exchangeable Na – &lt;0.1meq/100g to 6.5meq/100g;</li> <li>• Exchangeable K – &lt;0.1meq/100g to 0.6meq/100g;</li> <li>• Exchangeable Ca – 0.2meq/100g to 23meq/100g; and</li> <li>• Exchangeable Mg – 0.2meq/100g to 11meq/100g.</li> </ul>



Analyte	Results
Sulphate	The results ranged from <10mg/kg to 920mg/kg.
Chloride	The results ranged from <10mg/kg to 7,300mg/kg.
Groundwater	The results of the analysis ranged from: <ul style="list-style-type: none"><li>• pH – 6.7 to 7.5;</li><li>• EC – 6,600µS/cm to 17,000µS/cm;</li><li>• Chloride – 1,500mg/L to 5,100mg/L; and</li><li>• Sulphate – 2mg/L to 590mg/L.</li></ul>
Surface water (detention basin)	The results of the analysis were as follows: <ul style="list-style-type: none"><li>• pH – 7.7;</li><li>• EC – 270µS/cm;</li><li>• Chloride – 28mg/L; and</li><li>• Sulphate – 47mg/L.</li></ul>

**Note:**

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

## 7 RESULTS INTERPRETATION

The 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 E <sub>Ce</sub> results generally ranged from <2dS/m to 7.8dS/m. The majority of the samples were classed as slightly saline. Sixteen (16) soil samples collected from various boreholes and depths across the site were classed as moderately saline. With the exception of BH14, the salinity values generally decreased with depth.
Soil pH and Plant Growth	<p>The soil pH results ranged from 4.4 to 9.8 and are classed as extremely acidic to very strongly alkaline. The majority of the surficial soils were generally within the strongly to very strongly alkaline for plant growth.</p> <p>The acidic conditions generally increased to a depth of approximately 2mBGL, before returning to generally alkaline conditions. The proposed excavations will expose acidic and alkaline soils, and may require treatment with lime or gypsum in order to make the soils suitable for plant growth.</p>
CEC in Soil	The CEC values ranged from <1meq/100g to 27meq/100g in the very low to high range. The majority of the samples were within the low to moderate 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 have more calcium than magnesium. The CEC of the soil is generally low to moderate. 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 3% to 34.2%. The majority of the ESP results were above the 6% threshold and were classed as sodic to highly sodic.
Groundwater Salinity	The laboratory results indicate that the groundwater is generally saline and within the 'saline' water type.
Surface Water Salinity	The laboratory results indicate that the surface water in Dam1 is non-saline and within the 'freshwater' water type.
Concrete Slabs and Footings in Saline Soils (CCAA 2018)	<p>The proposed earthworks are anticipated to expose soils generally classed as slightly saline, with localised occurrences of moderately saline. The CCAA 2018 recommended concrete grade for slabs and footings in moderately saline soils is N25. The results should be assessed by the project design team as applicable for the proposed development.</p> <p>Reference should also be made to AS2159-2009 for minimum concrete strengths and reinforcement cover for concrete piles/foundations.</p>
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.

Parameter	Notes
<p>Exposure Classification for Concrete Piles/Foundations (AS2159-2009)</p>	<p>The soil pH and sulphate results indicate that the soils are generally mildly aggressive towards buried concrete. The results indicate that soils in the vicinity of BH1 (2.3-2.5m) are moderately aggressive towards buried concrete.</p> <p>The groundwater pH, sulphate and chloride results indicate that the groundwater is non-aggressive towards buried concrete.</p> <p>The results should be assessed by the project design team as applicable for the proposed development.</p>
<p>Exposure Classification for Steel Piles/Foundations (AS2159-2009)</p>	<p>The soil resistivity, pH and chloride results indicate that the soils are mildly aggressive towards buried steel.</p> <p>The groundwater pH and chloride results indicate that the groundwater is non-aggressive towards buried steel.</p> <p>The results should be assessed by the project design team as applicable for the proposed development.</p>

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## 8 CONCLUSIONS

### 8.1 ASS Conditions

Based on the information reviewed for this assessment, JKE is of the opinion that there is a very low potential for ASS materials to be disturbed during the proposed development works described in Section 1.2 of this report. This conclusion is based on the following:

- The ASS risk mapping indicates that the site is located within an area of no known occurrence of ASS;
- The borehole logs for the investigation indicate the site is underlain by fill soils and/or residual soils over siltstone bedrock. ASS materials are not usually associated with residual soil profiles;
- The imported clay, siltstone and sandstone fill were sourced from approved properties in Willoughby and Merrylands. These properties were located in areas of no known ASS occurrence;
- No visible or olfactory indications of ASS were encountered during the investigation;
- The regional geological information indicates that the site is underlain by Bringelly Shale; and
- The site is located at approximately 82m to 86m AHD, with excavations to up to approximately 4-5mBGL (i.e. excavations extent to approximately 77mAHD). ASS materials are not usually associated with soil horizons above 5m AHD.

Based on this information, further intrusive investigation and/or an ASSMP is not considered necessary for the proposed development.

### 8.2 Salinity Conditions

The investigation identified the following salinity conditions:

- The soils are classed as extremely acidic to very strongly alkaline;
- The soils are generally classed as slightly to moderately saline;
- The soils are generally sodic to highly sodic;
- The soils are generally mildly aggressive towards buried concrete. Localised occurrences of soils classed as moderately aggressive towards buried concrete were encountered in the south-west of the site;
- The soils are mildly aggressive towards buried steel;
- The groundwater is classed as saline;
- The groundwater is non-aggressive towards buried concrete; and
- The groundwater is non-aggressive towards buried steel.

Based on the results of this investigation, JKE is of the opinion that a SMP is required for the proposed development. The SMP is presented in Section 9 of this report.

## 9 SALINITY MANAGEMENT PLAN (SMP)

Salinity management recommendations outlined in this section have been designed generally in accordance with the amended Salinity Code of Practice. These recommendations should be reviewed (and if necessary, revised) in the event of any changes to the proposed development at the site. The recommendations should be assessed by the project design team as applicable for the proposed development.

Reference should also be made to the recommendations outlined in other relevant documentation, including but not limited to the local council salinity control/management plan, development consent conditions, geotechnical reports and landscape design documentation.

### 9.1 Earthwork Recommendations

The earthwork recommendations are summarised in the table below:

Table 9-1: Earthwork Recommendations

Aspect	Recommendations
Earthworks Contractor	The salinity conditions and recommendations outlined in this section of the report should be reviewed by the earthworks contractor prior to the commencement of development works.
Bulk Earthwork Overview	Cut and fill earthworks are anticipated for the proposed development. The development generally includes cuts to depths of approximately 1.5mBGL in the southern sections of the site and approximately 1.5m of fill in other sections of the site. Localised deeper cuts to approximately 4-5mBGL are proposed in the south-west of the site, and up to 3.5-4m of filling is required to fill the existing detention basin in the north-west of the site. JKE anticipate that the cut material will be used as fill and note that the proposed cut volume exceeds the estimated fill volume. Importation of material from an external source is not expected to be required.
Cuts	Cuts within the site will expose slightly and moderately saline soils, and soils which are generally mildly aggressive towards buried concrete and steel. Cuts within the south-west of the site (in the vicinity of BH1) to depths greater than approximately 1.8mBGL will expose soils which are moderately aggressive towards concrete.  An appropriate concrete strength should be used for infrastructure which comes into contact with moderately saline soils exposed by cuts.
Filling	Approximately half of the site will be filled to achieve the final development level. Fill material sourced from the south-west of the site (in the vicinity of BH1) should be placed back at depth so as to minimise adverse salinity conditions associated with moderately saline soils and soils which are moderately aggressive towards buried concrete.  Fill material imported onto the site must comply the importation criteria for salinity as outlined in Section 10.
Staging of Works	Earthworks should be staged (where possible) to reduce the time of exposure of subsoils to erosion by wind and rain.
Erosion and Sediment Control	An erosion and sediment control plan should be prepared prior to the commencement of earthworks. The plan should be implemented during the development to manage and control sediment discharge from the site.

Aspect	Recommendations
	<p>The plan should remain in place during the earthworks phase until the pavement construction works are completed.</p> <p>All batter slopes should be stabilised to control erosion during development and post earthworks (refer to the Blue Book 2004).</p> <p>Erosion control for stockpiles and disturbed areas should be planned during the development including the grading and sealing of partially completed earthwork surfaces during construction (refer to the Blue Book 2004).</p>
Gypsum and/or Lime Treatment	<p>Sodic and highly dispersive soils can be treated by gypsum and/or lime. This will increase the proportion of exchangeable calcium in the soil and reduce the degree of sodicity (and thereby dispersivity) in areas where cut faces will be exposed.</p> <p>The amount of lime/gypsum to be added will vary with the soil and tests should be undertaken prior to, and during, the proposed earthworks to assess the appropriate quantity of lime/gypsum.</p>

## 9.2 Site Drainage, Surface Water and Storm Water Run-off

The recommendations for site drainage are summarised in the table below:

Table 9-2: Recommendations for Site Drainage

Aspect	Recommendations
Earthworks Contractor	The salinity conditions and recommendations outlined in this section of the report should be reviewed by the earthworks contractor prior to the commencement of development works.
Drainage Patterns	The proposed earthworks should be designed to utilise the existing surface drainage systems (drainage channels, detention basin) to the extent practicable. Where required, appropriate artificial drainage should be installed to minimise water logging and localised flooding.
Installation of Sub-soil Drains	<p>Subsoil drains should be provided in areas where seepage discharge from the underlying natural soil may occur, such as retained cuts, cut slopes, or significant changes in grade, etc.</p> <p>Slabs, foundations and retaining walls should be designed with subsoil drains and good drainage to avoid water logging.</p>
Surface water and Storm water run-off	<p>Stormwater should be managed appropriately in order to reduce infiltration. Stormwater infrastructure should be designed to minimise leakage. Guttering and down pipes should be properly connected and maintained at all times.</p> <p>Surface water runoff should be directed around all stockpiles and work areas.</p>

### 9.3 Design of Built Structures

The design of built structures should incorporate the following:

Table 9-3: Recommendations for Built Structures

Aspect	Recommendations
Structural Advice	The salinity conditions and recommendations outlined in this section of the report should be reviewed by a qualified structural/civil engineer prior to the commencement of development.
Damp Proof Course (DPC)	Appropriate damp proof course (DPC) and moisture barriers should be used as outlined in the WSROC document ' <i>Western Sydney Salinity Code of Practice, June 2003</i> ' and other relevant building codes and industry standards.
Exposure Class Masonry and Admixtures	Where required under the relevant building codes and standards, exposure class masonry must be used below the DPC, including for strip footings. This is especially important in areas where landscaping is located adjacent to built structures. An appropriate mortar and mixing ratio must be used with exposure class masonry. Admixtures for waterproofing and/or corrosion prevention should be used where necessary.
Adequate Drainage around Built Structures	Care should be taken to check that the infrastructure design process considers the existing patterns of surface and subsurface water movement through the site during both dry and wet periods.  Construction of infrastructure, which may cause an increase in areas of surficial water logging through poor surface drainage, may cause the groundwater table to rise.
Durability of Concrete Piles/Foundations	The soils are generally classed as mildly aggressive towards buried concrete. Localised occurrences of soils classed as moderately aggressive towards buried concrete were encountered in the south-west of the site. The groundwater is classed as non-aggressive towards buried concrete. The appropriate concrete strength and corrosion allowance outlined in the AS2159-2009 should be adopted.  The CCAA 2018 publication recommends a concrete grade of N25 for slabs and footings exposed to moderately saline soils.  The results should be assessed by the project design team as applicable for the proposed development.
Durability of Steel Piles/Foundations	The soils are classed as mildly aggressive towards buried steel. The groundwater is classed as non-aggressive towards buried steel. Appropriate corrosion allowance for steel outlined in the AS2159-2009 should be adopted.  The results should be assessed by the project design team as applicable for the proposed development.

## 9.4 Gardens and Landscaped Areas

The recommendations for the design of gardens and landscaped areas are summarised in the table below:

Table 9-4: Recommendations for Gardens and Landscaped Areas

Aspect	Recommendations
Arborist Advice	The salinity conditions and recommendations outlined in this section of the report should be reviewed by a qualified Arborist/landscape designer prior to the commencement of development.
Retention of Existing Vegetation	<p>Areas of established vegetation especially deep rooted trees should be retained. Deep rooted trees generally draw water from the underlying natural soils and possibly the deeper groundwater system. Hence preventing the groundwater table from rising.</p> <p>Consideration should be made to plant deep rooted native trees in areas predisposed to salinity.</p>
Selection of Plants and Topsoil	<p>The fill at the site is generally slightly to moderately saline, extremely acidic to very strongly alkaline and sodic to highly sodic. These conditions are not considered favourable for plant growth.</p> <p>Nutrient rich topsoil should be used to promote plant growth in landscaped areas. Special attention should be paid to soil fertility to promote optimal conditions for successful revegetation. Suitable native plant species which require minimal watering should be established in landscaped areas.</p> <p>Topsoil imported onto the site should, as a minimum, meet the importation criteria for salinity as outlined in Section 10.</p>
Landscape Design	<p>Landscaped areas and garden beds should not be located adjacent to built structures. Excessive watering of such areas can lead to rising damp in the adjacent structures resulting in potential damage to bricks, concrete, steel etc.</p> <p>In the event this is unavoidable, the landscaped areas and garden beds should be lowered such that soil in contact with built structures is below the damp proof course (DPC). Exposure grade bricks should be used below the DPC to minimise damp rise and potential damage.</p>
Irrigation of Landscaped and Garden Areas	The use of potable water for irrigation should be kept to a minimum. This can be achieved by incorporating 'waterwise' gardening principles which include using sprinklers and drip irrigation system activated by timers etc. Irrigation systems should be periodically checked to ensure there is no leakage.
Use of 'Grey' water	Many new developments are encouraged to use recycled water or 'grey' water for irrigation purposes. Recycled water (grey water) is generally more saline than potable water and excessive use may result in increasing soil and groundwater salinity. In order to minimise potential plant dieback, consideration should be given to planting native salt tolerant plant species which require minimal watering. Advice from a qualified Arborist should be obtained for the conditions encountered at the site.

## 9.5 Roads, Footpaths and Hardstand Areas

The recommendations for the design of road, footpaths and hardstand areas are summarised in the table below:

Table 9-5: Recommendations for Roads, Footpaths and Hardstand Areas

Aspect	Recommendations
Earthworks Contractor	The salinity conditions and recommendations outlined in this section of the report should be reviewed by the earthworks contractor prior to the commencement of development works.
Graded Surfaces	All roads, pavements, footpaths and hardstand areas should be graded to prevent surface water ponding. Subsoil drains should be provided in all such areas to collect stormwater and surface water run-off.
Corrosion of Concrete and Steel	Concrete and steel used in footpaths, road side kerbs, gutters etc. should be designed to withstand the saline and aggressive conditions encountered at the site. Reference should be made to Sections 7 and 0 for further information.  The results should be assessed by the project design team as applicable for the proposed development.
Installation of Services	Services should be installed in joint trenches and conduits. The conduits should be installed under and across roads at the time of construction of the road and associated roadside landscaping to reduce future works within the road corridor.
Design of Landscaped Areas	Landscaped areas in the vicinity of roads, car parks and hardstands should be designed as outlined in Section 9.4.

## 9.6 Ongoing Management

Salinity is a natural phenomenon which can change over time especially during extreme dry and wet periods. Regular inspections and maintenance of facilities should be undertaken in order to identify issues at an early stage. Early detection and prevention of adverse salinity conditions is important to ongoing management. A few key ongoing management aspects are discussed in the table below.

Table 9-6: Key Ongoing Management Aspects

Aspect	Recommendations
Groundwater Management	A rising groundwater table may lead to adverse salinity conditions as the groundwater is considered to be saline. However, it is acknowledged that the groundwater is non-aggressive towards buried concrete and steel. This can change over time, more so in dry conditions when salts tend to accumulate in groundwater.  Planning and design should involve management of factors that could lead to a rise in the groundwater table level. Such measures include reducing the importation of potable water to the site, reduction of irrigation requirements, avoiding the use of infiltration pits to disperse surface water and preventing leakage from wetland and bioretention basins. JKE note that the proposed development involves the construction of several data centre buildings and associated roadways. Landscaped areas are expected to be limited to the landscape setback around the boundaries of the site, within the asset protection zone (buffer) in the south-east of the site, and possibly formed gardens near the buildings.



Aspect	Recommendations
	<p>Watering activities associated with the landscaped areas will tend to increase groundwater recharge. Subsoil drains should be installed in these areas so as to avoid excessive recharge of the groundwater system, reduce the potential for water logging and also increase the potential for on-site water recycling.</p>
Salinity Compliance	<p>Compliance documentation is recommended to verify that the management recommendations outlined in this report are implemented. If compliance input/documentation is required from JKE, we would need to be engaged for this work at the commencement of the development. At this time, a site specific compliance checklist would be provided. The checklist should be completed by the relevant contractors (i.e. earthworks, structural design, landscape, architects etc) after the completion of each stage of the development. JKE would typically not be in a position to provide a compliance 'sign-off' if we were not involved during the earthworks and construction phases of the project.</p> <p>In the event that an alternative consultant is selected to provide compliance documentation, we would strongly recommend that the consultant is engaged prior to the commencement of works.</p>
Routine Inspections	<p>Routine inspections of drainage facilities, landscaped areas, batter slopes, cut faces, roads, walkways, pavements and hardstand areas should be undertaken by maintenance staff. A checklist of adverse salinity indicators should be maintained during the inspections.</p> <p>A qualified environmental consultant should be contacted in the event any of the salinity indicators are identified at the site.</p>

## 10 SOIL SALINITY IMPORTATION CRITERIA

The proposed development may require importation of fill/topsoil material to achieve the desired surface finishes. JKE note that the preliminary cut/fill balance indicates an excess of material. Therefore, importation of fill/topsoil is likely to be limited to the extent necessary for suitable planting mediums for landscaped areas. Additional importation of fill may also be required depending on the staging of earthworks.

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 10-1: 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.

---

## 11 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 patterns can also impact the salinity at the site. The results outlined in this report are a snapshot 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 recommendations 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.



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## 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, e.g. addition of basement levels, or deeper filling/cut excavations; 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.



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### **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.



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## Appendix A: Report Figures



AERIAL IMAGE SOURCE: MAPS.AU.NEARMAP.COM

**LEGEND**

 SITE BOUNDARY

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

Title: <b>SITE LOCATION PLAN</b>	
Location: 16 JOHNSTON CRESCENT, HORSLEY PARK, NSW	
Project No: E36628BR	Figure No: 1

**JKEnvironments**





PLOT DATE: 11/04/2024 1:45:16 PM DWG FILE: K:\SC EIS JOBS\36000\36028BR\HORSLEY PARK\CAD\E36628BR.DWG

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)
	S3-06 GROUNDWATER MONITORING WELL LOCATION, NUMBER AND DEPTH OF FILL (m) (ERM, 2023)

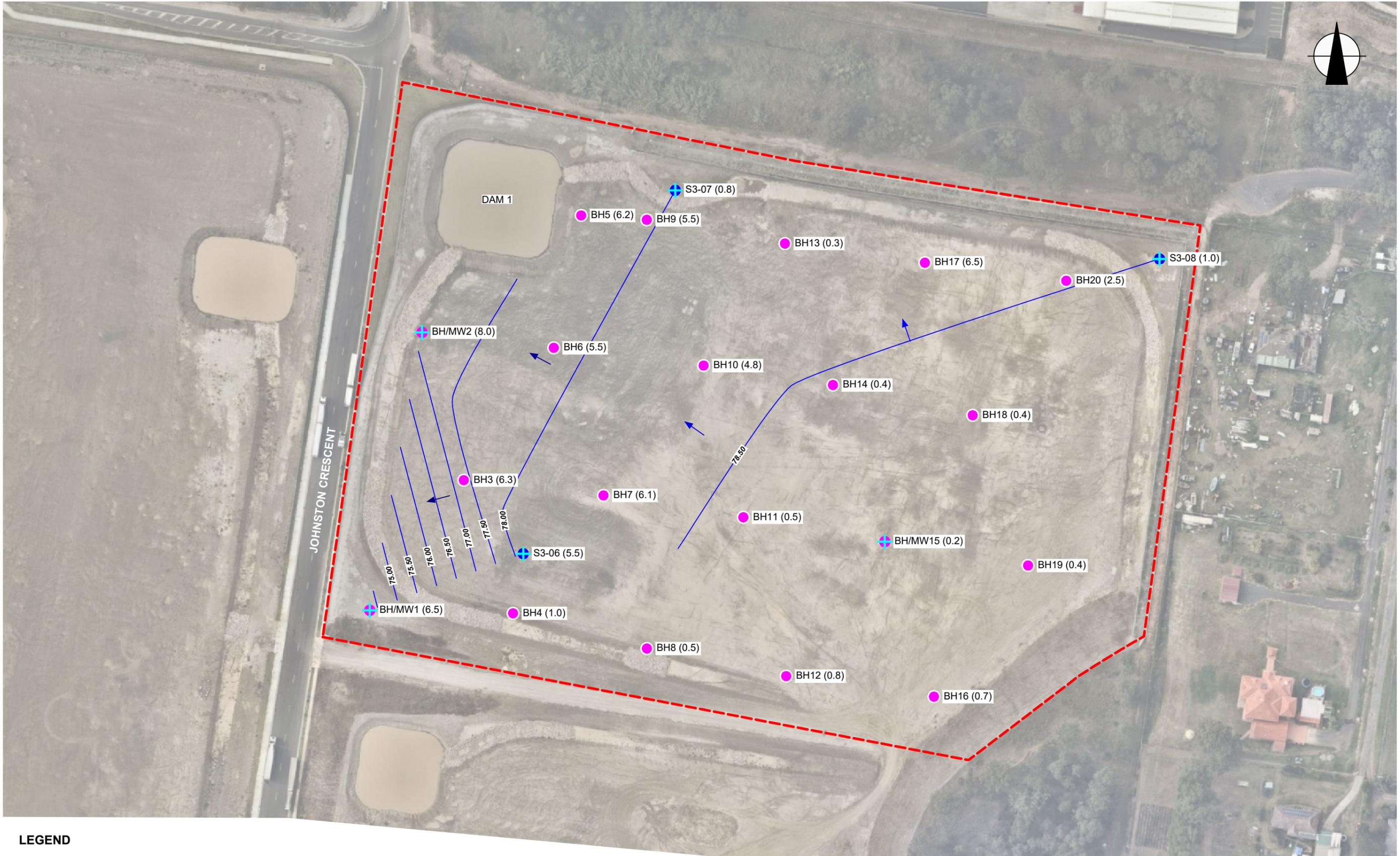
AERIAL IMAGE SOURCE: MAPS.AU.NEARMAP.COM

SCALE 1:1500 @A3 METRES

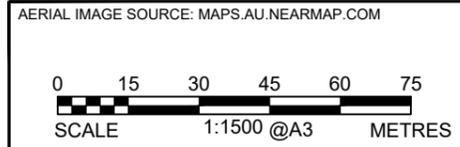
This plan should be read in conjunction with the Environmental report.

Title: <b>SAMPLE LOCATION PLAN</b>	
Location: 16 JOHNSTON CRESCENT, HORSLEY PARK, NSW	
Project No: E36628BR	Figure No: 2
<b>JKEnvironments</b>	





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)
	S3-06 GROUNDWATER MONITORING WELL LOCATION, NUMBER AND DEPTH OF FILL (m) (ERM, 2023)
	78.0 GROUNDWATER CONTOUR INTERVALS (m)
	INFERRED GROUNDWATER FLOW DIRECTION



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

Title: <b>GROUNDWATER CONTOUR PLAN</b>	
Location: 16 JOHNSTON CRESCENT, HORSLEY PARK, NSW	
Project No: E36628BR	Figure No: 3
<b>JKEnvironments</b>	

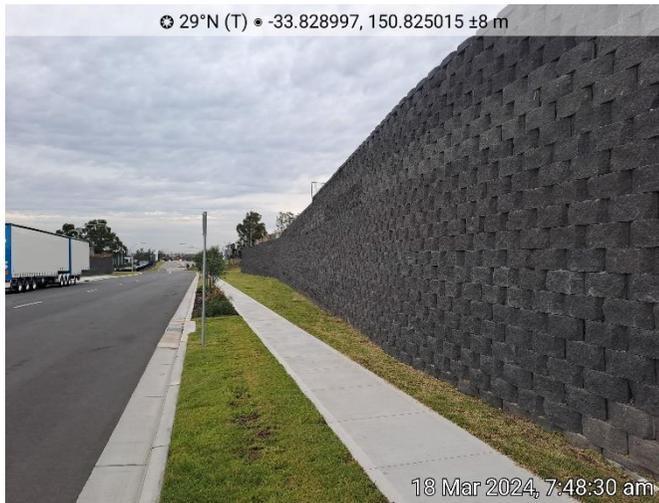


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## Appendix B: Selected Site Photographs



Photograph 1: Retaining wall along Johnston Crescent



Photograph 2: Retaining wall along Burley Road



Photograph 3: General site condition



Photograph 4: North-west of site showing drainage channel



Photograph 5: Sediment basin in north-west of site



Photograph 6: Sediment basin and drainage channel



Photograph 7: Newly planted vegetation along northern site boundary



Photograph 8: Newly planted vegetation with conservation area beyond



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## **Appendix C: Proposed Development Plans**

**DRAFT**



DATE	NO.	REVISION HISTORY	DRW	CHK	QA
20/12/2023	1	ISSUE	HDR	HT	HDR

- NOTE:
1. ALL DRAWINGS TO BE READ IN CONJUNCTION WITH ASSOCIATED SPECIFICATION
  2. DO NOT SCALE FROM DRAWINGS
  3. CONFIRM ALL MEASUREMENTS ON SITE
  4. CHECK ON SITE PRIOR TO CONSTRUCTION AND REPORT ANY DISCREPANCIES
  5. ENSURE COORDINATION WITH OTHER TRADES ON SITE
  6. ASL = ABOVE SLAB LEVEL

PRINCIPAL CONSULTANTS  
 Architect HDR  
 Structural TTW

PRINCIPAL CONTRACTOR

CLIENT



**NEXTDC**  
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 T: +61 7 3177 4777

PROJECT ARCHITECT



Document Author Project Number  
 10335877

Key Plan



Site: S4 Stage: NEXTDC Project Number:

Project Address:  
 321-325 BURLEY ROAD, HORSLEY PARK, NSW 2175 AUSTRALIA

Project Name:  
 NEXTDC DATA CENTRE

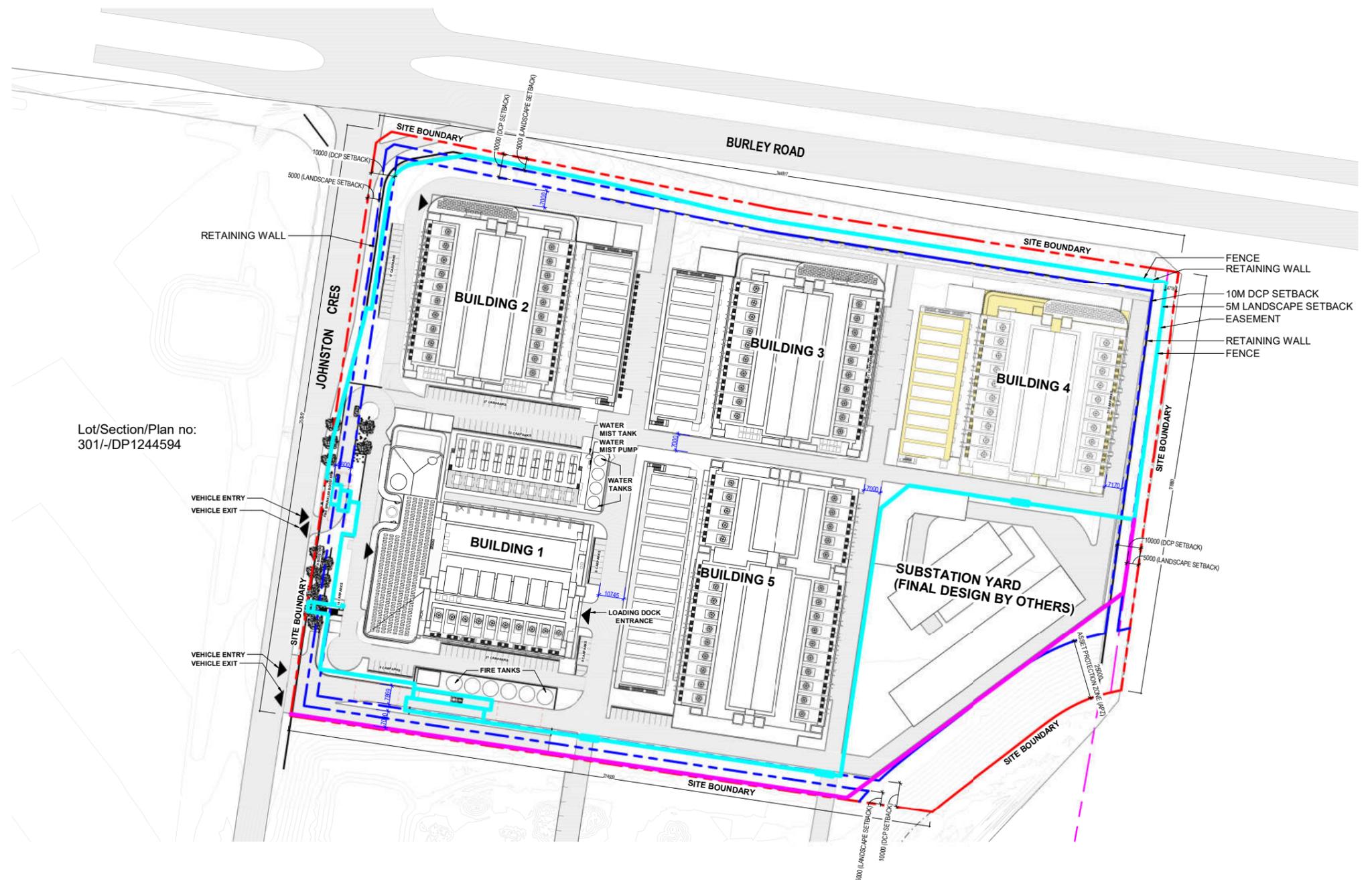
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 SITE ANALYSIS / SITE SURVEY PLAN

Drawing Status:  
**STATE SIGNIFICANT DEVELOPMENT APPLICATION (SSDA)**

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CHK	Checker	Date	20/12/2023

Scale:	1 : 2000	Sheet:	A1	File Name:	
Drawing Number	AR-000-DRG-NXT-0060	Rev	1		

**DRAFT**



Lot/Section/Plan no:  
301/-/DP1244594

**1 PROPOSED SITE PLAN**  
1:1000

LEGEND:

- 2.4M HIGH PALISADE FENCE
- 2.4M HIGH WELDED MESH FENCE
- 1.8M HIGH TEMPORARY HOARDING

Parking Schedule	
PARKING LOCATION	# OF SPOTS
BLD 01	90
BLD 02	52
BLD 03	16
BLD 04	16
BLD 05	43
PARKING LOT	70
Grand total:	287

- NOTE:
- ALL DRAWINGS TO BE READ IN CONJUNCTION WITH ASSOCIATED SPECIFICATION
  - DO NOT SCALE FROM DRAWINGS
  - CONFIRM ALL MEASUREMENTS ON SITE
  - CHECK ON SITE PRIOR TO CONSTRUCTION AND REPORT ANY DISCREPANCIES
  - ENSURE COORDINATION WITH OTHER TRADES ON SITE
  - ASL = ABOVE SLAB LEVEL

PRINCIPAL CONSULTANTS  
Architect HDR  
Structural TTW

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PROJECT ARCHITECT

Document Author Project Number  
10335877

Key Plan

Site: S4 Stage: NEXTDC Project Number:

Project Address:  
321-325 BURLEY ROAD, HORSLEY PARK, NSW 2175 AUSTRALIA

Project Name:  
NEXTDC DATA CENTRE

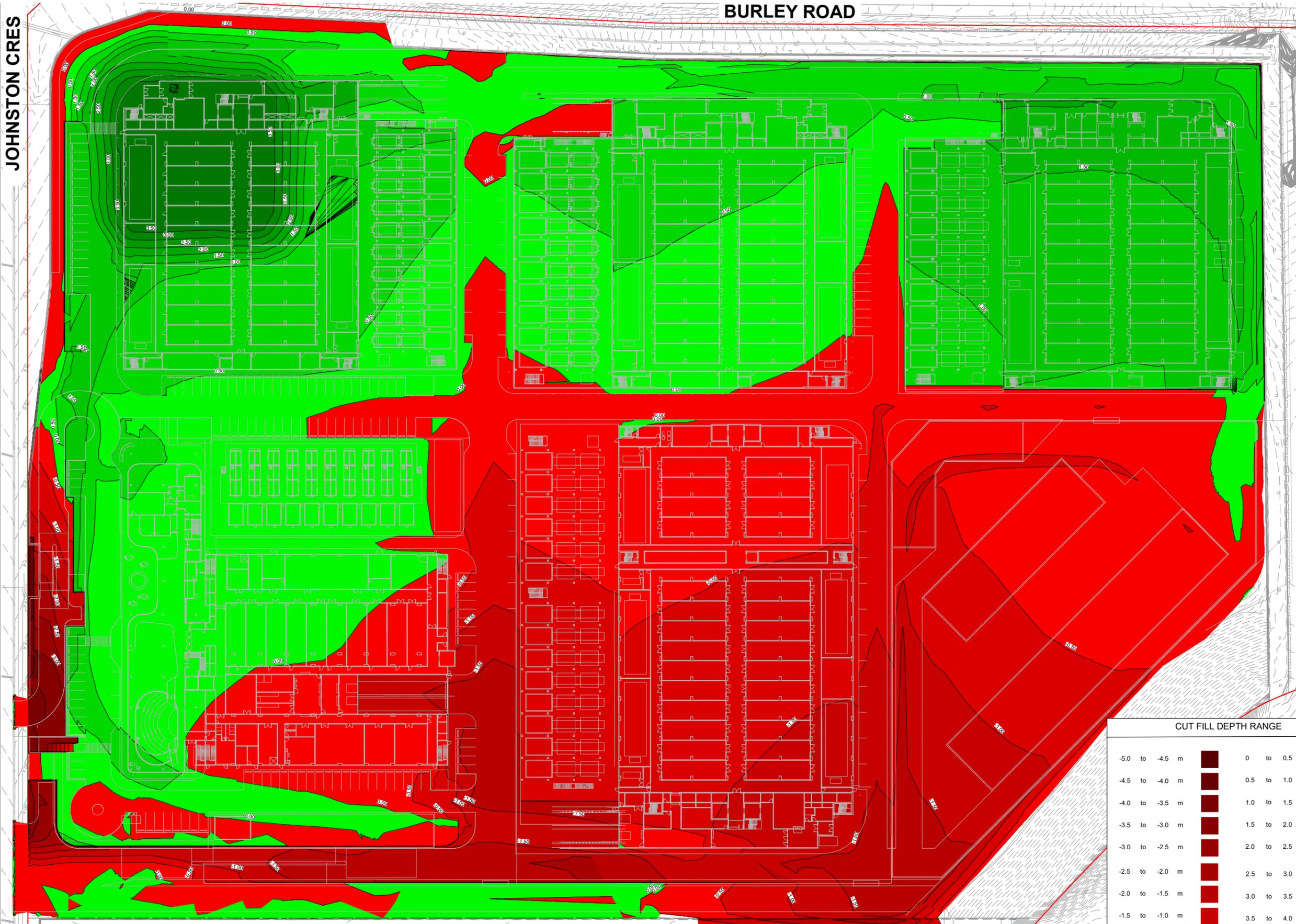
Drawing title  
PROPOSED SITE PLAN

Drawing Status:  
STATE SIGNIFICANT DEVELOPMENT APPLICATION (SSDA)

Drawn	Author	Date	20/12/2023
CHK	Checker	Date	20/12/2023
Scale:	As Indicated	Sheet:	A1
File Name:		Rev	
AR-000-DRG-NXT-0062			1

JOHNSTON CRES

BURLEY ROAD



**NOTES:**

1. BULK EARTHWORKS DEPTHS SHOWN FROM AVAILABLE SURVEY LEVELS TO FINISHED DESIGN SURFACE LEVELS
2. VOLUME CALCULATION ASSUMED 300mm SETDOWN FOR ALL PROPOSED PAVEMENTS, SLABS AND LANDSCAPING AREAS, TO BE CONFIRMED AT DETAILED DESIGN STAGE
3. BULK EARTHWORKS DEPTHS AND VOLUMES SHOWN ARE PRELIMINARY ONLY AND SUBJECT TO CHANGE AT DETAILED DESIGN STAGE
4. NOT TO BE USED FOR TENDER OR DETAILED EXCAVATION. CONTRACTOR TO UNDERTAKE THEIR OWN VERIFICATION OF CUT FILL VOLUMES.

PRELIMINARY VOLUME ANALYSIS	
	VOLUME (M <sup>3</sup> )
CUT	-37,150
FILL	22,190
BALANCE	-14,960

CUT FILL DEPTH RANGE			
-5.0 to -4.5 m	0 to 0.5 m		
-4.5 to -4.0 m	0.5 to 1.0 m		
-4.0 to -3.5 m	1.0 to 1.5 m		
-3.5 to -3.0 m	1.5 to 2.0 m		
-3.0 to -2.5 m	2.0 to 2.5 m		
-2.5 to -2.0 m	2.5 to 3.0 m		
-2.0 to -1.5 m	3.0 to 3.5 m		
-1.5 to -1.0 m	3.5 to 4.0 m		
-1.0 to -0.5 m	4.0 to 4.5 m		
-0.5 to 0 m	4.5 to 5.0 m		

PRELIMINARY

1	PRELIMINARY	JH	GC	GC	
DATE	NO	REVISION HISTORY	DRW	CHK	QA

NOTE:

1. ALL DRAWINGS TO BE READ IN CONJUNCTION WITH ASSOCIATED SPECIFICATION
2. DO NOT SCALE FROM DRAWINGS
3. CONFIRM ALL MEASUREMENTS ON SITE
4. CHECK ON SITE PRIOR TO CONSTRUCTION AND REPORT ANY DISCREPANCIES
5. ENSURE COORDINATION WITH OTHER TRADES ON SITE
6. ASL = ABOVE SLAB LEVEL

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Services AURECON

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[Contractor / Consultant / Document Author]

613 8288 3788 | Level 5, 224 Bunda St, Canberra City, ACT 2601

Document Author Project Number

Key Plan

Site: Stage: NEXTRC Project Number:

Project Address:  
16 JOHNSTON CRESCENT,  
HORSLEY PARK, NSW 2175  
AUSTRALIA

Project Name:  
NEXT DC DATA CENTRE

Drawing title  
BULK EARTHWORKS  
CUT/FILL PLAN (ULTIMATE)

Drawing Status:  
STATE SIGNIFICANT  
DEVELOPMENT APPLICATION  
(SSDA)

Drawn: JHSS Date: 2/02/2024

CHK: GC Date: 2/02/2024

Scale: 1:500 Sheet: A1 File Name:

Drawing Number: S4-CI-NXT-DRG-0000-1000 Rev: 1



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## **Appendix D: 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 quantitation 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 a concentration of 0.5mg/kg for values that are less than the practical quantitation limit.

#### *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 1**  
**SUMMARY OF SOIL LABORATORY RESULTS - EC and ECe**

Borehole Number	Sample Depth (m)	Sample Description	EC (µS/cm)	ECe (dS/m)	Salinity Class
BH1	0.0-0.1	F: sandy clay	770	6.9	MODERATELY SALINE
BH1	0.8-1.0	F: silty clay	520	4.7	MODERATELY SALINE
BH1	2.3-2.5	F: silty clay	150	<2	NON SALINE
BH1	2.3-2.5	LAB DUPLICATE	160	<2	NON SALINE
BH1	3.8-4.0	F: silty clay	600	5.4	MODERATELY SALINE
BH1	4.8-5.0	F: silty clay	450	4	MODERATELY SALINE
BH1	7.3-7.5	XW SILTSTONE	310	2.8	SLIGHTLY SALINE
BH1	10.2-10.5	SILTSTONE	160	<2	NON SALINE
BH2	0.0-0.1	F: gravelly sand	550	4.9	MODERATELY SALINE
BH2	0.8-1.0	F: sandy clay	330	3	SLIGHTLY SALINE
BH2	1.4-1.5	F: sandy clay	220	<2	NON SALINE
BH2	3.8-4.0	F: silty clay	200	<2	NON SALINE
BH2	3.8-4.0	LAB DUPLICATE	230	<2	NON SALINE
BH2	4.8-5.0	F: silty clay	360	2.1	SLIGHTLY SALINE
BH2	5.8-6.0	F: silty clay	320	2.9	SLIGHTLY SALINE
BH2	7.3-7.5	F: silty clay	450	4	MODERATELY SALINE
BH2	8.8-9.0	XW SILTSTONE	290	2.6	SLIGHTLY SALINE
BH2	11.8-12.0	XW SILTSTONE	230	<2	NON SALINE
BH3	0.3-0.5	F: gravelly sand	530	4.8	MODERATELY SALINE
BH3	0.8-1.0	F: silty clay	220	<2	NON SALINE
BH3	1.8-2.0	F: silty clay	380	3.4	SLIGHTLY SALINE
BH3	2.8-3.0	F: silty clay	360	3.2	SLIGHTLY SALINE
BH3	3.7-4.0	F: silty clay	420	2.9	SLIGHTLY SALINE
BH3	3.7-4.0	LAB DUPLICATE	410	2.9	SLIGHTLY SALINE
BH3	4.8-5.0	F: silty clay	380	2.6	SLIGHTLY SALINE
BH3	5.7-6.0	F: silty clay	400	2.8	SLIGHTLY SALINE
BH3	6.7-7.0	XW SILTSTONE	220	<2	NON SALINE
BH4	0.0-0.1	F: silty clay	460	3.2	SLIGHTLY SALINE
BH4	0.8-1.0	F: silty clay	460	3.2	SLIGHTLY SALINE
BH4	1.4-1.5	SILTY CLAY	490	3.4	SLIGHTLY SALINE
BH4	1.8-2.0	SILTY CLAY	430	3	SLIGHTLY SALINE
BH4	2.4-2.5	XW SILTSTONE	390	2.7	SLIGHTLY SALINE
BH4	2.8-3.0	XW SILTSTONE	300	2.7	SLIGHTLY SALINE
BH4	3.8-4.0	XW SILTSTONE	270	2.4	SLIGHTLY SALINE
BH5	0.0-0.1	F: silty clay	390	2.7	SLIGHTLY SALINE
BH5	0.8-1.0	F: silty clay	200	<2	NON SALINE
BH5	1.3-1.5	F: silty clay	270	<2	NON SALINE
BH5	1.3-1.5	LAB DUPLICATE	270	<2	NON SALINE
BH5	1.8-2.0	F: silty clay	430	3	SLIGHTLY SALINE
BH5	2.7-3.0	F: silty clay	510	4.6	MODERATELY SALINE
BH5	3.7-4.0	F: silty clay	430	3.8	SLIGHTLY SALINE
BH5	4.8-5.0	F: silty clay	490	4.4	MODERATELY SALINE
BH5	6.8-7.0	XW SILTSTONE	180	<2	NON SALINE
BH6	0.0-0.1	F: clayey sand	500	3.5	SLIGHTLY SALINE
BH6	0.4-0.5	F: clayey sand	250	<2	NON SALINE
BH6	0.8-1.0	F: clayey sand	200	<2	NON SALINE
BH6	1.7-2.0	F: clayey sand	240	2.1	SLIGHTLY SALINE
BH6	2.3-2.5	F: silty clay	75	<2	NON SALINE
BH6	2.3-2.5	LAB DUPLICATE	73	<2	NON SALINE
BH6	3.7-4.0	F: silty clay	390	2.8	SLIGHTLY SALINE
BH6	4.8-5.0	F: silty clay	440	3.1	SLIGHTLY SALINE
BH6	5.7-6.0	XW SILTSTONE	300	2.1	SLIGHTLY SALINE
BH7	0.0-0.1	F: gravelly sand	340	2.4	SLIGHTLY SALINE
BH7	0.4-0.5	F: gravelly sand	410	2.9	SLIGHTLY SALINE
BH7	0.8-1.0	F: silty clay	230	<2	NON SALINE
BH7	1.8-2.0	F: silty clay	380	2.6	SLIGHTLY SALINE
BH7	2.4-2.5	F: silty clay	390	2.7	SLIGHTLY SALINE
BH7	3.8-4.0	F: silty clay	520	3.6	SLIGHTLY SALINE
BH7	3.8-4.0	LAB DUPLICATE	540	3.8	SLIGHTLY SALINE
BH7	5.8-6.0	F: silty clay	450	4	MODERATELY SALINE
BH8	0.0-0.1	F: gravelly sand	470	3.3	SLIGHTLY SALINE
BH8	0.5-0.6	XW SILTSTONE	240	<2	NON SALINE
BH9	0.4-0.5	F: silty clay	260	<2	NON SALINE
BH9	1.4-1.5	F: silty clay	360	2.5	SLIGHTLY SALINE
BH9	1.8-2.0	F: silty clay	360	3.2	SLIGHTLY SALINE

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 1**  
**SUMMARY OF SOIL LABORATORY RESULTS - EC and ECe**

Borehole Number	Sample Depth (m)	Sample Description	EC (µS/cm)	ECe (dS/m)	Salinity Class
BH9	2.8-3.0	F: silty clay	400	3.6	SLIGHTLY SALINE
BH9	3.8-4.0	F: silty clay	470	4.2	MODERATELY SALINE
BH9	4.8-5.0	F: silty clay	480	3.4	SLIGHTLY SALINE
BH9	5.8-6.0	XW SILTSTONE	220	<2	NON SALINE
BH9	5.8-6.0	LAB DUPLICATE	190	<2	NON SALINE
BH10	0.0-0.1	F: gravelly sand	240	<2	NON SALINE
BH10	0.8-1.0	F: silty clay	330	3	SLIGHTLY SALINE
BH10	1.8-2.0	F: silty clay	370	3.3	SLIGHTLY SALINE
BH10	2.7-3.0	F: silty clay	320	2.9	SLIGHTLY SALINE
BH10	4.8-5.0	XW SILTSTONE	230	<2	NON SALINE
BH11	0.0-0.1	F: gravelly sand	220	<2	NON SALINE
BH11	0.4-0.5	XW SILTSTONE	260	2.3	SLIGHTLY SALINE
BH11	1.4-1.5	XW SILTSTONE	240	3.4	SLIGHTLY SALINE
BH11	2.7-3.0	XW SILTSTONE	300	4.2	MODERATELY SALINE
BH12	0.0-0.1	F: gravelly sand	250	<2	NON SALINE
BH12	0.0-0.1	LAB DUPLICATE	290	2	SLIGHTLY SALINE
BH12	0.8-1.0	XW SILTSTONE	240	3.4	SLIGHTLY SALINE
BH12	1.8-2.0	XW SILTSTONE	240	3.3	SLIGHTLY SALINE
BH13	0.0-0.1	F: gravelly sand	330	2.3	SLIGHTLY SALINE
BH13	0.4-0.5	XW SILTSTONE	180	<2	NON SALINE
BH13	1.4-1.5	XW SILTSTONE	220	<2	NON SALINE
BH13	2.8-3.0	XW SILTSTONE	110	<2	NON SALINE
BH13	4.3-4.5	XW SILTSTONE	150	2	SLIGHTLY SALINE
BH14	0.0-0.1	F: gravelly sand	350	2.1	SLIGHTLY SALINE
BH14	0.8-1.0	XW SILTSTONE	220	3	SLIGHTLY SALINE
BH14	1.8-2.0	XW SILTSTONE	210	3	SLIGHTLY SALINE
BH14	1.8-2.0	LAB DUPLICATE	250	3.5	SLIGHTLY SALINE
BH14	2.8-3.0	XW SILTSTONE	150	2.2	SLIGHTLY SALINE
BH14	4.3-4.5	XW SILTSTONE	170	2.4	SLIGHTLY SALINE
BH15	0.0-0.1	F: silty clay	470	3.3	SLIGHTLY SALINE
BH15	0.7-1.0	XW SILTSTONE	230	3.2	SLIGHTLY SALINE
BH15	2.4-2.5	XW SILTSTONE	260	3.6	SLIGHTLY SALINE
BH15	3.7-3.0	XW SILTSTONE	180	2.5	SLIGHTLY SALINE
BH15	5.7-6.0	XW SILTSTONE	170	2.4	SLIGHTLY SALINE
BH15	8.7-9.0	XW SILTSTONE	150	2.1	SLIGHTLY SALINE
BH15	9.3-9.5	XW SILTSTONE	560	7.8	MODERATELY SALINE
BH16	0.0-0.1	F: gravelly sand	350	2.4	SLIGHTLY SALINE
BH16	0.4-0.5	F: silty clay	360	2.5	SLIGHTLY SALINE
BH16	0.8-1.0	XW SILTSTONE	240	3.3	SLIGHTLY SALINE
BH16	0.8-1.0	LAB DUPLICATE	240	3.3	SLIGHTLY SALINE
BH16	1.8-2.0	XW SILTSTONE	310	4.3	MODERATELY SALINE
BH17	0.4-0.5	F: silty clay	380	2.6	SLIGHTLY SALINE
BH17	1.4-1.5	F: silty clay	700	6.3	MODERATELY SALINE
BH17	2.3-2.5	F: silty clay	470	4.2	MODERATELY SALINE
BH17	3.8-4.0	F: silty clay	470	3.3	SLIGHTLY SALINE
BH17	5.8-6.0	F: silty clay	530	3.7	SLIGHTLY SALINE
BH17	7.3-7.5	XW SILTSTONE	160	2.3	SLIGHTLY SALINE
BH18	0.0-0.1	F: gravelly sand	360	2.6	SLIGHTLY SALINE
BH18	0.0-0.1	LAB DUPLICATE	330	2.3	SLIGHTLY SALINE
BH18	0.4-0.5	XW SILTSTONE	230	2.1	SLIGHTLY SALINE
BH18	1.4-1.5	XW SILTSTONE	180	2.5	SLIGHTLY SALINE
BH18	2.3-2.5	XW SILTSTONE	100	<2	NON SALINE
BH18	3.7-4.0	XW SILTSTONE	120	<2	NON SALINE
BH19	0.0-0.1	F: gravelly sand	230	<2	NON SALINE
BH19	0.7-1.0	XW SILTSTONE	180	2.6	SLIGHTLY SALINE
BH19	1.8-2.0	XW SILTSTONE	190	2.6	SLIGHTLY SALINE
BH19	2.8-3.0	XW SILTSTONE	240	3.3	SLIGHTLY SALINE
BH20	0.4-0.5	F: silty clay	560	3.9	SLIGHTLY SALINE
BH20	0.4-0.5	LAB DUPLICATE	560	3.9	SLIGHTLY SALINE
BH20	1.4-1.5	F: silty clay	540	3.8	SLIGHTLY SALINE
BH20	1.8-2.0	F: silty clay	440	3.1	SLIGHTLY SALINE
BH20	2.4-2.5	F: silty clay	240	<2	NON SALINE
BH20	2.8-3.0	XW SILTSTONE	240	2.1	SLIGHTLY SALINE
BH20	3.8-4.0	XW SILTSTONE	100	<2	NON SALINE
<b>Total Number of Samples</b>			129	129	-
<b>Minimum Value</b>			73	<PQL	-
<b>Maximum Value</b>			770	7.8	-

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 2**  
**SUMMARY OF RESISTIVITY CALCULATION ON SOIL EC RESULTS**

Borehole Number	Sample Depth (m)	Sample Description	EC (µS/cm)	Resistivity (ohm.cm)	Classification Condition B
BH1	0.0-0.1	F: sandy clay	770	1,299	Mildly Aggressive
BH1	0.8-1.0	F: silty clay	520	1,923	Mildly Aggressive
BH1	2.3-2.5	F: silty clay	150	6,667	Non Aggressive
BH1	2.3-2.5	LAB DUPLICATE	160	6,250	Non Aggressive
BH1	3.8-4.0	F: silty clay	600	1,667	Mildly Aggressive
BH1	4.8-5.0	F: silty clay	450	2,222	Non Aggressive
BH1	7.3-7.5	XW SILTSTONE	310	3,226	Non Aggressive
BH1	10.2-10.5	SILTSTONE	160	6,250	Non Aggressive
BH2	0.0-0.1	F: gravelly sand	550	1,818	Mildly Aggressive
BH2	0.8-1.0	F: sandy clay	330	3,030	Non Aggressive
BH2	1.4-1.5	F: sandy clay	220	4,545	Non Aggressive
BH2	3.8-4.0	F: silty clay	200	5,000	Non Aggressive
BH2	3.8-4.0	LAB DUPLICATE	230	4,348	Non Aggressive
BH2	4.8-5.0	F: silty clay	360	2,778	Non Aggressive
BH2	5.8-6.0	F: silty clay	320	3,125	Non Aggressive
BH2	7.3-7.5	F: silty clay	450	2,222	Non Aggressive
BH2	8.8-9.0	XW SILTSTONE	290	3,448	Non Aggressive
BH2	11.8-12.0	XW SILTSTONE	230	4,348	Non Aggressive
BH3	0.3-0.5	F: gravelly sand	530	1,887	Mildly Aggressive
BH3	0.8-1.0	F: silty clay	220	4,545	Non Aggressive
BH3	1.8-2.0	F: silty clay	380	2,632	Non Aggressive
BH3	2.8-3.0	F: silty clay	360	2,778	Non Aggressive
BH3	3.7-4.0	F: silty clay	420	2,381	Non Aggressive
BH3	3.7-4.0	LAB DUPLICATE	410	2,439	Non Aggressive
BH3	4.8-5.0	F: silty clay	380	2,632	Non Aggressive
BH3	5.7-6.0	F: silty clay	400	2,500	Non Aggressive
BH3	6.7-7.0	XW SILTSTONE	220	4,545	Non Aggressive
BH4	0.0-0.1	F: silty clay	460	2,174	Non Aggressive
BH4	0.8-1.0	F: silty clay	460	2,174	Non Aggressive
BH4	1.4-1.5	SILTY CLAY	490	2,041	Non Aggressive
BH4	1.8-2.0	SILTY CLAY	430	2,326	Non Aggressive
BH4	2.4-2.5	XW SILTSTONE	390	2,564	Non Aggressive
BH4	2.8-3.0	XW SILTSTONE	300	3,333	Non Aggressive
BH4	3.8-4.0	XW SILTSTONE	270	3,704	Non Aggressive
BH5	0.0-0.1	F: silty clay	390	2,564	Non Aggressive
BH5	0.8-1.0	F: silty clay	200	5,000	Non Aggressive
BH5	1.3-1.5	F: silty clay	270	3,704	Non Aggressive
BH5	1.3-1.5	LAB DUPLICATE	270	3,704	Non Aggressive
BH5	1.8-2.0	F: silty clay	430	2,326	Non Aggressive
BH5	2.7-3.0	F: silty clay	510	1,961	Mildly Aggressive
BH5	3.7-4.0	F: silty clay	430	2,326	Non Aggressive
BH5	4.8-5.0	F: silty clay	490	2,041	Non Aggressive
BH5	6.8-7.0	XW SILTSTONE	180	5,556	Non Aggressive
BH6	0.0-0.1	F: clayey sand	500	2,000	Mildly Aggressive
BH6	0.4-0.5	F: clayey sand	250	4,000	Non Aggressive
BH6	0.8-1.0	F: clayey sand	200	5,000	Non Aggressive
BH6	1.7-2.0	F: clayey sand	240	4,167	Non Aggressive
BH6	2.3-2.5	F: silty clay	75	13,333	Non Aggressive
BH6	2.3-2.5	LAB DUPLICATE	73	13,699	Non Aggressive
BH6	3.7-4.0	F: silty clay	390	2,564	Non Aggressive
BH6	4.8-5.0	F: silty clay	440	2,273	Non Aggressive
BH6	5.7-6.0	XW SILTSTONE	300	3,333	Non Aggressive
BH7	0.0-0.1	F: gravelly sand	340	2,941	Non Aggressive
BH7	0.4-0.5	F: gravelly sand	410	2,439	Non Aggressive
BH7	0.8-1.0	F: silty clay	230	4,348	Non Aggressive
BH7	1.8-2.0	F: silty clay	380	2,632	Non Aggressive
BH7	2.4-2.5	F: silty clay	390	2,564	Non Aggressive
BH7	3.8-4.0	F: silty clay	520	1,923	Mildly Aggressive
BH7	3.8-4.0	LAB DUPLICATE	540	1,852	Mildly Aggressive
BH7	5.8-6.0	F: silty clay	450	2,222	Non Aggressive
BH8	0.0-0.1	F: gravelly sand	470	2,128	Non Aggressive
BH8	0.5-0.6	XW SILTSTONE	240	4,167	Non Aggressive
BH9	0.4-0.5	F: silty clay	260	3,846	Non Aggressive
BH9	1.4-1.5	F: silty clay	360	2,778	Non Aggressive
BH9	1.8-2.0	F: silty clay	360	2,778	Non Aggressive

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 2**  
**SUMMARY OF RESISTIVITY CALCULATION ON SOIL EC RESULTS**

Borehole Number	Sample Depth (m)	Sample Description	EC (µS/cm)	Resistivity (ohm.cm)	Classification Condition B
BH9	2.8-3.0	F: silty clay	400	2,500	Non Aggressive
BH9	3.8-4.0	F: silty clay	470	2,128	Non Aggressive
BH9	4.8-5.0	F: silty clay	480	2,083	Non Aggressive
BH9	5.8-6.0	XW SILTSTONE	220	4,545	Non Aggressive
BH9	5.8-6.0	LAB DUPLICATE	190	5,263	Non Aggressive
BH10	0.0-0.1	F: gravelly sand	240	4,167	Non Aggressive
BH10	0.8-1.0	F: silty clay	330	3,030	Non Aggressive
BH10	1.8-2.0	F: silty clay	370	2,703	Non Aggressive
BH10	2.7-3.0	F: silty clay	320	3,125	Non Aggressive
BH10	4.8-5.0	XW SILTSTONE	230	4,348	Non Aggressive
BH11	0.0-0.1	F: gravelly sand	220	4,545	Non Aggressive
BH11	0.4-0.5	XW SILTSTONE	260	3,846	Non Aggressive
BH11	1.4-1.5	XW SILTSTONE	240	4,167	Non Aggressive
BH11	2.7-3.0	XW SILTSTONE	300	3,333	Non Aggressive
BH12	0.0-0.1	F: gravelly sand	250	4,000	Non Aggressive
BH12	0.0-0.1	LAB DUPLICATE	290	3,448	Non Aggressive
BH12	0.8-1.0	XW SILTSTONE	240	4,167	Non Aggressive
BH12	1.8-2.0	XW SILTSTONE	240	4,167	Non Aggressive
BH13	0.0-0.1	F: gravelly sand	330	3,030	Non Aggressive
BH13	0.4-0.5	XW SILTSTONE	180	5,556	Non Aggressive
BH13	1.4-1.5	XW SILTSTONE	220	4,545	Non Aggressive
BH13	2.8-3.0	XW SILTSTONE	110	9,091	Non Aggressive
BH13	4.3-4.5	XW SILTSTONE	150	6,667	Non Aggressive
BH14	0.0-0.1	F: gravelly sand	350	2,857	Non Aggressive
BH14	0.8-1.0	XW SILTSTONE	220	4,545	Non Aggressive
BH14	1.8-2.0	XW SILTSTONE	210	4,762	Non Aggressive
BH14	1.8-2.0	LAB DUPLICATE	250	4,000	Non Aggressive
BH14	2.8-3.0	XW SILTSTONE	150	6,667	Non Aggressive
BH14	4.3-4.5	XW SILTSTONE	170	5,882	Non Aggressive
BH15	0.0-0.1	F: silty clay	470	2,128	Non Aggressive
BH15	0.7-1.0	XW SILTSTONE	230	4,348	Non Aggressive
BH15	2.4-2.5	XW SILTSTONE	260	3,846	Non Aggressive
BH15	3.7-3.0	XW SILTSTONE	180	5,556	Non Aggressive
BH15	5.7-6.0	XW SILTSTONE	170	5,882	Non Aggressive
BH15	8.7-9.0	XW SILTSTONE	150	6,667	Non Aggressive
BH15	9.3-9.5	XW SILTSTONE	560	1,786	Mildly Aggressive
BH16	0.0-0.1	F: gravelly sand	350	2,857	Non Aggressive
BH16	0.4-0.5	F: silty clay	360	2,778	Non Aggressive
BH16	0.8-1.0	XW SILTSTONE	240	4,167	Non Aggressive
BH16	0.8-1.0	LAB DUPLICATE	240	4,167	Non Aggressive
BH16	1.8-2.0	XW SILTSTONE	310	3,226	Non Aggressive
BH17	0.4-0.5	F: silty clay	380	2,632	Non Aggressive
BH17	1.4-1.5	F: silty clay	700	1,429	Mildly Aggressive
BH17	2.3-2.5	F: silty clay	470	2,128	Non Aggressive
BH17	3.8-4.0	F: silty clay	470	2,128	Non Aggressive
BH17	5.8-6.0	F: silty clay	530	1,887	Mildly Aggressive
BH17	7.3-7.5	XW SILTSTONE	160	6,250	Non Aggressive
BH18	0.0-0.1	F: gravelly sand	360	2,778	Non Aggressive
BH18	0.0-0.1	LAB DUPLICATE	330	3,030	Non Aggressive
BH18	0.4-0.5	XW SILTSTONE	230	4,348	Non Aggressive
BH18	1.4-1.5	XW SILTSTONE	180	5,556	Non Aggressive
BH18	2.3-2.5	XW SILTSTONE	100	10,000	Non Aggressive
BH18	3.7-4.0	XW SILTSTONE	120	8,333	Non Aggressive
BH19	0.0-0.1	F: gravelly sand	230	4,348	Non Aggressive
BH19	0.7-1.0	XW SILTSTONE	180	5,556	Non Aggressive
BH19	1.8-2.0	XW SILTSTONE	190	5,263	Non Aggressive
BH19	2.8-3.0	XW SILTSTONE	240	4,167	Non Aggressive
BH20	0.4-0.5	F: silty clay	560	1,786	Mildly Aggressive
BH20	0.4-0.5	LAB DUPLICATE	560	1,786	Mildly Aggressive
BH20	1.4-1.5	F: silty clay	540	1,852	Mildly Aggressive
BH20	1.8-2.0	F: silty clay	440	2,273	Non Aggressive
BH20	2.4-2.5	F: silty clay	240	4,167	Non Aggressive
BH20	2.8-3.0	XW SILTSTONE	240	4,167	Non Aggressive
BH20	3.8-4.0	XW SILTSTONE	100	10,000	Non Aggressive
<b>Total Number of Samples</b>			129	129	-
<b>Minimum Value</b>			73	1,299	-
<b>Maximum Value</b>			770	13,699	-

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 3**  
**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
BH1	0.0-0.1	F: sandy clay	5.2	Mildly Aggressive	Non-Aggressive
BH1	0.8-1.0	F: silty clay	8.5	Non-Aggressive	Non-Aggressive
BH1	2.3-2.5	F: silty clay	4.5	Moderately Aggressive	Non-Aggressive
BH1	2.3-2.5	LAB DUPLICATE	4.4	Moderately Aggressive	Non-Aggressive
BH1	3.8-4.0	F: silty clay	8.4	Non-Aggressive	Non-Aggressive
BH1	4.8-5.0	F: silty clay	8.8	Non-Aggressive	Non-Aggressive
BH1	7.3-7.5	XW SILTSTONE	9.4	Non-Aggressive	Non-Aggressive
BH1	10.2-10.5	SILTSTONE	8.6	Non-Aggressive	Non-Aggressive
BH2	0.0-0.1	F: gravelly sand	9.4	Non-Aggressive	Non-Aggressive
BH2	0.8-1.0	F: sandy clay	8.5	Non-Aggressive	Non-Aggressive
BH2	1.4-1.5	F: sandy clay	7.5	Non-Aggressive	Non-Aggressive
BH2	3.8-4.0	F: silty clay	7.8	Non-Aggressive	Non-Aggressive
BH2	3.8-4.0	LAB DUPLICATE	7.8	Non-Aggressive	Non-Aggressive
BH2	4.8-5.0	F: silty clay	8.4	Non-Aggressive	Non-Aggressive
BH2	5.8-6.0	F: silty clay	8.4	Non-Aggressive	Non-Aggressive
BH2	7.3-7.5	F: silty clay	9.4	Non-Aggressive	Non-Aggressive
BH2	8.8-9.0	XW SILTSTONE	8.6	Non-Aggressive	Non-Aggressive
BH2	11.8-12.0	XW SILTSTONE	9.5	Non-Aggressive	Non-Aggressive
BH3	0.3-0.5	F: gravelly sand	8.8	Non-Aggressive	Non-Aggressive
BH3	0.8-1.0	F: silty clay	7.5	Non-Aggressive	Non-Aggressive
BH3	1.8-2.0	F: silty clay	9.1	Non-Aggressive	Non-Aggressive
BH3	2.8-3.0	F: silty clay	9.2	Non-Aggressive	Non-Aggressive
BH3	3.7-4.0	F: silty clay	8.8	Non-Aggressive	Non-Aggressive
BH3	3.7-4.0	LAB DUPLICATE	8.7	Non-Aggressive	Non-Aggressive
BH3	4.8-5.0	F: silty clay	8.3	Non-Aggressive	Non-Aggressive
BH3	5.7-6.0	F: silty clay	8.6	Non-Aggressive	Non-Aggressive
BH3	6.7-7.0	XW SILTSTONE	8.7	Non-Aggressive	Non-Aggressive
BH4	0.0-0.1	F: silty clay	8.8	Non-Aggressive	Non-Aggressive
BH4	0.8-1.0	F: silty clay	7.5	Non-Aggressive	Non-Aggressive
BH4	1.4-1.5	SILTY CLAY	4.8	Mildly Aggressive	Non-Aggressive
BH4	1.8-2.0	SILTY CLAY	4.8	Mildly Aggressive	Non-Aggressive
BH4	2.4-2.5	XW SILTSTONE	5.4	Mildly Aggressive	Non-Aggressive
BH4	2.8-3.0	XW SILTSTONE	7.2	Non-Aggressive	Non-Aggressive
BH4	3.8-4.0	XW SILTSTONE	8	Non-Aggressive	Non-Aggressive
BH5	0.0-0.1	F: silty clay	5.8	Non-Aggressive	Non-Aggressive
BH5	0.8-1.0	F: silty clay	5	Mildly Aggressive	Non-Aggressive
BH5	1.3-1.5	F: silty clay	6.1	Non-Aggressive	Non-Aggressive
BH5	1.3-1.5	LAB DUPLICATE	6.2	Non-Aggressive	Non-Aggressive
BH5	1.8-2.0	F: silty clay	9.1	Non-Aggressive	Non-Aggressive
BH5	2.7-3.0	F: silty clay	8.7	Non-Aggressive	Non-Aggressive
BH5	3.7-4.0	F: silty clay	9.4	Non-Aggressive	Non-Aggressive
BH5	4.8-5.0	F: silty clay	8.4	Non-Aggressive	Non-Aggressive
BH5	6.8-7.0	XW SILTSTONE	9	Non-Aggressive	Non-Aggressive
BH6	0.0-0.1	F: clayey sand	9.5	Non-Aggressive	Non-Aggressive
BH6	0.4-0.5	F: clayey sand	8.8	Non-Aggressive	Non-Aggressive
BH6	0.8-1.0	F: clayey sand	8.9	Non-Aggressive	Non-Aggressive
BH6	1.7-2.0	F: clayey sand	6.6	Non-Aggressive	Non-Aggressive
BH6	2.3-2.5	F: silty clay	4.8	Mildly Aggressive	Non-Aggressive
BH6	2.3-2.5	LAB DUPLICATE	4.8	Mildly Aggressive	Non-Aggressive
BH6	3.7-4.0	F: silty clay	8.7	Non-Aggressive	Non-Aggressive
BH6	4.8-5.0	F: silty clay	8.9	Non-Aggressive	Non-Aggressive
BH6	5.7-6.0	XW SILTSTONE	8.6	Non-Aggressive	Non-Aggressive
BH7	0.0-0.1	F: gravelly sand	8.9	Non-Aggressive	Non-Aggressive
BH7	0.4-0.5	F: gravelly sand	8.6	Non-Aggressive	Non-Aggressive
BH7	0.8-1.0	F: silty clay	7.3	Non-Aggressive	Non-Aggressive
BH7	1.8-2.0	F: silty clay	9.3	Non-Aggressive	Non-Aggressive
BH7	2.4-2.5	F: silty clay	8.6	Non-Aggressive	Non-Aggressive
BH7	3.8-4.0	F: silty clay	8.7	Non-Aggressive	Non-Aggressive
BH7	3.8-4.0	LAB DUPLICATE	8.7	Non-Aggressive	Non-Aggressive
BH7	5.8-6.0	F: silty clay	8.7	Non-Aggressive	Non-Aggressive
BH8	0.0-0.1	F: gravelly sand	9.2	Non-Aggressive	Non-Aggressive
BH8	0.5-0.6	XW SILTSTONE	9.2	Non-Aggressive	Non-Aggressive
BH9	0.4-0.5	F: silty clay	5.3	Mildly Aggressive	Non-Aggressive
BH9	1.4-1.5	F: silty clay	9.3	Non-Aggressive	Non-Aggressive
BH9	1.8-2.0	F: silty clay	9.4	Non-Aggressive	Non-Aggressive

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

Classification for Concrete Piles	pH Value	Classification for Steel Piles
>5.5	>5	Non-Aggressive
4.5 - 5.5	4.0 - 5.0	Non-Aggressive
4 - 4.5	3.0 - 4.0	Mildly Aggressive
<4	<3	Moderately Aggressive

**TABLE 3**  
**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
BH9	2.8-3.0	F: silty clay	9.1	Non-Aggressive	Non-Aggressive
BH9	3.8-4.0	F: silty clay	9.8	Non-Aggressive	Non-Aggressive
BH9	4.8-5.0	F: silty clay	8.6	Non-Aggressive	Non-Aggressive
BH9	5.8-6.0	XW SILTSTONE	9.3	Non-Aggressive	Non-Aggressive
BH9	5.8-6.0	LAB DUPLICATE	9.1	Non-Aggressive	Non-Aggressive
BH10	0.0-0.1	F: gravelly sand	9.2	Non-Aggressive	Non-Aggressive
BH10	0.8-1.0	F: silty clay	9.1	Non-Aggressive	Non-Aggressive
BH10	1.8-2.0	F: silty clay	9.4	Non-Aggressive	Non-Aggressive
BH10	2.7-3.0	F: silty clay	7.8	Non-Aggressive	Non-Aggressive
BH10	4.8-5.0	XW SILTSTONE	9.3	Non-Aggressive	Non-Aggressive
BH11	0.0-0.1	F: gravelly sand	9	Non-Aggressive	Non-Aggressive
BH11	0.4-0.5	XW SILTSTONE	9.7	Non-Aggressive	Non-Aggressive
BH11	1.4-1.5	XW SILTSTONE	9.4	Non-Aggressive	Non-Aggressive
BH11	2.7-3.0	XW SILTSTONE	9.4	Non-Aggressive	Non-Aggressive
BH12	0.0-0.1	F: gravelly sand	7.3	Non-Aggressive	Non-Aggressive
BH12	0.0-0.1	LAB DUPLICATE	7.1	Non-Aggressive	Non-Aggressive
BH12	0.8-1.0	XW SILTSTONE	9.2	Non-Aggressive	Non-Aggressive
BH12	1.8-2.0	XW SILTSTONE	9.6	Non-Aggressive	Non-Aggressive
BH13	0.0-0.1	F: gravelly sand	9.1	Non-Aggressive	Non-Aggressive
BH13	0.4-0.5	XW SILTSTONE	9.2	Non-Aggressive	Non-Aggressive
BH13	1.4-1.5	XW SILTSTONE	9.4	Non-Aggressive	Non-Aggressive
BH13	2.8-3.0	XW SILTSTONE	9.5	Non-Aggressive	Non-Aggressive
BH13	4.3-4.5	XW SILTSTONE	9.4	Non-Aggressive	Non-Aggressive
BH14	0.0-0.1	F: gravelly sand	9.1	Non-Aggressive	Non-Aggressive
BH14	0.8-1.0	XW SILTSTONE	9.4	Non-Aggressive	Non-Aggressive
BH14	1.8-2.0	XW SILTSTONE	9.4	Non-Aggressive	Non-Aggressive
BH14	1.8-2.0	LAB DUPLICATE	9.3	Non-Aggressive	Non-Aggressive
BH14	2.8-3.0	XW SILTSTONE	9.4	Non-Aggressive	Non-Aggressive
BH14	4.3-4.5	XW SILTSTONE	9.5	Non-Aggressive	Non-Aggressive
BH15	0.0-0.1	F: silty clay	8.9	Non-Aggressive	Non-Aggressive
BH15	0.7-1.0	XW SILTSTONE	9.6	Non-Aggressive	Non-Aggressive
BH15	2.4-2.5	XW SILTSTONE	9.6	Non-Aggressive	Non-Aggressive
BH15	3.7-3.0	XW SILTSTONE	9.5	Non-Aggressive	Non-Aggressive
BH15	5.7-6.0	XW SILTSTONE	9.7	Non-Aggressive	Non-Aggressive
BH15	8.7-9.0	XW SILTSTONE	9.6	Non-Aggressive	Non-Aggressive
BH15	9.3-9.5	XW SILTSTONE	9.5	Non-Aggressive	Non-Aggressive
BH16	0.0-0.1	F: gravelly sand	7.7	Non-Aggressive	Non-Aggressive
BH16	0.4-0.5	F: silty clay	9.2	Non-Aggressive	Non-Aggressive
BH16	0.8-1.0	XW SILTSTONE	9.4	Non-Aggressive	Non-Aggressive
BH16	0.8-1.0	LAB DUPLICATE	9.4	Non-Aggressive	Non-Aggressive
BH16	1.8-2.0	XW SILTSTONE	9.8	Non-Aggressive	Non-Aggressive
BH17	0.4-0.5	F: silty clay	8.8	Non-Aggressive	Non-Aggressive
BH17	1.4-1.5	F: silty clay	8.8	Non-Aggressive	Non-Aggressive
BH17	2.3-2.5	F: silty clay	8.8	Non-Aggressive	Non-Aggressive
BH17	3.8-4.0	F: silty clay	8.5	Non-Aggressive	Non-Aggressive
BH17	5.8-6.0	F: silty clay	8.5	Non-Aggressive	Non-Aggressive
BH17	7.3-7.5	XW SILTSTONE	9.3	Non-Aggressive	Non-Aggressive
BH18	0.0-0.1	F: gravelly sand	9.4	Non-Aggressive	Non-Aggressive
BH18	0.0-0.1	LAB DUPLICATE	9.4	Non-Aggressive	Non-Aggressive
BH18	0.4-0.5	XW SILTSTONE	9.4	Non-Aggressive	Non-Aggressive
BH18	1.4-1.5	XW SILTSTONE	9.7	Non-Aggressive	Non-Aggressive
BH18	2.3-2.5	XW SILTSTONE	9.5	Non-Aggressive	Non-Aggressive
BH18	3.7-4.0	XW SILTSTONE	9.5	Non-Aggressive	Non-Aggressive
BH19	0.0-0.1	F: gravelly sand	8.8	Non-Aggressive	Non-Aggressive
BH19	0.7-1.0	XW SILTSTONE	9.3	Non-Aggressive	Non-Aggressive
BH19	1.8-2.0	XW SILTSTONE	9.8	Non-Aggressive	Non-Aggressive
BH19	2.8-3.0	XW SILTSTONE	9.7	Non-Aggressive	Non-Aggressive
BH20	0.4-0.5	F: silty clay	7.7	Non-Aggressive	Non-Aggressive
BH20	0.4-0.5	LAB DUPLICATE	7.9	Non-Aggressive	Non-Aggressive
BH20	1.4-1.5	F: silty clay	8.7	Non-Aggressive	Non-Aggressive
BH20	1.8-2.0	F: silty clay	8.2	Non-Aggressive	Non-Aggressive
BH20	2.4-2.5	F: silty clay	8.8	Non-Aggressive	Non-Aggressive
BH20	2.8-3.0	XW SILTSTONE	9.1	Non-Aggressive	Non-Aggressive
BH20	3.8-4.0	XW SILTSTONE	9.6	Non-Aggressive	Non-Aggressive
<b>Total Number of Samples</b>			129	-	-
<b>Minimum Value</b>			4.4	-	-
<b>Maximum Value</b>			9.8	-	-

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

Classification for Concrete Piles		pH Value	Classification for Steel Piles	
>5.5	Non-Aggressive	>5	Non-Aggressive	
4.5 - 5.5	Mildly Aggressive	4.0 - 5.0	Non-Aggressive	
4 - 4.5	Moderately Aggressive	3.0 - 4.0	Mildly Aggressive	
<4	Severely Aggressive	<3	Moderately Aggressive	

**TABLE 4**  
**SUMMARY OF SOIL LABORATORY RESULTS - SULPHATE & CHLORIDES**

Borehole Number	Sample Depth (m)	Sample Description	Chloride (mg/kg)	Sulphate (mg/kg)	Classification for Concrete Piles	Classification for Steel Piles
					Sulfate - Condition B	Chloride - Condition B
BH1	0.0-0.1	F: sandy clay	580	570	Non-Aggressive	Non-Aggressive
BH1	0.8-1.0	F: silty clay	290	290	Non-Aggressive	Non-Aggressive
BH1	2.3-2.5	F: silty clay	21	220	Non-Aggressive	Non-Aggressive
BH1	2.3-2.5	LAB DUPLICATE	20	220	Non-Aggressive	Non-Aggressive
BH1	3.8-4.0	F: silty clay	370	310	Non-Aggressive	Non-Aggressive
BH1	4.8-5.0	F: silty clay	220	180	Non-Aggressive	Non-Aggressive
BH1	7.3-7.5	XW SILTSTONE	66	34	Non-Aggressive	Non-Aggressive
BH1	10.2-10.5	SILTSTONE	110	67	Non-Aggressive	Non-Aggressive
BH2	0.0-0.1	F: gravelly sand	450	190	Non-Aggressive	Non-Aggressive
BH2	0.8-1.0	F: sandy clay	170	200	Non-Aggressive	Non-Aggressive
BH2	1.4-1.5	F: sandy clay	63	250	Non-Aggressive	Non-Aggressive
BH2	3.8-4.0	F: silty clay	<10	<10	Non-Aggressive	Non-Aggressive
BH2	3.8-4.0	LAB DUPLICATE	<10	<10	Non-Aggressive	Non-Aggressive
BH2	4.8-5.0	F: silty clay	91	160	Non-Aggressive	Non-Aggressive
BH2	5.8-6.0	F: silty clay	84	180	Non-Aggressive	Non-Aggressive
BH2	7.3-7.5	F: silty clay	230	240	Non-Aggressive	Non-Aggressive
BH2	8.8-9.0	XW SILTSTONE	220	58	Non-Aggressive	Non-Aggressive
BH2	11.8-12.0	XW SILTSTONE	180	74	Non-Aggressive	Non-Aggressive
BH3	0.3-0.5	F: gravelly sand	490	150	Non-Aggressive	Non-Aggressive
BH3	0.8-1.0	F: silty clay	130	160	Non-Aggressive	Non-Aggressive
BH3	1.8-2.0	F: silty clay	160	100	Non-Aggressive	Non-Aggressive
BH3	2.8-3.0	F: silty clay	120	150	Non-Aggressive	Non-Aggressive
BH3	3.7-4.0	F: silty clay	160	170	Non-Aggressive	Non-Aggressive
BH3	3.7-4.0	LAB DUPLICATE	160	170	Non-Aggressive	Non-Aggressive
BH3	4.8-5.0	F: silty clay	130	230	Non-Aggressive	Non-Aggressive
BH3	5.7-6.0	F: silty clay	220	300	Non-Aggressive	Non-Aggressive
BH3	6.7-7.0	XW SILTSTONE	160	230	Non-Aggressive	Non-Aggressive
BH4	0.0-0.1	F: silty clay	160	38	Non-Aggressive	Non-Aggressive
BH4	0.8-1.0	F: silty clay	260	230	Non-Aggressive	Non-Aggressive
BH4	1.4-1.5	SILTY CLAY	430	260	Non-Aggressive	Non-Aggressive
BH4	1.8-2.0	SILTY CLAY	340	230	Non-Aggressive	Non-Aggressive
BH4	2.4-2.5	XW SILTSTONE	300	240	Non-Aggressive	Non-Aggressive
BH4	2.8-3.0	XW SILTSTONE	250	130	Non-Aggressive	Non-Aggressive
BH4	3.8-4.0	XW SILTSTONE	260	62	Non-Aggressive	Non-Aggressive
BH5	0.0-0.1	F: silty clay	120	490	Non-Aggressive	Non-Aggressive
BH5	0.8-1.0	F: silty clay	20	300	Non-Aggressive	Non-Aggressive
BH5	1.3-1.5	F: silty clay	110	280	Non-Aggressive	Non-Aggressive
BH5	1.3-1.5	LAB DUPLICATE	92	270	Non-Aggressive	Non-Aggressive
BH5	1.8-2.0	F: silty clay	200	130	Non-Aggressive	Non-Aggressive
BH5	2.7-3.0	F: silty clay	330	150	Non-Aggressive	Non-Aggressive
BH5	3.7-4.0	F: silty clay	120	250	Non-Aggressive	Non-Aggressive
BH5	4.8-5.0	F: silty clay	7300	920	Non-Aggressive	Non-Aggressive
BH5	6.8-7.0	XW SILTSTONE	110	42	Non-Aggressive	Non-Aggressive
BH6	0.0-0.1	F: clayey sand	310	260	Non-Aggressive	Non-Aggressive
BH6	0.4-0.5	F: clayey sand	83	170	Non-Aggressive	Non-Aggressive
BH6	0.8-1.0	F: clayey sand	45	160	Non-Aggressive	Non-Aggressive
BH6	1.7-2.0	F: clayey sand	85	250	Non-Aggressive	Non-Aggressive
BH6	2.3-2.5	F: silty clay	27	72	Non-Aggressive	Non-Aggressive
BH6	2.3-2.5	LAB DUPLICATE	26	67	Non-Aggressive	Non-Aggressive
BH6	3.7-4.0	F: silty clay	210	110	Non-Aggressive	Non-Aggressive
BH6	4.8-5.0	F: silty clay	230	120	Non-Aggressive	Non-Aggressive
BH6	5.7-6.0	XW SILTSTONE	120	90	Non-Aggressive	Non-Aggressive
BH7	0.0-0.1	F: gravelly sand	180	200	Non-Aggressive	Non-Aggressive
BH7	0.4-0.5	F: gravelly sand	190	230	Non-Aggressive	Non-Aggressive
BH7	0.8-1.0	F: silty clay	97	140	Non-Aggressive	Non-Aggressive
BH7	1.8-2.0	F: silty clay	160	88	Non-Aggressive	Non-Aggressive
BH7	2.4-2.5	F: silty clay	120	200	Non-Aggressive	Non-Aggressive
BH7	3.8-4.0	F: silty clay	240	280	Non-Aggressive	Non-Aggressive
BH7	3.8-4.0	LAB DUPLICATE	250	310	Non-Aggressive	Non-Aggressive
BH7	5.8-6.0	F: silty clay	170	230	Non-Aggressive	Non-Aggressive
BH8	0.0-0.1	F: gravelly sand	190	290	Non-Aggressive	Non-Aggressive
BH8	0.5-0.6	XW SILTSTONE	76	53	Non-Aggressive	Non-Aggressive
BH9	0.4-0.5	F: silty clay	76	360	Non-Aggressive	Non-Aggressive
BH9	1.4-1.5	F: silty clay	150	130	Non-Aggressive	Non-Aggressive
BH9	1.8-2.0	F: silty clay	160	100	Non-Aggressive	Non-Aggressive

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	Chloride Values	Classification for Steel Piles
<5,000	Non-Aggressive	<5,000	Non-Aggressive
5,000 - 10,000	Mildly Aggressive	5,000 - 20,000	Non-Aggressive
10,000 - 20,000	Moderately Aggressive	20,000 - 50,000	Mildly Aggressive
>20,000	Severely Aggressive	>50,000	Moderately Aggressive

TABLE 4  
 SUMMARY OF SOIL LABORATORY RESULTS - SULPHATE & CHLORIDES

Borehole Number	Sample Depth (m)	Sample Description	Chloride (mg/kg)	Sulphate (mg/kg)	Classification for Concrete Piles	Classification for Steel Piles
					Sulfate - Condition B	Chloride - Condition B
BH9	2.8-3.0	F: silty clay	140	230	Non-Aggressive	Non-Aggressive
BH9	3.8-4.0	F: silty clay	160	340	Non-Aggressive	Non-Aggressive
BH9	4.8-5.0	F: silty clay	210	250	Non-Aggressive	Non-Aggressive
BH9	5.8-6.0	XW SILTSTONE	39	61	Non-Aggressive	Non-Aggressive
BH9	5.8-6.0	LAB DUPLICATE	35	56	Non-Aggressive	Non-Aggressive
BH10	0.0-0.1	F: gravelly sand	110	120	Non-Aggressive	Non-Aggressive
BH10	0.8-1.0	F: silty clay	130	220	Non-Aggressive	Non-Aggressive
BH10	1.8-2.0	F: silty clay	140	79	Non-Aggressive	Non-Aggressive
BH10	2.7-3.0	F: silty clay	150	240	Non-Aggressive	Non-Aggressive
BH10	4.8-5.0	XW SILTSTONE	63	81	Non-Aggressive	Non-Aggressive
BH11	0.0-0.1	F: gravelly sand	54	220	Non-Aggressive	Non-Aggressive
BH11	0.4-0.5	XW SILTSTONE	20	60	Non-Aggressive	Non-Aggressive
BH11	1.4-1.5	XW SILTSTONE	47	71	Non-Aggressive	Non-Aggressive
BH11	2.7-3.0	XW SILTSTONE	100	77	Non-Aggressive	Non-Aggressive
BH12	0.0-0.1	F: gravelly sand	87	260	Non-Aggressive	Non-Aggressive
BH12	0.0-0.1	LAB DUPLICATE	83	260	Non-Aggressive	Non-Aggressive
BH12	0.8-1.0	XW SILTSTONE	95	60	Non-Aggressive	Non-Aggressive
BH12	1.8-2.0	XW SILTSTONE	59	59	Non-Aggressive	Non-Aggressive
BH13	0.0-0.1	F: gravelly sand	170	88	Non-Aggressive	Non-Aggressive
BH13	0.4-0.5	XW SILTSTONE	10	20	Non-Aggressive	Non-Aggressive
BH13	1.4-1.5	XW SILTSTONE	41	43	Non-Aggressive	Non-Aggressive
BH13	2.8-3.0	XW SILTSTONE	35	27	Non-Aggressive	Non-Aggressive
BH13	4.3-4.5	XW SILTSTONE	35	37	Non-Aggressive	Non-Aggressive
BH14	0.0-0.1	F: gravelly sand	170	130	Non-Aggressive	Non-Aggressive
BH14	0.8-1.0	XW SILTSTONE	47	50	Non-Aggressive	Non-Aggressive
BH14	1.8-2.0	XW SILTSTONE	27	89	Non-Aggressive	Non-Aggressive
BH14	1.8-2.0	LAB DUPLICATE	30	100	Non-Aggressive	Non-Aggressive
BH14	2.8-3.0	XW SILTSTONE	36	69	Non-Aggressive	Non-Aggressive
BH14	4.3-4.5	XW SILTSTONE	24	31	Non-Aggressive	Non-Aggressive
BH15	0.0-0.1	F: silty clay	230	250	Non-Aggressive	Non-Aggressive
BH15	0.7-1.0	XW SILTSTONE	27	39	Non-Aggressive	Non-Aggressive
BH15	2.4-2.5	XW SILTSTONE	29	47	Non-Aggressive	Non-Aggressive
BH15	3.7-3.0	XW SILTSTONE	31	72	Non-Aggressive	Non-Aggressive
BH15	5.7-6.0	XW SILTSTONE	39	41	Non-Aggressive	Non-Aggressive
BH15	8.7-9.0	XW SILTSTONE	32	68	Non-Aggressive	Non-Aggressive
BH15	9.3-9.5	XW SILTSTONE	460	120	Non-Aggressive	Non-Aggressive
BH16	0.0-0.1	F: gravelly sand	210	280	Non-Aggressive	Non-Aggressive
BH16	0.4-0.5	F: silty clay	160	40	Non-Aggressive	Non-Aggressive
BH16	0.8-1.0	XW SILTSTONE	73	76	Non-Aggressive	Non-Aggressive
BH16	0.8-1.0	LAB DUPLICATE	73	95	Non-Aggressive	Non-Aggressive
BH16	1.8-2.0	XW SILTSTONE	59	63	Non-Aggressive	Non-Aggressive
BH17	0.4-0.5	F: silty clay	160	150	Non-Aggressive	Non-Aggressive
BH17	1.4-1.5	F: silty clay	460	340	Non-Aggressive	Non-Aggressive
BH17	2.3-2.5	F: silty clay	220	240	Non-Aggressive	Non-Aggressive
BH17	3.8-4.0	F: silty clay	260	250	Non-Aggressive	Non-Aggressive
BH17	5.8-6.0	F: silty clay	250	340	Non-Aggressive	Non-Aggressive
BH17	7.3-7.5	XW SILTSTONE	52	77	Non-Aggressive	Non-Aggressive
BH18	0.0-0.1	F: gravelly sand	100	150	Non-Aggressive	Non-Aggressive
BH18	0.0-0.1	LAB DUPLICATE	85	120	Non-Aggressive	Non-Aggressive
BH18	0.4-0.5	XW SILTSTONE	10	130	Non-Aggressive	Non-Aggressive
BH18	1.4-1.5	XW SILTSTONE	<10	66	Non-Aggressive	Non-Aggressive
BH18	2.3-2.5	XW SILTSTONE	10	60	Non-Aggressive	Non-Aggressive
BH18	3.7-4.0	XW SILTSTONE	10	49	Non-Aggressive	Non-Aggressive
BH19	0.0-0.1	F: gravelly sand	90	120	Non-Aggressive	Non-Aggressive
BH19	0.7-1.0	XW SILTSTONE	52	40	Non-Aggressive	Non-Aggressive
BH19	1.8-2.0	XW SILTSTONE	38	35	Non-Aggressive	Non-Aggressive
BH19	2.8-3.0	XW SILTSTONE	73	38	Non-Aggressive	Non-Aggressive
BH20	0.4-0.5	F: silty clay	460	270	Non-Aggressive	Non-Aggressive
BH20	0.4-0.5	LAB DUPLICATE	450	270	Non-Aggressive	Non-Aggressive
BH20	1.4-1.5	F: silty clay	310	290	Non-Aggressive	Non-Aggressive
BH20	1.8-2.0	F: silty clay	290	220	Non-Aggressive	Non-Aggressive
BH20	2.4-2.5	F: silty clay	110	100	Non-Aggressive	Non-Aggressive
BH20	2.8-3.0	XW SILTSTONE	75	88	Non-Aggressive	Non-Aggressive
BH20	3.8-4.0	XW SILTSTONE	10	44	Non-Aggressive	Non-Aggressive
<b>Total Number of Samples</b>			129	129	-	-
<b>Minimum Value</b>			<PQL	<PQL	-	-
<b>Maximum Value</b>			7300	920	-	-

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	Chloride Values	Classification for Steel Piles
<5,000	Non-Aggressive	<5,000	Non-Aggressive
5,000 - 10,000	Mildly Aggressive	5,000 - 20,000	Non-Aggressive
10,000 - 20,000	Moderately Aggressive	20,000 - 50,000	Mildly Aggressive
>20,000	Severely Aggressive	>50,000	Moderately Aggressive

**TABLE 5**  
**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)					%	
BH1	0.0-0.1	F: sandy clay	3.7	0.2	2.8	1.1	7.9	13.9%	1.32:1
BH1	0.0-0.1	LAB DUPLICATE	3.6	0.2	2.7	0.9	7.4	12.2%	1.33:1
BH1	0.8-1.0	F: silty clay	9.4	0.2	6.8	3.8	20	19.0%	1.38:1
BH2	0.0-0.1	F: gravelly sand	2.2	0.3	4.6	3.6	11	32.7%	0.48:1
BH2	1.4-1.5	F: sandy clay	3.1	0.3	3.2	0.8	7.4	10.8%	0.97:1
BH3	0.3-0.5	F: gravelly sand	1.7	0.2	4.7	3.1	9.7	32.0%	0.36:1
BH3	0.8-1.0	F: silty clay	2	<0.1	9.2	2.6	14	18.6%	0.22:1
BH4	0.0-0.1	F: silty clay	8.2	0.2	4.3	3.3	16	20.6%	1.91:1
BH4	1.4-1.5	SILTY CLAY	1.2	0.5	11	6.5	19	34.2%	0.11:1
BH5	0.0-0.1	F: silty clay	2	0.2	3.2	0.6	5.9	10.2%	0.63:1
BH5	0.8-1.0	F: silty clay	2.1	0.2	2.3	0.2	4.8	4.2%	0.91:1
BH6	0.0-0.1	F: clayey sand	2.4	0.3	3.8	3.1	9.6	32.3%	0.63:1
BH6	0.0-0.1	LAB DUPLICATE	3.5	0.3	4.6	3.8	12	31.7%	0.76:1
BH6	0.8-1.0	F: clayey sand	9.4	0.1	0.6	0.3	10	3.0%	15.67:1
BH6	2.3-2.5	F: silty clay	0.2	<0.1	0.2	<0.1	<1	10.0%	1.0:1
BH7	0.0-0.1	F: gravelly sand	4.5	0.2	3.1	2.1	9.9	21.2%	1.45:1
BH7	0.8-1.0	F: silty clay	5.6	0.2	4.3	1.8	12	15.0%	1.3:1
BH8	0.0-0.1	F: gravelly sand	8.5	0.2	5.4	4.2	18	23.3%	1.57:1
BH8	0.5-0.6	XW SILTSTONE	23	<0.1	2.4	1.6	27	5.9%	9.58:1
BH9	0.4-0.5	F: silty clay	4.6	0.4	3.5	0.4	8.9	4.5%	1.31:1
BH9	1.4-1.5	F: silty clay	9.1	0.2	5.1	3.9	18	21.7%	1.78:1
BH9	1.8-2.0	F: silty clay	13	0.2	4.4	3.4	21	16.2%	2.95:1
BH10	0.0-0.1	F: gravelly sand	5.1	0.2	2.6	1.1	9	12.2%	1.96:1
BH10	0.0-0.1	LAB DUPLICATE	4.9	0.3	3.1	1.4	9.7	14.4%	1.58:1
BH10	0.8-1.0	F: silty clay	12	0.3	5	2.8	20	14.0%	2.4:1
BH11	0.0-0.1	F: gravelly sand	8	0.2	0.9	0.3	9.4	3.2%	8.89:1
BH11	0.4-0.5	XW SILTSTONE	21	0.2	3	1.9	26	7.3%	7.0:1
BH12	0.0-0.1	F: gravelly sand	7.8	0.2	3	0.8	12	6.7%	2.6:1
BH12	0.8-1.0	XW SILTSTONE	15	0.2	2.3	1.2	18	6.7%	6.52:1
BH13	0.0-0.1	F: gravelly sand	9.4	0.3	5.2	2.8	18	15.6%	1.81:1
BH13	0.4-0.5	XW SILTSTONE	9.3	0.4	8.4	2.6	21	12.4%	1.11:1
BH14	0.0-0.1	F: gravelly sand	7.1	0.2	2.5	1.5	11	13.6%	2.84:1
BH15	0.0-0.1	F: silty clay	7.3	0.2	4.2	2.7	14	19.3%	1.74:1
BH15	0.7-1.0	XW SILTSTONE	11	0.4	3.2	1.4	16	8.8%	3.44:1
BH16	0.0-0.1	F: gravelly sand	4.8	0.3	3.8	0.9	9.7	9.3%	1.26:1
BH16	0.0-0.1	LAB DUPLICATE	4.5	0.2	3.1	0.7	8.6	8.1%	1.45:1
BH16	0.4-0.5	F: silty clay	13	0.2	4.1	2.5	20	12.5%	3.17:1
BH17	0.4-0.5	F: silty clay	11	0.3	4.9	2.1	19	11.1%	2.24:1
BH17	2.3-2.5	F: silty clay	14	0.2	4.4	2	21	9.5%	3.18:1
BH17	3.8-4.0	F: silty clay	9.8	0.3	6	3	19	15.8%	1.63:1
BH18	0.0-0.1	F: gravelly sand	15	0.3	3.6	2.3	22	10.5%	4.17:1
BH18	0.4-0.5	XW SILTSTONE	5.5	0.6	4.8	2	13	15.4%	1.15:1
BH19	0.0-0.1	F: gravelly sand	7.7	0.2	2.1	0.9	11	8.2%	3.67:1
BH20	0.4-0.5	F: silty clay	3.8	0.3	8.1	5	17	29.4%	0.47:1
BH20	1.4-1.5	F: silty clay	13	0.2	3.8	2.1	19	11.1%	3.42:1
BH20	1.4-1.5	LAB DUPLICATE	11	0.2	3.9	2.3	17	13.5%	2.82:1
BH20	1.8-2.0	F: silty clay	7.9	0.3	6.9	3.3	18	18.3%	1.14:1
<b>Total Number of Samples</b>			47	47	47	47	47	47	47
<b>Minimum Value</b>			0.2	<PQL	0.20	<PQL	<PQL	3%	0.11 :1
<b>Maximum Value</b>			23	0.6	11	6.5	27	34.2%	15.67 :1

**ESP Value**

< 5%  
 5% to 15%  
 > 15%

**Sodicity Rating**

Non-Sodic
Sodic
Highly Sodic

**TABLE 6**  
**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)		
MW1	9.62	6.8	14,036	24.5	169.6	3.81	6.7	14,000	470	3,700	Non-Aggressive	Non-Aggressive
MW2	5.94	7.1	8,355	20.9	82.1	2.43	7.2	8,200	590	1,700	Non-Aggressive	Non-Aggressive
MW15	5.53	7.2	8,344	24.8	83.4	1.19	7.5	8,100	210	1,900	Non-Aggressive	Non-Aggressive
S3-06	5.82	7.0	15,304	21.8	114.4	1.6	7.3	15,000	2	4,700	Non-Aggressive	Non-Aggressive
S3-07	4.63	7.1	6,731	23	145.2	1.39	7.4	6,600	130	1,500	Non-Aggressive	Non-Aggressive
S3-08	5.17	6.7	16,894	23.9	121.9	1.85	6.9	17,000	500	5,100	Non-Aggressive	Non-Aggressive
Dam1	-	8.9	607	20.2	34.7	8.68	7.7	270	47	28	Non-Aggressive	Non-Aggressive
<b>Total Number of Samples</b>	6	7	7	7	7	7	7	7	7	7	-	-
<b>Minimum Value</b>	4.63	6.7	607	20.2	34.7	1.19	6.7	270	2	28	-	-
<b>Maximum Value</b>	9.62	8.9	16,894	24.8	169.6	8.68	7.7	17,000	590	5,100	-	-

**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)
> 5.5	<1,000	<6,000
4.5 - 5.5	1,000 - 3,000	6,000 - 12,000
4.0 - 4.5	3,000 - 10,000	12,000 - 30,000
< 4	>10,000	>30,000

**Classification B**

Non-Aggressive
Mildly Aggressive
Moderately Aggressive
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)
> 5	<1,000
4.0 - 5.0	1,000 - 10,000
3.0 - 4.0	10,000 - 20,000
<3	>20,000

**Classification B**

Non-Aggressive
Non-Aggressive
Mildly Aggressive
Moderately Aggressive



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## **Appendix E: Background on Salinity**



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## 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.



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## **Appendix F: Information on Acid Sulfate Soils**



## A. Background

Acid Sulfate Soil (ASS) is formed from iron rich alluvial sediments and sulfate (found in seawater) in the presence of sulfate reducing bacteria and plentiful organic matter. These conditions are generally found in mangroves, salt marsh vegetation or tidal areas and at the bottom of coastal rivers and lakes. ASS materials are distinguished from other soil or sediment materials (referred to as 'soil materials' throughout the National Acid Sulfate Soils Guidance) by having properties and behaviour that have either:

- 1) Been affected considerably by the oxidation of Reduced Inorganic Sulfur (RIS), or
- 2) The capacity to be affected considerably by the oxidation of their RIS constituents.

Acid sulfate soil materials include potential acid sulfate soils (PASS or sulfidic soil materials) and actual acid sulfate soils (AASS or sulfuric soil materials). These are often found in the same profile, with AASS overlying PASS. PASS and AASS are defined further below:

- PASS are soil materials which contain RIS such as pyrite. The field pH of these soils in their undisturbed state is usually more than pH 4 and is commonly neutral to alkaline (pH 7–9). These soil materials are invariably saturated with water in their natural state. Their texture may be peat, clay, loam, silt or sand and is often dark grey in colour and soft in consistence, but these materials may also exhibit colours that are dark brown, or medium to pale grey to white; and
- AASS are soil materials which contained RIS such as pyrite that have undergone oxidation. This oxidation results in low pH (that is pH less than 4) and often a yellow (jarosite) and/or orange to red mottling (ferric iron oxides) in the soil profile. Actual ASS contains Actual Acidity, and commonly also contains RIS (the source of Potential Sulfuric Acidity) as well as Retained Acidity.

## B. The ASS Planning Maps

The ASS planning maps provide an indication of the relative potential for disturbance of ASS to occur at locations within the council area. These maps do not provide an indication of the actual occurrence of ASS at a site or the likely severity of the conditions.

The maps are divided into five classes dependent upon the type of activities/works that if undertaken, may represent an environmental risk through the development of acidic conditions associated with ASS:

Table 1: Risk Classes

Risk Class	Description
Class 1	All works.
Class 2	All works below existing ground level and works by which the water table is likely to be lowered.
Class 3	Works at depths beyond 1m below existing ground level or works by which the water table is likely to be lowered beyond 1m below existing ground level.
Class 4	Works at depths beyond 2m below existing ground level or works by which the water table is likely to be lowered beyond 2m below existing ground level.
Class 5	Works within 500m of adjacent Class 1, 2, 3, 4 land which are likely to lower the water table below 1m AHD on the adjacent land.

### C. The ASS Risk Maps

The ASS risk maps provide an indication of the probability of occurrence of ASS materials at a particular location based on interpretation from geological and soil landscape maps. The maps provide classes based on high probability, low probability, no known occurrence and areas of disturbed terrain (site specific assessment necessary) and the likely depth at which ASS materials are likely to be encountered.

### D. Interpretation of ASS Field Tests

Tables A1 and A2 below provide some guidance on the interpretation of  $pH_F$  and  $pH_{FOX}$  test results, as detailed in the *National Acid Sulfate Soil Guidance: National acid sulfate soils sampling and identification methods manual* (2018):

Table A1: Interpretation of some  $pH_F$  test ranges

pH value	Result	Comments
$pH_F \leq 4$ , jarosite not observed in the soil layer/horizon	May indicate an AASS indicating previous oxidation of RIS or may indicate naturally occurring, non ASS soils.	Generally not conclusive as naturally occurring, non ASS soils, such as many organic soils (for example peats) and heavily leached soils, often also return $pH_F \leq 4$ .
$pH_F \leq 4$ , jarosite observed in the soil layer/horizon	The soil material is an AASS.	Jarosite and other iron precipitate minerals in ASS such as schwertmannite require a $pH < 4$ to form and indicate prior oxidation of RIS.
$pH_F > 7$	Expected in waterlogged, unoxidised, or poorly drained soils.	Marine muds commonly have a $pH > 7$ which reflects a seawater ( $pH 8.2$ ) influence. Oxidation of samples with $H_2O_2$ can help indicate if the soil materials contain RIS.

Source: Adapted from DER (2015a).

Table A2: Interpretation of  $pH_{FOX}$  test results

pH value and reaction	Result	Comments
Strong reaction of soil with $H_2O_2$ (that is X or V)	Useful indicator of the presence of RIS but cannot be used alone	Organic rich substrates such as peat and coffee rock, and soil constituents like manganese oxides, can also cause a reaction. Care must be exercised in interpreting these results. Laboratory analyses are required to confirm if appreciable RIS is present.
$pH_{FOX}$ value at least one unit below field $pH_F$ and strong reaction with $H_2O_2$ (that is X or V)	May indicate PASS	The difference between $pH_F$ and $pH_{FOX}$ is termed the $\Delta pH$ . Generally the larger the $\Delta pH$ the more indicative of PASS. The lower the final $pH_{FOX}$ the better the likelihood of an appreciable RIS content. For example, a change from $pH_F$ of 8 to $pH_{FOX}$ of 7 (that is a $\Delta pH$ of 1) would not indicate PASS, however, a unit change from $pH_F$ of 3.5 to $pH_{FOX}$ of 2.5 would be indicative of PASS. Laboratory analyses are required to confirm if appreciable RIS is present.
$pH_{FOX} < 3$ , large $\Delta pH$ and a strong reaction with $H_2O_2$ (that is X or V)	Strongly indicates PASS	The lower the $pH_{FOX}$ below 3, the greater the likelihood that appreciable RIS is present. A combination of all three parameters – $pH_{FOX}$ , $\Delta pH$ and reaction strength – gives the



pH value and reaction	Result	Comments
		best indication of PASS. Laboratory analyses are required to confirm that appreciable RIS is present.
A pH <sub>FOX</sub> 3–4 and Low, Medium or Strong reaction with H <sub>2</sub> O <sub>2</sub>	Inconclusive	RIS may be present; however, organic matter may also be responsible for the decrease in pH. Laboratory analyses are required to confirm the presence of RIS.
pH <sub>FOX</sub> 4–5	Inconclusive	RIS may be present in small quantities, or poorly reactive under rapid oxidation, or the sample may contain shell/ carbonate which neutralises some or all acid produced on oxidation. Equally, the pH <sub>FOX</sub> value may be due to the production of organic acids with no RIS present. Laboratory analyses are required to confirm if appreciable RIS is present.
pH <sub>FOX</sub> > 5, small or no ΔpH, but Low, Medium or Strong reaction with H <sub>2</sub> O <sub>2</sub>	Inconclusive	For neutral to alkaline pHF with shell or white concretions, the fizz test with 1 M HCl can be used to identify the presence of carbonates. Laboratory analyses are required to confirm if appreciable RIS is present and further testing is required to confirm that effective self-neutralising materials are present.

Source: Adapted from DER (2015a).



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# **Appendix G: Lotsearch Environmental Risk and Planning Report**



# LOTSEARCH

LOTSEARCH ENVIRO PROFESSIONAL

**Date: 12 Mar 2024 11:07:24**

**Reference: LS053720 EP**

**Address: 16 Johnston Crescent, Horsley Park, NSW 2175**

**Disclaimer:**

The purpose of this report is to provide an overview of some of the site history, environmental risk and planning information available, affecting an individual address or geographical area in which the property is located. It is not a substitute for an on-site inspection or review of other available reports and records. It is not intended to be, and should not be taken to be, a rating or assessment of the desirability or market value of the property or its features. You should obtain independent advice before you make any decision based on the information within the report. The detailed terms applicable to use of this report are set out at the end of this report.

# Dataset Listing

Datasets contained within this report, detailing their source and data currency:

Dataset Name	Custodian	Supply Date	Currency Date	Update Frequency	Dataset Buffer (m)	No. Features On-site	No. Features within 100m	No. Features within Buffer
Cadastre Boundaries	NSW Department of Customer Service - Spatial Services	04/01/2024	04/01/2024	Quarterly	-	-	-	-
Topographic Data	NSW Department of Customer Service - Spatial Services	22/08/2022	22/08/2022	Annually	-	-	-	-
List of NSW contaminated sites notified to EPA	Environment Protection Authority	29/02/2024	09/02/2024	Monthly	1000m	0	0	0
Contaminated Land Records of Notice	Environment Protection Authority	26/02/2024	26/02/2024	Monthly	1000m	0	0	0
Former Gasworks	Environment Protection Authority	24/01/2024	14/07/2021	Quarterly	1000m	0	0	0
Notices under the POEO Act 1997	Environment Protection Authority	17/01/2024	17/01/2024	Monthly	1000m	1	1	2
National Waste Management Facilities Database	Geoscience Australia	26/05/2022	07/03/2017	Annually	1000m	0	0	0
National Liquid Fuel Facilities	Geoscience Australia	20/09/2023	07/09/2020	Annually	1000m	0	0	0
EPA PFAS Investigation Program	Environment Protection Authority	04/03/2024	21/11/2032	Monthly	2000m	0	0	0
Defence PFAS Investigation & Management Program - Investigation Sites	Department of Defence	06/03/2024	06/03/2024	Monthly	2000m	0	0	0
Defence PFAS Investigation & Management Program - Management Sites	Department of Defence	06/03/2024	06/03/2024	Monthly	2000m	0	0	0
Airservices Australia National PFAS Management Program	Airservices Australia	06/03/2024	06/03/2024	Monthly	2000m	0	0	0
Defence Controlled Areas	Department of Defence	12/01/2024	12/01/2024	Quarterly	2000m	0	0	0
Defence 3 Year Regional Contamination Investigation Program	Department of Defence	24/01/2024	02/09/2022	Quarterly	2000m	0	0	0
National Unexploded Ordnance (UXO)	Department of Defence	12/01/2024	12/01/2024	Quarterly	2000m	0	0	0
EPA Other Sites with Contamination Issues	Environment Protection Authority	13/11/2023	15/12/2022	Annually	1000m	0	0	0
Licensed Activities under the POEO Act 1997	Environment Protection Authority	04/03/2024	04/03/2024	Monthly	1000m	5	6	13
Delicensed POEO Activities still regulated by the EPA	Environment Protection Authority	04/03/2024	04/03/2024	Monthly	1000m	0	0	0
Former POEO Licensed Activities now revoked or surrendered	Environment Protection Authority	04/03/2024	04/03/2024	Monthly	1000m	4	4	4
UBD Business Directories (Premise & Intersection Matches)	Hardie Grant			Not required	150m	0	0	0
UBD Business Directories (Road & Area Matches)	Hardie Grant			Not required	150m	-	0	0
UBD Business Directory Dry Cleaners & Motor Garages/Service Stations (Premise & Intersection Matches)	Hardie Grant			Not required	500m	0	0	0
UBD Business Directory Dry Cleaners & Motor Garages/Service Stations (Road & Area Matches)	Hardie Grant			Not required	500m	-	0	0
Points of Interest	NSW Department of Customer Service - Spatial Services	13/11/2023	13/11/2023	Quarterly	1000m	0	0	4
Tanks (Areas)	NSW Department of Customer Service - Spatial Services	13/11/2023	13/11/2023	Quarterly	1000m	0	0	0
Tanks (Points)	NSW Department of Customer Service - Spatial Services	13/11/2023	13/11/2023	Quarterly	1000m	0	0	1
Major Easements	NSW Department of Customer Service - Spatial Services	31/01/2024	31/01/2024	Quarterly	1000m	0	1	4
State Forest	Forestry Corporation of NSW	12/12/2023	11/12/2023	Annually	1000m	0	0	0
NSW National Parks and Wildlife Service Reserves	NSW Office of Environment & Heritage	16/02/2023	31/12/2022	Annually	1000m	0	0	0
Hydrogeology Map of Australia	Commonwealth of Australia (Geoscience Australia)	06/02/2024	19/08/2019	Annually	1000m	1	1	1

Dataset Name	Custodian	Supply Date	Currency Date	Update Frequency	Dataset Buffer (m)	No. Features On-site	No. Features within 100m	No. Features within Buffer
Temporary Water Restriction (Botany Sands Groundwater Source) Order 2018	NSW Department of Planning, Industry and Environment	09/05/2023	23/02/2018	Annually	1000m	0	0	0
National Groundwater Information System (NGIS) Boreholes	Bureau of Meteorology; Water NSW	18/04/2023	13/07/2022	Annually	2000m	0	0	8
NSW Seamless Geology Single Layer: Rock Units	Department of Regional NSW	06/12/2023	31/05/2023	Annually	1000m	1	1	3
NSW Seamless Geology – Single Layer: Trendlines	Department of Regional NSW	06/12/2023	31/05/2023	Annually	1000m	0	0	0
NSW Seamless Geology – Single Layer: Geological Boundaries and Faults	Department of Regional NSW	06/12/2023	31/05/2023	Annually	1000m	0	0	0
Naturally Occurring Asbestos Potential	NSW Dept. of Industry, Resources & Energy	04/12/2015	24/09/2015	Annually	1000m	0	0	0
Atlas of Australian Soils	Australian Bureau of Agriculture and Resource Economics and Sciences (ABARES)	12/01/2024	17/02/2011	Annually	1000m	2	2	3
Soil Landscapes of Central and Eastern NSW	NSW Department of Planning, Industry and Environment	12/12/2023	27/07/2020	Annually	1000m	1	1	3
Environmental Planning Instrument Acid Sulfate Soils	NSW Department of Planning, Industry and Environment	02/02/2024	01/09/2023	Monthly	500m	0	-	-
Atlas of Australian Acid Sulfate Soils	CSIRO	12/01/2024	21/02/2013	Annually	1000m	1	1	1
Dryland Salinity - National Assessment	National Land and Water Resources Audit	18/07/2014	12/05/2013	Annually	1000m	1	1	1
Dryland Salinity Potential of Western Sydney	NSW Department of Planning, Industry and Environment	12/05/2017	01/01/2002	Annually	1000m	1	1	3
Mining Subsidence Districts	NSW Department of Customer Service - Subsidence Advisory NSW	24/01/2024	24/01/2024	Quarterly	1000m	0	0	0
Current Mining Titles	NSW Department of Industry	06/03/2024	06/03/2024	Monthly	1000m	1	1	2
Mining Title Applications	NSW Department of Industry	06/03/2024	06/03/2024	Monthly	1000m	0	0	0
Historic Mining Titles	NSW Department of Industry	06/03/2024	06/03/2024	Monthly	1000m	9	10	15
Environmental Planning Instrument SEPP State Significant Precincts	NSW Department of Planning, Industry and Environment	02/02/2024	08/09/2023	Monthly	1000m	0	0	0
Environmental Planning Instrument Land Zoning	NSW Department of Planning, Industry and Environment	02/02/2024	19/01/2024	Monthly	1000m	1	3	25
Commonwealth Heritage List	Australian Government Department of the Agriculture, Water and the Environment	20/10/2023	13/04/2022	Annually	1000m	0	0	0
National Heritage List	Australian Government Department of the Agriculture, Water and the Environment	20/10/2023	13/04/2022	Annually	1000m	0	0	0
State Heritage Register - Curtilages	NSW Department of Planning, Industry and Environment	24/01/2024	24/11/2023	Quarterly	1000m	0	0	0
Environmental Planning Instrument Local Heritage	NSW Department of Planning, Industry and Environment	02/02/2024	19/01/2024	Monthly	1000m	0	0	0
Bush Fire Prone Land	NSW Rural Fire Service	26/02/2024	20/11/2023	Monthly	1000m	2	3	3
NSW Native Vegetation Type Map	NSW Department of Planning and Environment	26/05/2023	12/12/2022	Quarterly	1000m	2	2	4
Ramsar Wetlands of Australia	Australian Government Department of Agriculture, Water and the Environment	09/05/2023	01/11/2022	Annually	1000m	0	0	0
Groundwater Dependent Ecosystems	Bureau of Meteorology	28/10/2022	26/10/2022	Annually	1000m	1	1	4
Inflow Dependent Ecosystems Likelihood	Bureau of Meteorology	28/10/2022	26/10/2022	Annually	1000m	1	1	7
NSW BioNet Species Sightings	NSW Office of Environment & Heritage	29/11/2023	29/11/2023	Weekly	10000m	-	-	-

# Site Diagram

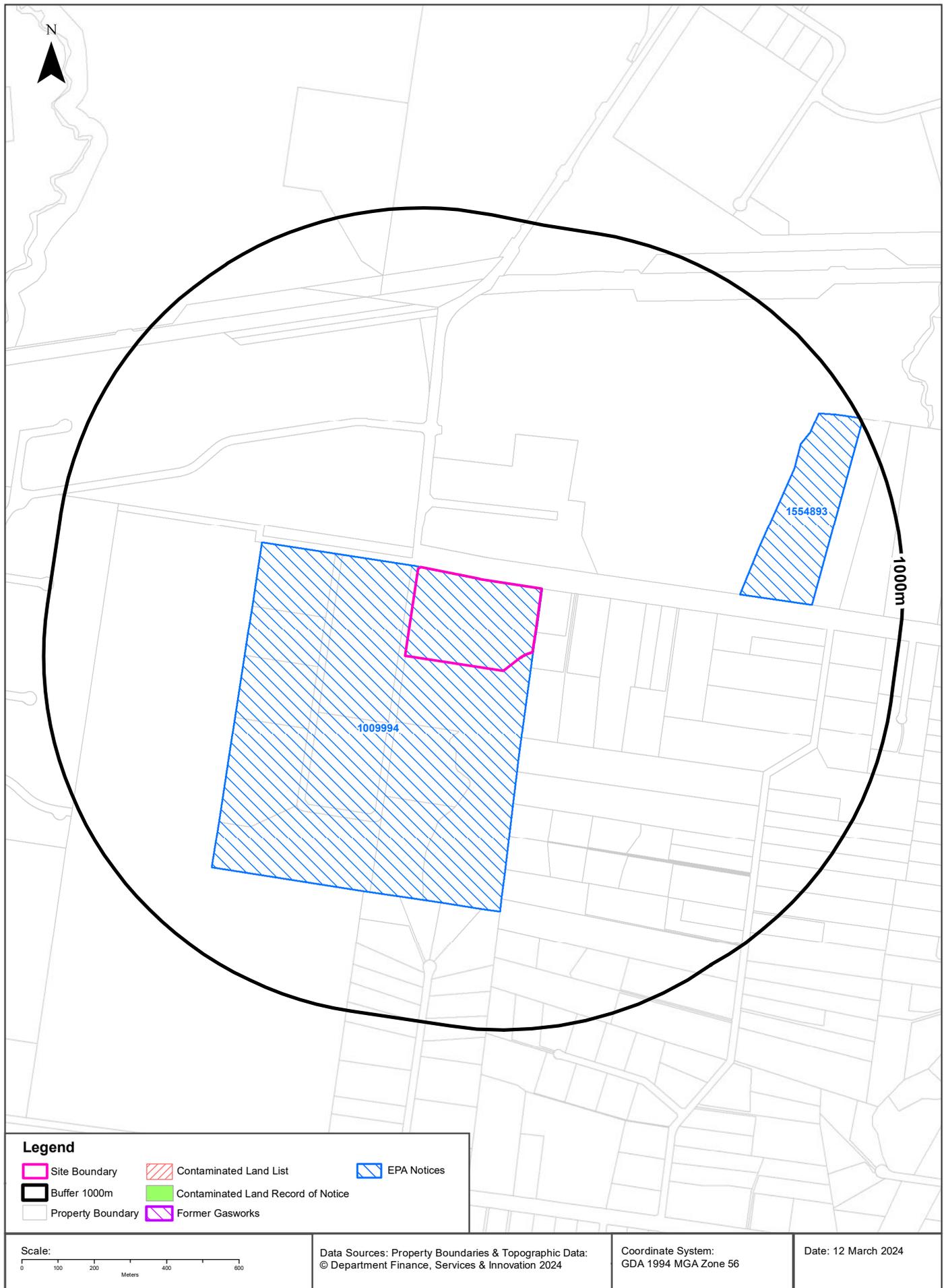
16 Johnston Crescent, Horsley Park, NSW 2175



<p><b>Legend</b></p> <ul style="list-style-type: none"> <li><span style="border: 2px solid magenta; display: inline-block; width: 15px; height: 10px; margin-right: 5px;"></span> Site Boundary</li> <li><span style="border: 1px solid magenta; display: inline-block; width: 15px; height: 10px; margin-right: 5px;"></span> Internal Parcel Boundaries</li> </ul>	<p><b>Total Area:</b> 82038m<sup>2</sup></p> <p><b>Total Perimeter:</b> 1.14km</p> <p>Disclaimers:</p> <p>Measurements are approximate only and may have been simplified or smaller lengths removed for readability.</p> <p>Parcels that make up a small percentage of the total site area have not been labelled for increased legibility.</p>	<p>Scale:</p> <p>Data Source Aerial Imagery: © Aerometrex Pty Ltd</p> <p>Coordinate System: GDA 1994 MGA Zone 56</p> <p>Date: 12 March 2024</p>
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# Contaminated Land

16 Johnston Crescent, Horsley Park, NSW 2175



# Contaminated Land

16 Johnston Crescent, Horsley Park, NSW 2175

## List of NSW contaminated sites notified to EPA

Records from the NSW EPA Contaminated Land list within the dataset buffer:

Map Id	Site	Address	Suburb	Activity	Management Class	Status	Location Confidence	Dist	Direction
N/A	No records in buffer								

The values within the EPA site management class in the table above, are given more detailed explanations in the table below:

EPA site management class	Explanation
Contamination being managed via the planning process (EP&A Act)	The EPA has completed an assessment of the contamination and decided that the contamination is significant enough to warrant regulation. The contamination of this site is managed by the consent authority under the Environmental Planning and Assessment Act 1979 (EP&A Act) planning approval process, with EPA involvement as necessary to ensure significant contamination is adequately addressed. The consent authority is typically a local council or the Department of Planning and Environment.
Contamination currently regulated under CLM Act	The EPA has completed an assessment of the contamination and decided that the contamination is significant enough to warrant regulation under the Contaminated Land Management Act 1997 (CLM Act). Management of the contamination is regulated by the EPA under the CLM Act. Regulatory notices are available on the EPA's Contaminated Land Public Record of Notices.
Contamination currently regulated under POEO Act	The EPA has completed an assessment of the contamination and decided that the contamination is significant enough to warrant regulation. Management of the contamination is regulated under the Protection of the Environment Operations Act 1997 (POEO Act). The EPA's regulatory actions under the POEO Act are available on the POEO public register.
Contamination formerly regulated under the CLM Act	The EPA has determined that the contamination is no longer significant enough to warrant regulation under the Contaminated Land Management Act 1997 (CLM Act). The contamination was addressed under the CLM Act.
Contamination formerly regulated under the POEO Act	The EPA has determined that the contamination is no longer significant enough to warrant regulation. The contamination was addressed under the Protection of the Environment Operations Act 1997 (POEO Act).
Contamination was addressed via the planning process (EP&A Act)	The EPA has determined that the contamination is no longer significant enough to warrant regulation. The contamination was addressed by the appropriate consent authority via the planning process under the Environmental Planning and Assessment Act 1979 (EP&A Act).
Ongoing maintenance required to manage residual contamination (CLM Act)	The EPA has determined that ongoing maintenance, under the Contaminated Land Management Act 1997 (CLM Act), is required to manage the residual contamination. Regulatory notices under the CLM Act are available on the EPA's Contaminated Land Public Record of Notices.
Regulation being finalised	The EPA has completed an assessment of the contamination and decided that the contamination is significant enough to warrant regulation under the Contaminated Land Management Act 1997. A regulatory approach is being finalised.
Regulation under the CLM Act not required	The EPA has completed an assessment of the contamination and decided that regulation under the Contaminated Land Management Act 1997 is not required.
Under assessment	The contamination is being assessed by the EPA to determine whether regulation is required. The EPA may require further information to complete the assessment. For example, the completion of management actions regulated under the planning process or Protection of the Environment Operations Act 1997. Alternatively, the EPA may require information via a notice issued under s77 of the Contaminated Land Management Act 1997 or issue a Preliminary Investigation Order.

NSW EPA Contaminated Land List Data Source: Environment Protection Authority  
 © State of New South Wales through the Environment Protection Authority

# Contaminated Land

16 Johnston Crescent, Horsley Park, NSW 2175

## Contaminated Land: Records of Notice

Record of Notices within the dataset buffer:

Map Id	Name	Address	Suburb	Notices	Area No	Location Confidence	Distance	Direction
N/A	No records in buffer							

Contaminated Land Records of Notice Data Source: Environment Protection Authority  
© State of New South Wales through the Environment Protection Authority  
Terms of use and disclaimer for Contaminated Land: Record of Notices, please visit  
<http://www.epa.nsw.gov.au/clm/clmdisclaimer.htm>

## Former Gasworks

Former Gasworks within the dataset buffer:

Map Id	Location	Council	Further Info	Location Confidence	Distance	Direction
N/A	No records in buffer					

Former Gasworks Data Source: Environment Protection Authority  
© State of New South Wales through the Environment Protection Authority

# Contaminated Land

16 Johnston Crescent, Horsley Park, NSW 2175

## EPA Notices

Penalty Notices, s.91 & s.92 Clean up Notices and s.96 Prevention Notices within the dataset buffer:

Number	Type	Name	Address	Status	Issued Date	Act	Offence	Offence Date	Loc Conf	Dist	Dir
<a href="#">1009994</a>	s.91 Clean Up Notice	CSR LIMITED	327 BURLEY ROAD, HORSLEY PARK, NSW 2175	Issued	27/07/2001				Premise Match	0m	On-site
<a href="#">1554893</a>	s.91 Clean Up Notice	ANTHONY GAUCI	198-222 Burley Road, HORSLEY PARK, NSW 2175	Issued	03/08/2017				Premise Match	547m	East

NSW EPA Notice Data Source: Environment Protection Authority  
© State of New South Wales through the Environment Protection Authority

# Waste Management & Liquid Fuel Facilities

16 Johnston Crescent, Horsley Park, NSW 2175

## National Waste Management Site Database

Sites on the National Waste Management Site Database within the dataset buffer:

Site Id	Owner	Name	Address	Suburb	Class	Landfill	Reprocess	Transfer	Comments	Loc Conf	Dist	Direction
N/A	No records in buffer											

Waste Management Facilities Data Source: Geoscience Australia  
Creative Commons 3.0 © Commonwealth of Australia <http://creativecommons.org/licenses/by/3.0/au/deed.en>

## National Liquid Fuel Facilities

National Liquid Fuel Facilities within the dataset buffer:

Map Id	Owner	Name	Address	Suburb	Class	Operational Status	Operator	Revision Date	Loc Conf	Dist	Direction
N/A	No records in buffer										

National Liquid Fuel Facilities Data Source: Geoscience Australia  
Creative Commons 3.0 © Commonwealth of Australia <http://creativecommons.org/licenses/by/3.0/au/deed.en>

# PFAS Investigation & Management Programs

16 Johnston Crescent, Horsley Park, NSW 2175

## EPA PFAS Investigation Program

Sites that are part of the EPA PFAS investigation program, within the dataset buffer:

Map ID	Site	Address	Loc Conf	Dist	Dir
N/A	No records in buffer				

EPA PFAS Investigation Program: Environment Protection Authority  
© State of New South Wales through the Environment Protection Authority

## Defence PFAS Investigation Program

Sites being investigated by the Department of Defence for PFAS contamination within the dataset buffer:

Map ID	Base Name	Address	Loc Conf	Dist	Dir
N/A	No records in buffer				

Defence PFAS Investigation Program Data Custodian: Department of Defence, Australian Government

## Defence PFAS Management Program

Sites being managed by the Department of Defence for PFAS contamination within the dataset buffer:

Map ID	Base Name	Address	Loc Conf	Dist	Dir
N/A	No records in buffer				

Defence PFAS Management Program Data Custodian: Department of Defence, Australian Government

## Airservices Australia National PFAS Management Program

Sites being investigated or managed by Airservices Australia for PFAS contamination within the dataset buffer:

Map ID	Site Name	Impacts	Loc Conf	Dist	Dir
N/A	No records in buffer				

Airservices Australia National PFAS Management Program Data Custodian: Airservices Australia

# Defence Sites and Unexploded Ordnance

16 Johnston Crescent, Horsley Park, NSW 2175

## Defence Controlled Areas (DCA)

Defence Controlled Areas provided by the Department of Defence within the dataset buffer:

Site ID	Location Name	Loc Conf	Dist	Dir
N/A	No records in buffer			

Defence Controlled Areas, Data Custodian: Department of Defence, Australian Government

## Defence 3 Year Regional Contamination Investigation Program (RCIP)

Sites which have been assessed as part of the Defence 3 Year Regional Contamination Investigation Program within the dataset buffer:

Property ID	Base Name	Address	Known Contamination	Loc Conf	Dist	Dir
N/A	No records in buffer					

Defence 3 Year Regional Contamination Investigation Program, Data Custodian: Department of Defence, Australian Government

## National Unexploded Ordnance (UXO)

Sites which have been assessed by the Department of Defence for the potential presence of unexploded ordnance within the dataset buffer:

Site ID	Location Name	Category	Area Description	Additional Information	Commonwealth	Loc Conf	Dist	Dir
N/A	No records in buffer							

National Unexploded Ordnance (UXO), Data Custodian: Department of Defence, Australian Government

## EPA Other Sites with Contamination Issues

16 Johnston Crescent, Horsley Park, NSW 2175

### EPA Other Sites with Contamination Issues

This dataset contains other sites identified on the EPA website as having contamination issues. This dataset currently includes:

- James Hardie asbestos manufacturing and waste disposal sites
- Radiological investigation sites in Hunter's Hill
- Pasmaico Lead Abatement Strategy Area

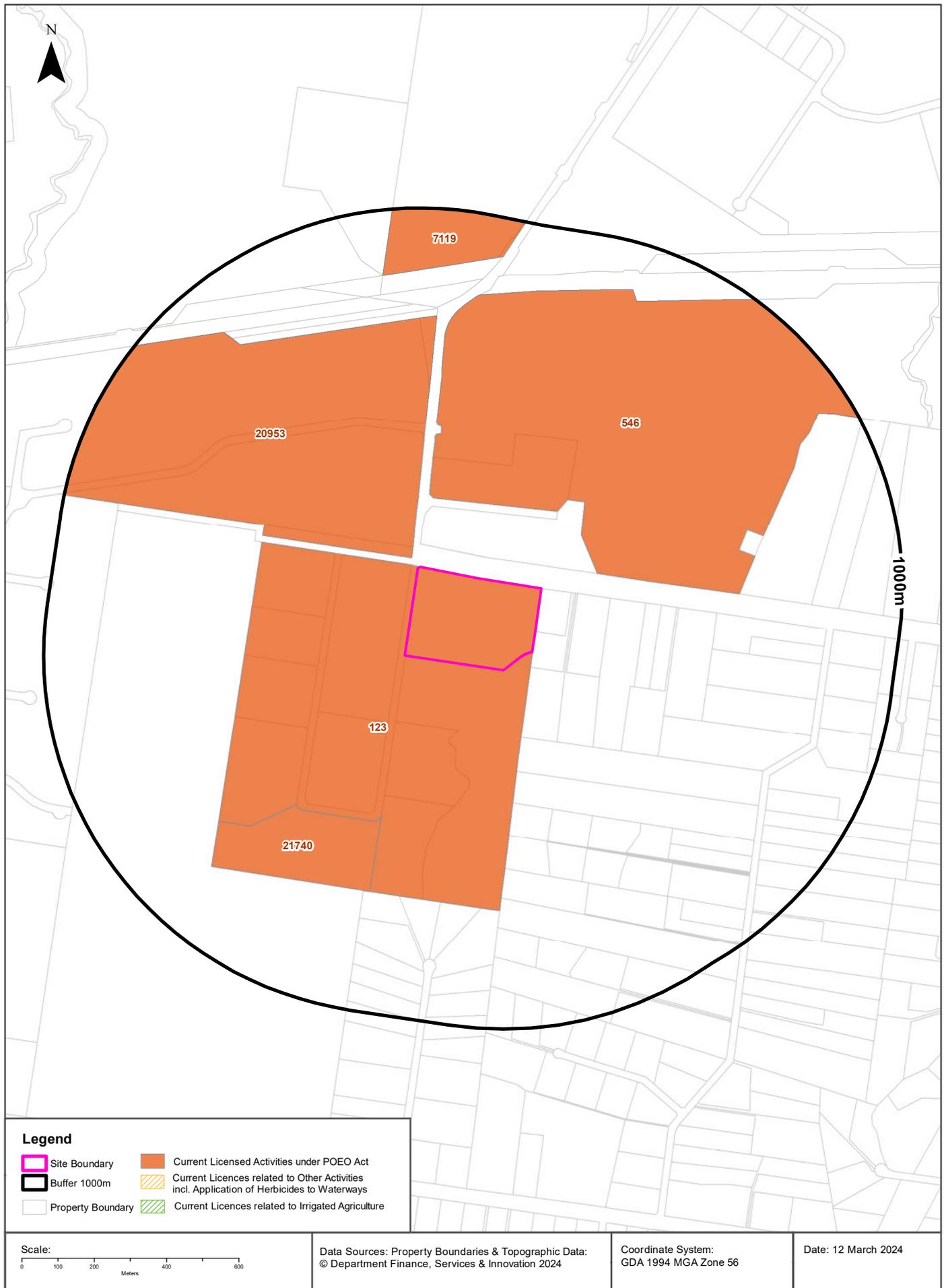
Sites within the dataset buffer:

Site Id	Site Name	Site Address	Dataset	Comments	Location Confidence	Distance	Direction
N/A	No records in buffer						

EPA Other Sites with Contamination Issues: Environment Protection Authority  
© State of New South Wales through the Environment Protection Authority

# Current EPA Licensed Activities

16 Johnston Crescent, Horsley Park, NSW 2175



## EPA Activities

16 Johnston Crescent, Horsley Park, NSW 2175

### Licensed Activities under the POEO Act 1997

Licensed activities under the Protection of the Environment Operations Act 1997, within the dataset buffer:

EPL	Organisation	Name	Address	Suburb	Activity	Loc Conf	Distance	Direction
123	PGH BRICKS & PAVERS PTY LIMITED	CSR BUILDING PRODUCTS, HORSLEY PARK	327 BURLEY ROAD, HORSLEY PARK, NSW 2175	HORSLEY PARK	Ceramic waste generation	Premise Match	0m	On-site
123	PGH BRICKS & PAVERS PTY LIMITED	CSR BUILDING PRODUCTS, HORSLEY PARK	327 BURLEY ROAD, HORSLEY PARK, NSW 2175	HORSLEY PARK	Land-based extractive activity	Premise Match	0m	On-site
123	PGH BRICKS & PAVERS PTY LIMITED	CSR BUILDING PRODUCTS, HORSLEY PARK	327 BURLEY ROAD, HORSLEY PARK, NSW 2175	HORSLEY PARK	Mining for minerals	Premise Match	0m	On-site
123	PGH BRICKS & PAVERS PTY LIMITED	CSR BUILDING PRODUCTS, HORSLEY PARK	327 BURLEY ROAD, HORSLEY PARK, NSW 2175	HORSLEY PARK	Ceramics production	Premise Match	0m	On-site
123	PGH BRICKS & PAVERS PTY LIMITED	CSR BUILDING PRODUCTS, HORSLEY PARK	327 BURLEY ROAD, HORSLEY PARK, NSW 2175	HORSLEY PARK	Crushing, grinding or separating	Premise Match	0m	On-site
20953	RB (HYGIENE HOME) AUSTRALIA PTY LTD		WAREHOUSE 3B, 3 OAKDALE CLOSE, HORSLEY PARK, NSW 2175		General chemicals storage	Premise Match	35m	North West
546	THE AUSTRAL BRICK CO PTY LTD	AUSTRAL BRICK, PLANTS 1, 2 & 3.	738-780 WALLGROVE ROAD	HORSLEY PARK	Ceramic waste generation	Premise Match	158m	North East
546	THE AUSTRAL BRICK CO PTY LTD	AUSTRAL BRICK, PLANTS 1, 2 & 3.	738-780 WALLGROVE ROAD	HORSLEY PARK	Crushing, grinding or separating	Premise Match	158m	North East
546	THE AUSTRAL BRICK CO PTY LTD	AUSTRAL BRICK, PLANTS 1, 2 & 3.	738-780 WALLGROVE ROAD	HORSLEY PARK	Land-based extractive activity	Premise Match	158m	North East
546	THE AUSTRAL BRICK CO PTY LTD	AUSTRAL BRICK, PLANTS 1, 2 & 3.	738-780 WALLGROVE ROAD	HORSLEY PARK	Mining for minerals	Premise Match	158m	North East
546	THE AUSTRAL BRICK CO PTY LTD	AUSTRAL BRICK, PLANTS 1, 2 & 3.	738-780 WALLGROVE ROAD	HORSLEY PARK	Ceramics production	Premise Match	158m	North East
21740	JALCO AUSTRALIA PTY. LIMITED		8 JOHNSTON CRESCENT, HORSLEY PARK, NSW 2175		Chemical production	Premise Match	450m	South West
7119	NSW ELECTRICITY NETWORKS OPERATIONS PTY LIMITED	TRANSGRID	200 OLD WALLGROVE ROAD	EASTERN CREEK	Waste storage - hazardous, restricted solid, liquid, clinical and related waste and asbestos waste	Premise Match	820m	North

POEO Licence Data Source: Environment Protection Authority  
 © State of New South Wales through the Environment Protection Authority

# Delicensed & Former Licensed EPA Activities

16 Johnston Crescent, Horsley Park, NSW 2175



## EPA Activities

16 Johnston Crescent, Horsley Park, NSW 2175

### Delicensed Activities still regulated by the EPA

Delicensed activities still regulated by the EPA, within the dataset buffer:

Licence No	Organisation	Name	Address	Suburb	Activity	Loc Conf	Distance	Direction
N/A	No records in buffer							

Delicensed Activities Data Source: Environment Protection Authority

© State of New South Wales through the Environment Protection Authority

### Former Licensed Activities under the POEO Act 1997, now revoked or surrendered

Former Licensed activities under the Protection of the Environment Operations Act 1997, now revoked or surrendered, within the dataset buffer:

Licence No	Organisation	Location	Status	Issued Date	Activity	Loc Conf	Distance	Direction
4653	LUHRMANN ENVIRONMENT MANAGEMENT PTY LTD	WATERWAYS THROUGHOUT NSW	Surrendered	06/09/2000	Other Activities / Non Scheduled Activity - Application of Herbicides	Network of Features	0m	On-site
4838	Robert Orchard	Various Waterways throughout New South Wales - SYDNEY NSW 2000	Surrendered	07/09/2000	Other Activities / Non Scheduled Activity - Application of Herbicides	Network of Features	0m	On-site
5150	FAIRFIELD CITY COUNCIL	WATERWAYS OF FAIRFIELD CITY COUNCIL - FAIRFIELD NSW 2165	Surrendered	17/08/2000	Other Activities / Non Scheduled Activity - Application of Herbicides	Network of Features	0m	On-site
6630	SYDNEY WEED & PEST MANAGEMENT PTY LTD	WATERWAYS THROUGHOUT NSW - PROSPECT, NSW, 2148	Surrendered	09/11/2000	Other Activities / Non Scheduled Activity - Application of Herbicides	Network of Features	0m	On-site

Former Licensed Activities Data Source: Environment Protection Authority

© State of New South Wales through the Environment Protection Authority

## Historical Business Directories

16 Johnston Crescent, Horsley Park, NSW 2175

### Business Directory Records 1950-1991 Premise or Road Intersection Matches

Potentially contaminative business activities extracted from Universal Business Directories from years 1991, 1986, 1982, 1970, 1961 & 1950, mapped to a premise or road intersection within the dataset buffer:

Map Id	Business Activity	Premise	Ref No.	Year	Location Confidence	Distance to Property Boundary or Road Intersection	Direction
N/A	No records in buffer						

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## Business Directory Records 1950-1991 Road or Area Matches

Potentially contaminative business activities extracted from Universal Business Directories from years 1991, 1986, 1982, 1970, 1961 & 1950, mapped to a road or an area, within the dataset buffer. Records are mapped to the road when a building number is not supplied, cannot be found, or the road has been renumbered since the directory was published:

Map Id	Business Activity	Premise	Ref No.	Year	Location Confidence	Distance to Road Corridor or Area
N/A	No records in buffer					

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## Historical Business Directories

16 Johnston Crescent, Horsley Park, NSW 2175

### Dry Cleaners, Motor Garages & Service Stations 1948-1993 Premise or Road Intersection Matches

Dry Cleaners, Motor Garages & Service Stations from UBD Business Directories, mapped to a premise or road intersection, within the dataset buffer.

Note: The Universal Business Directories were published between 1948 and 1993. Dry Cleaners, Motor Garages & Service Stations have been extracted from all of these directories except the following years 1951, 1955, 1957, 1960, 1963, 1973, 1974, 1977, 1987.

Map Id	Business Activity	Premise	Ref No.	Year	Location Confidence	Distance to Property Boundary or Road Intersection	Direction
N/A	No records in buffer						

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## Dry Cleaners, Motor Garages & Service Stations 1948-1993 Road or Area Matches

Dry Cleaners, Motor Garages & Service Stations from UBD Business Directories, mapped to a road or an area, within the dataset buffer. Records are mapped to the road when a building number is not supplied, cannot be found, or the road has been renumbered since the directory was published.

Note: The Universal Business Directories were published between 1948 and 1993. Dry Cleaners, Motor Garages & Service Stations have been extracted from all of these directories except the following years 1951, 1955, 1957, 1960, 1963, 1973, 1974, 1977, 1987.

Map Id	Business Activity	Premise	Ref No.	Year	Location Confidence	Distance to Road Corridor or Area
N/A	No records in buffer					

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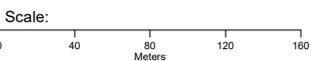
# Aerial Imagery 2023

16 Johnston Crescent, Horsley Park, NSW 2175



### Legend

-  Site Boundary
-  Buffer 150m



Data Source Aerial Imagery:  
© Aerometrex Pty Ltd

Coordinate System:  
GDA 1994 MGA Zone 56

Date: 12 March 2024

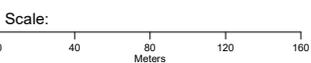
# Aerial Imagery 2020

16 Johnston Crescent, Horsley Park, NSW 2175



### Legend

-  Site Boundary
-  Buffer 150m



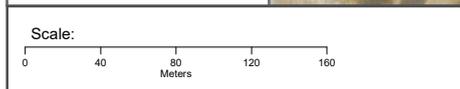
Data Source Aerial Imagery:  
© Aerometrex Pty Ltd

Coordinate System:  
GDA 1994 MGA Zone 56

Date: 12 March 2024

# Aerial Imagery 2016

16 Johnston Crescent, Horsley Park, NSW 2175



Data Source Aerial Imagery:  
© Aerometrex Pty Ltd

Coordinate System:  
GDA 1994 MGA Zone 56

Date: 12 March 2024

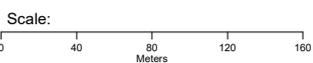
# Aerial Imagery 2011

16 Johnston Crescent, Horsley Park, NSW 2175



## Legend

-  Site Boundary
-  Buffer 150m



Data Source Aerial Imagery:  
© Aerometrex Pty Ltd

Coordinate System:  
GDA 1994 MGA Zone 56

Date: 12 March 2024

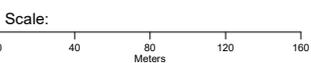
# Aerial Imagery 2007

16 Johnston Crescent, Horsley Park, NSW 2175



### Legend

-  Site Boundary
-  Buffer 150m



Data Source Aerial Imagery:  
© Aerometrex Pty Ltd

Coordinate System:  
GDA 1994 MGA Zone 56

Date: 12 March 2024

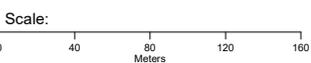
# Aerial Imagery 2000

16 Johnston Crescent, Horsley Park, NSW 2175



## Legend

-  Site Boundary
-  Buffer 150m



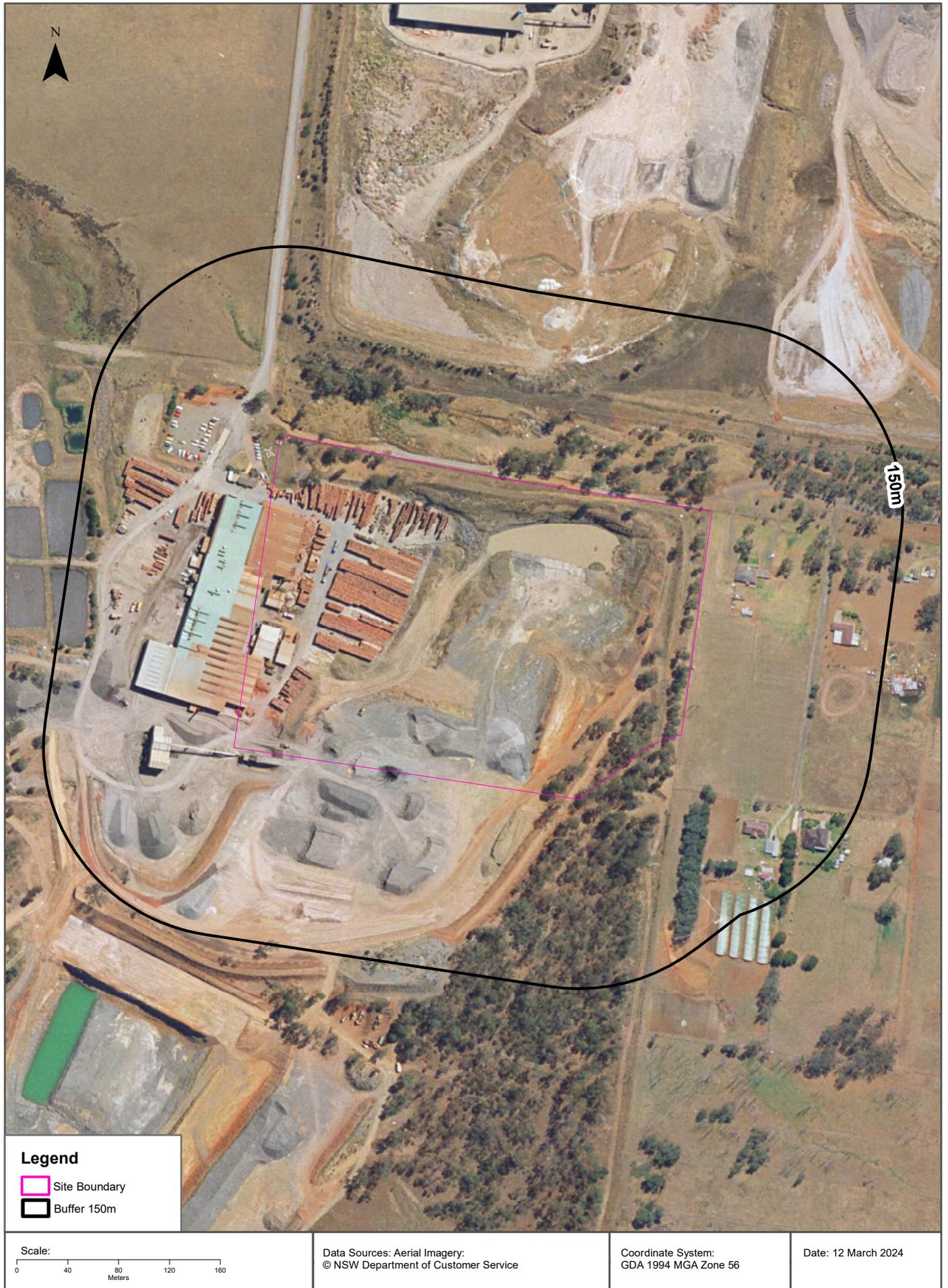
Data Source Aerial Imagery:  
© Aerometrex Pty Ltd

Coordinate System:  
GDA 1994 MGA Zone 56

Date: 12 March 2024

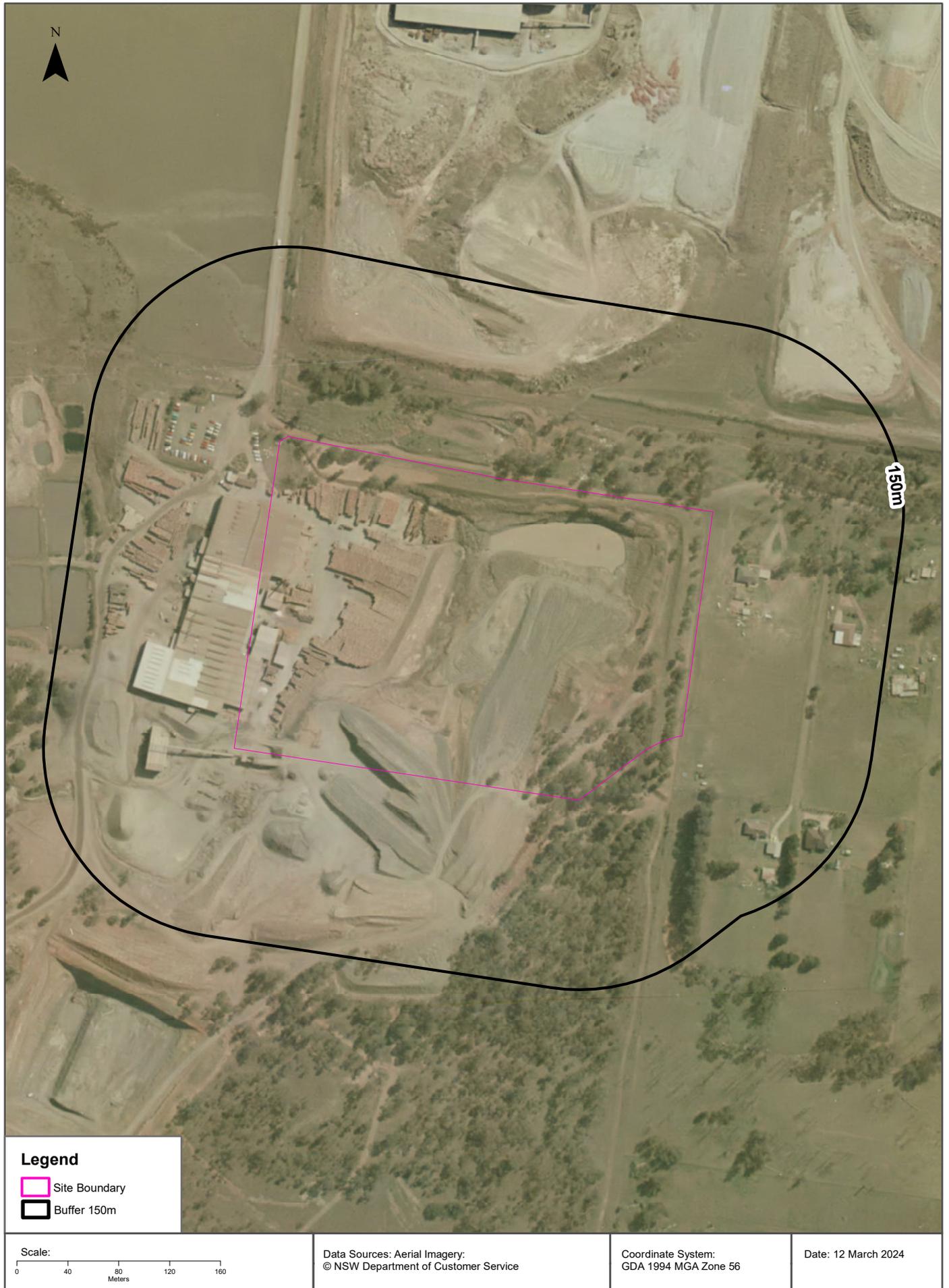
# Aerial Imagery 1994

16 Johnston Crescent, Horsley Park, NSW 2175



# Aerial Imagery 1991

16 Johnston Crescent, Horsley Park, NSW 2175



# Aerial Imagery 1986

16 Johnston Crescent, Horsley Park, NSW 2175



# Aerial Imagery 1982

16 Johnston Crescent, Horsley Park, NSW 2175



# Aerial Imagery 1978

16 Johnston Crescent, Horsley Park, NSW 2175



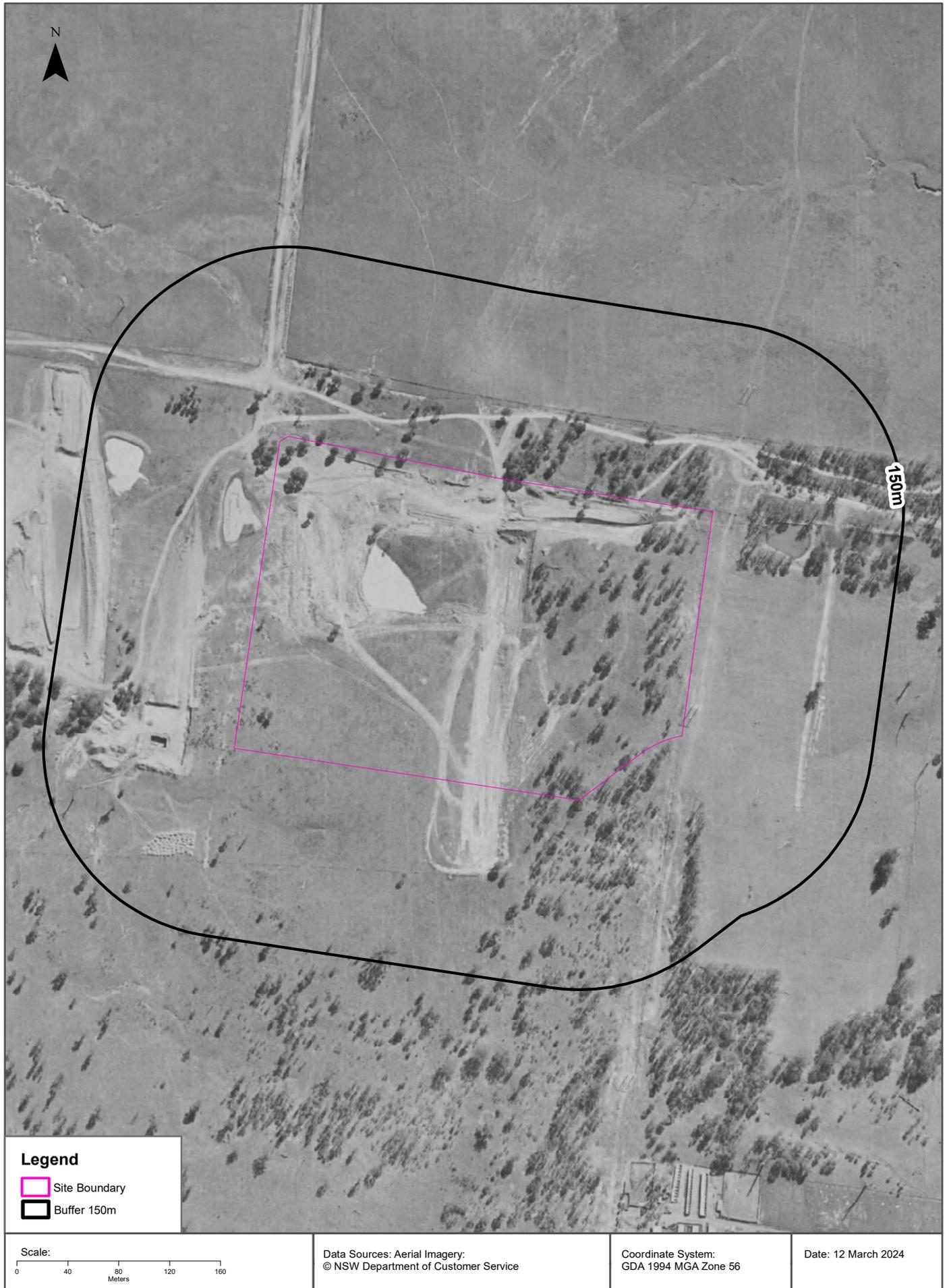
# Aerial Imagery 1970

16 Johnston Crescent, Horsley Park, NSW 2175



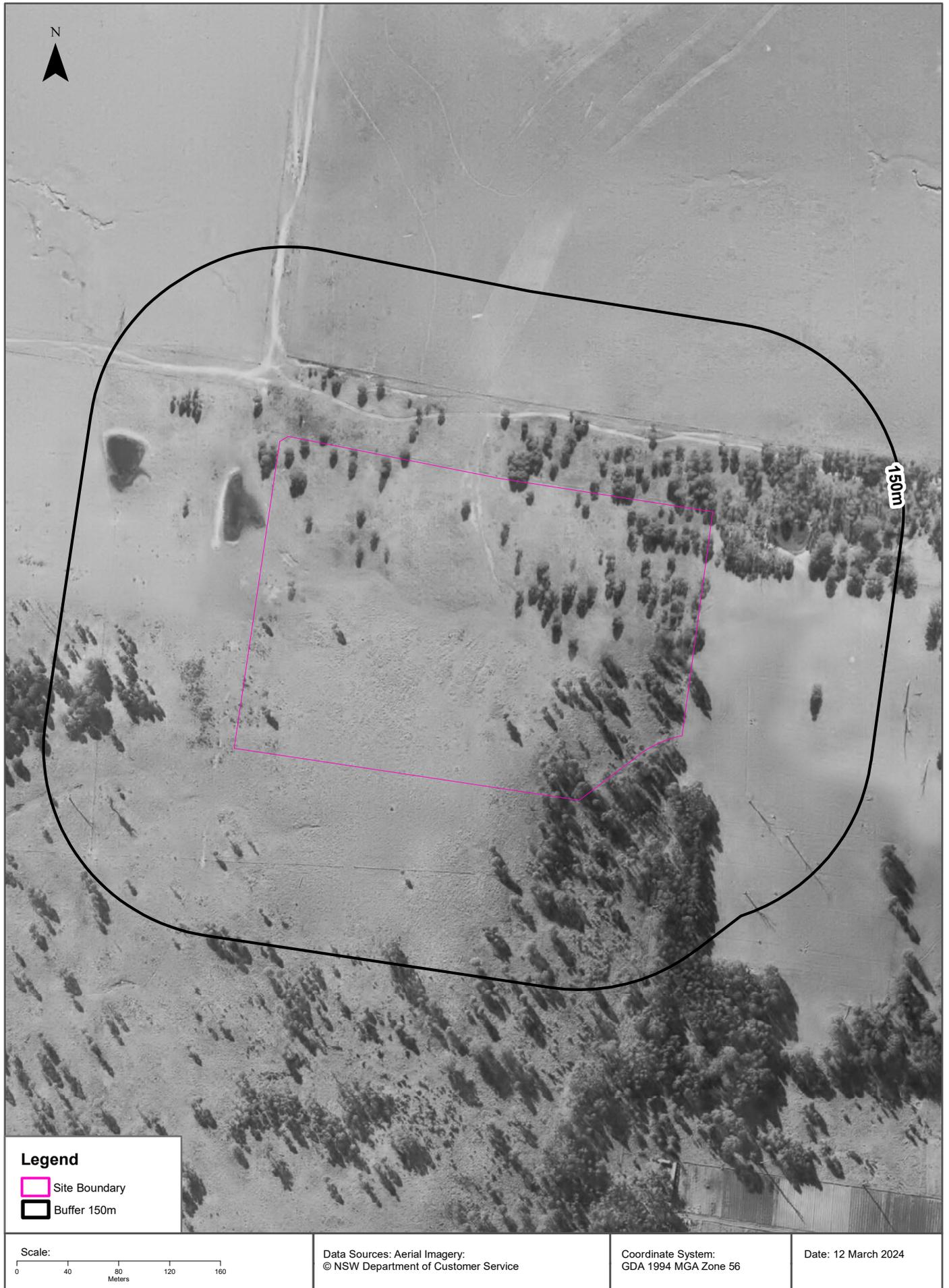
# Aerial Imagery 1965

16 Johnston Crescent, Horsley Park, NSW 2175



# Aerial Imagery 1961

16 Johnston Crescent, Horsley Park, NSW 2175



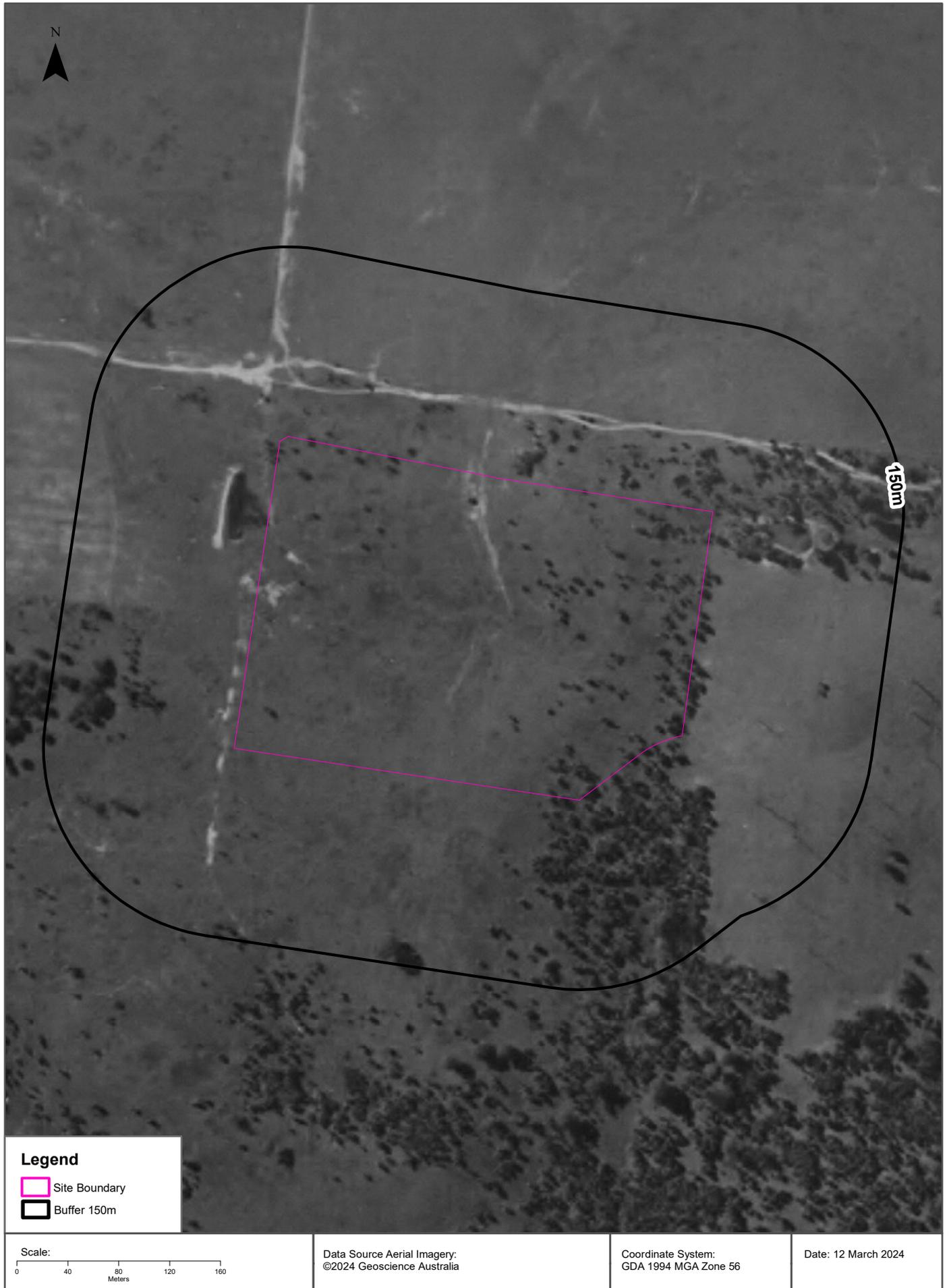
# Aerial Imagery 1955, 1956

16 Johnston Crescent, Horsley Park, NSW 2175



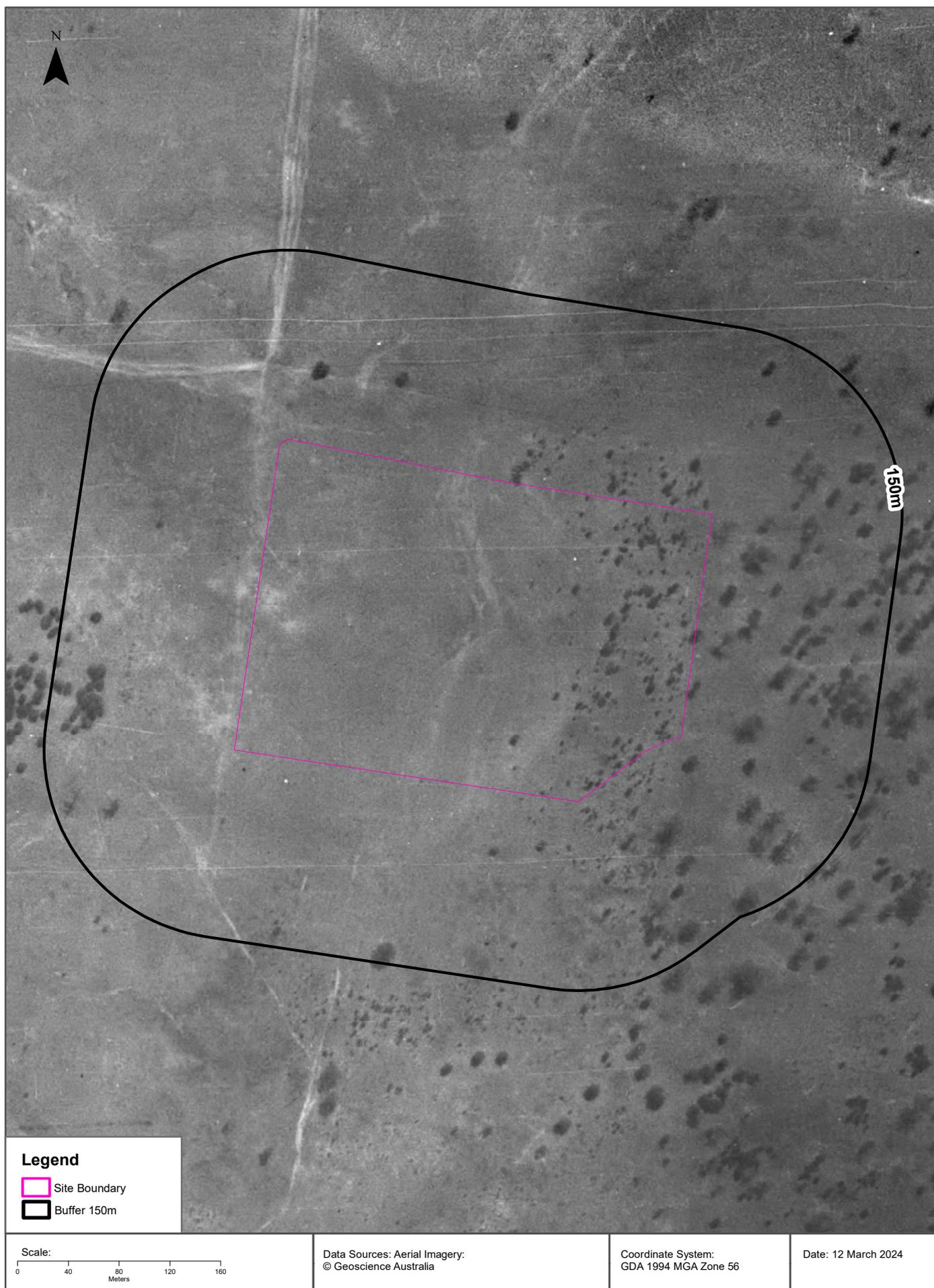
# Aerial Imagery 1949

16 Johnston Crescent, Horsley Park, NSW 2175



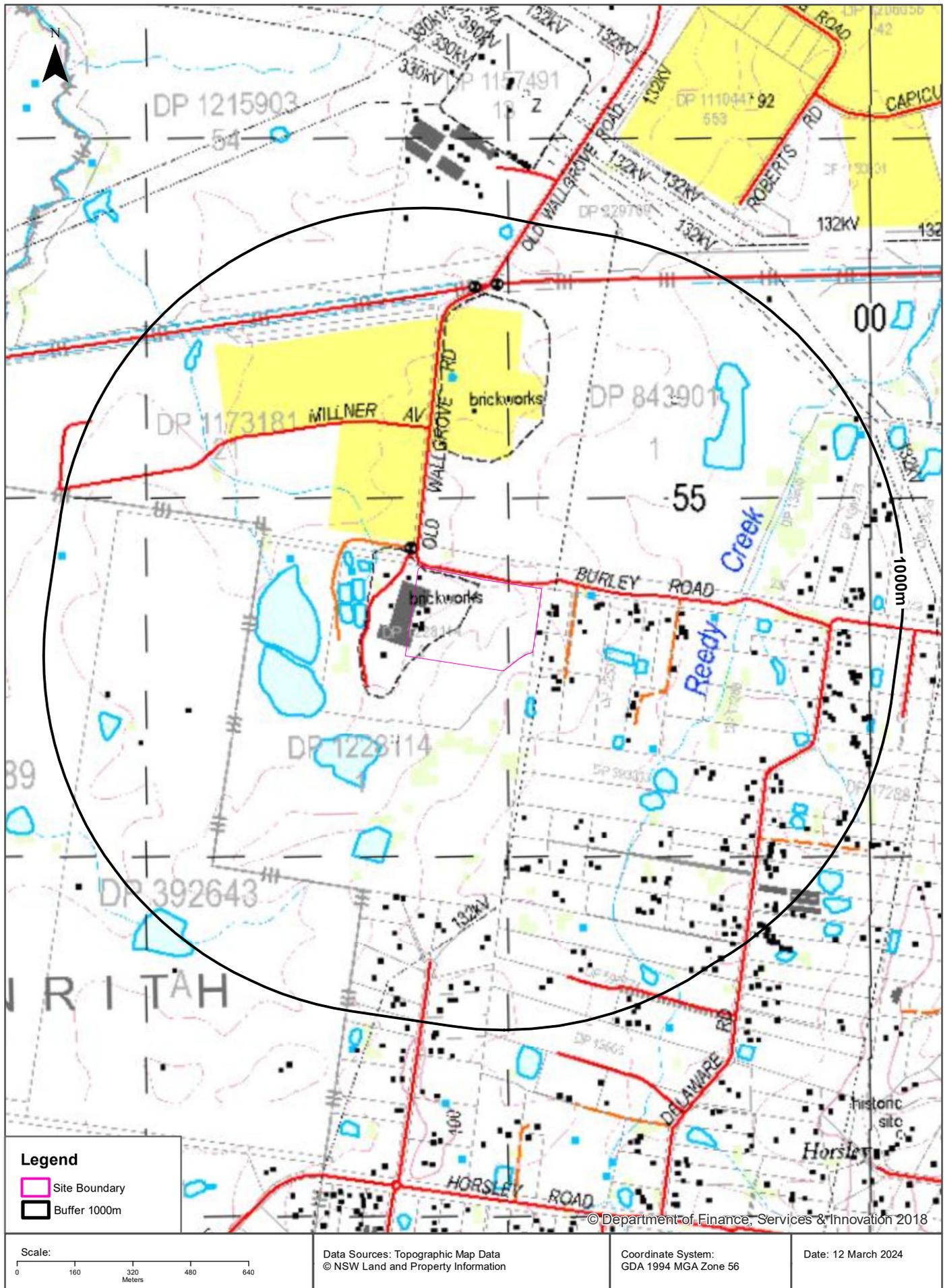
# Aerial Imagery 1930

16 Johnston Crescent, Horsley Park, NSW 2175



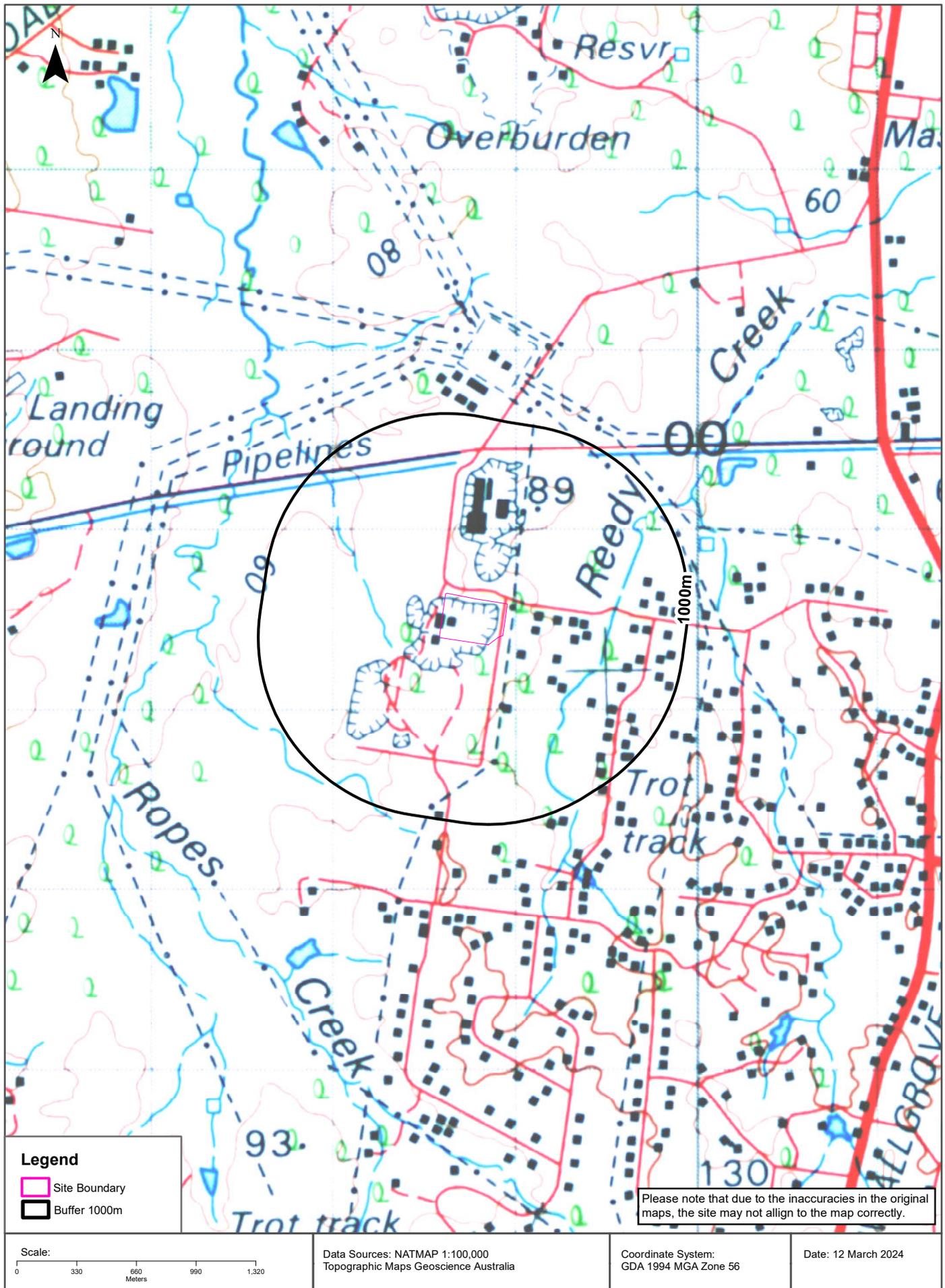
# Topographic Map 2015

16 Johnston Crescent, Horsley Park, NSW 2175



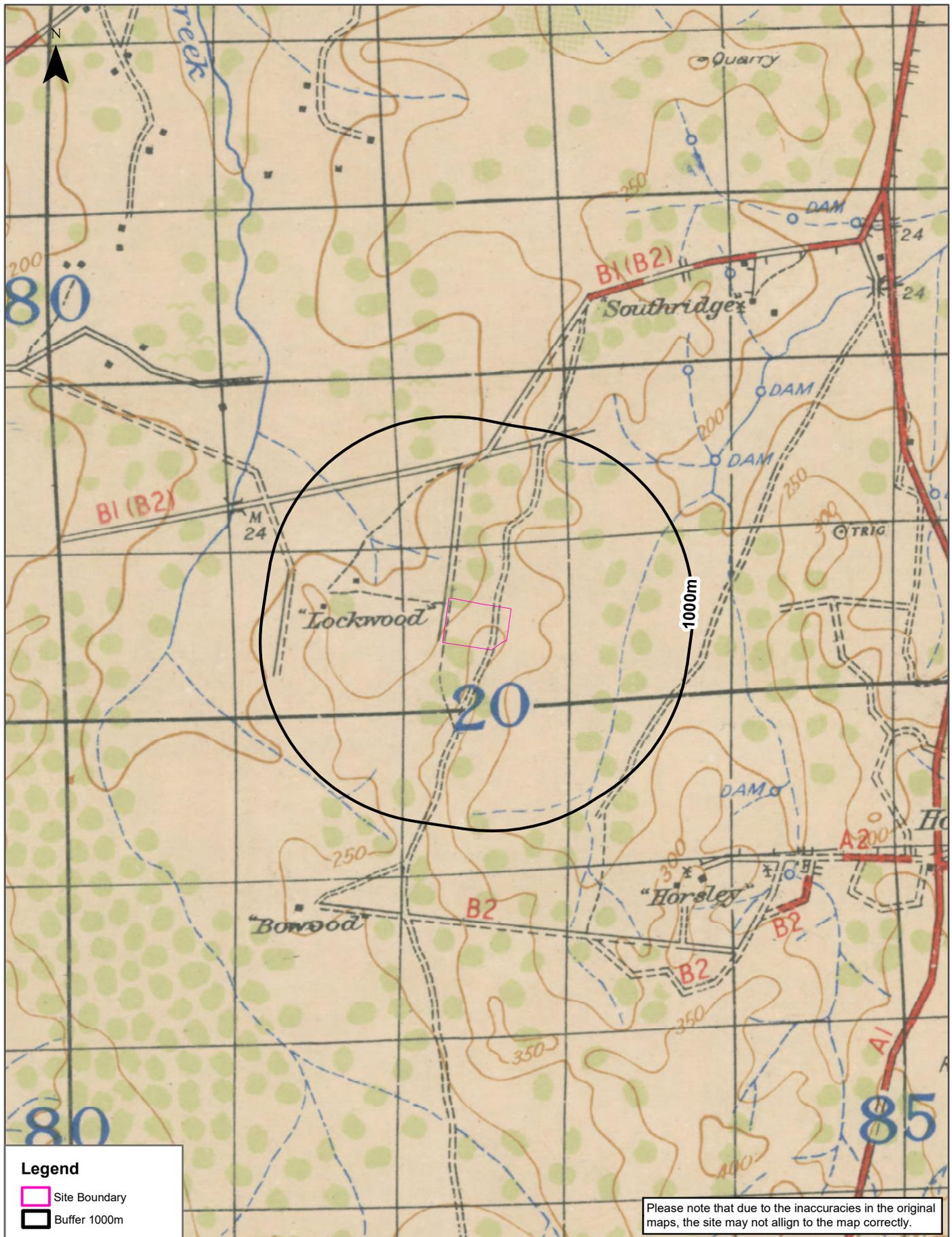
# Historical Map 1975

16 Johnston Crescent, Horsley Park, NSW 2175



# Historical Map c.1942

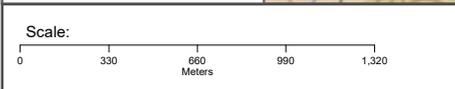
16 Johnston Crescent, Horsley Park, NSW 2175



Please note that due to the inaccuracies in the original maps, the site may not align to the map correctly.

**Legend**

-  Site Boundary
-  Buffer 1000m



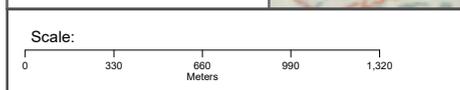
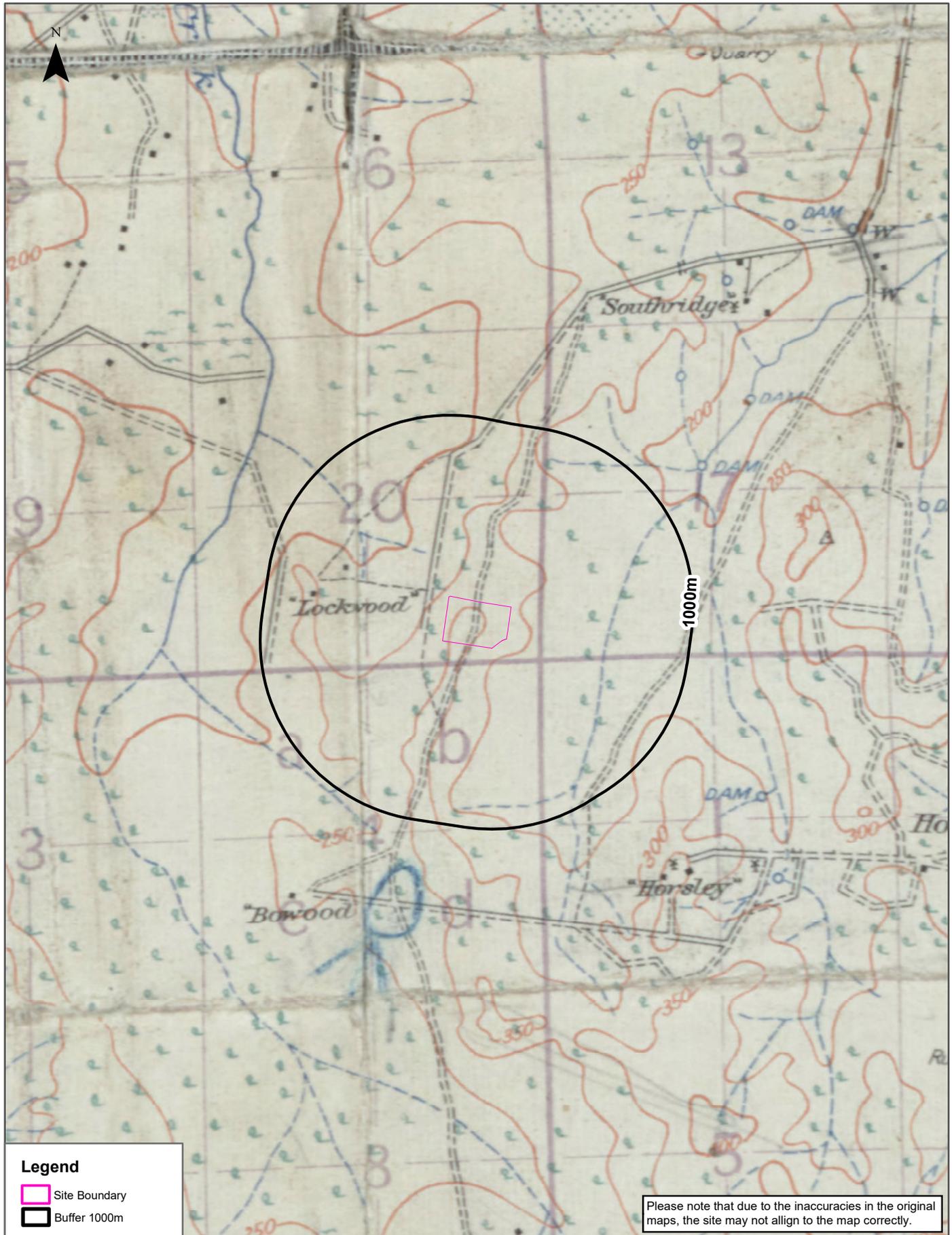
Data Sources: Australia 1:63360  
Produced by Australian Section Imperial General Staff

Coordinate System:  
GDA 1994 MGA Zone 56

Date: 12 March 2024

# Historical Map c.1929

16 Johnston Crescent, Horsley Park, NSW 2175



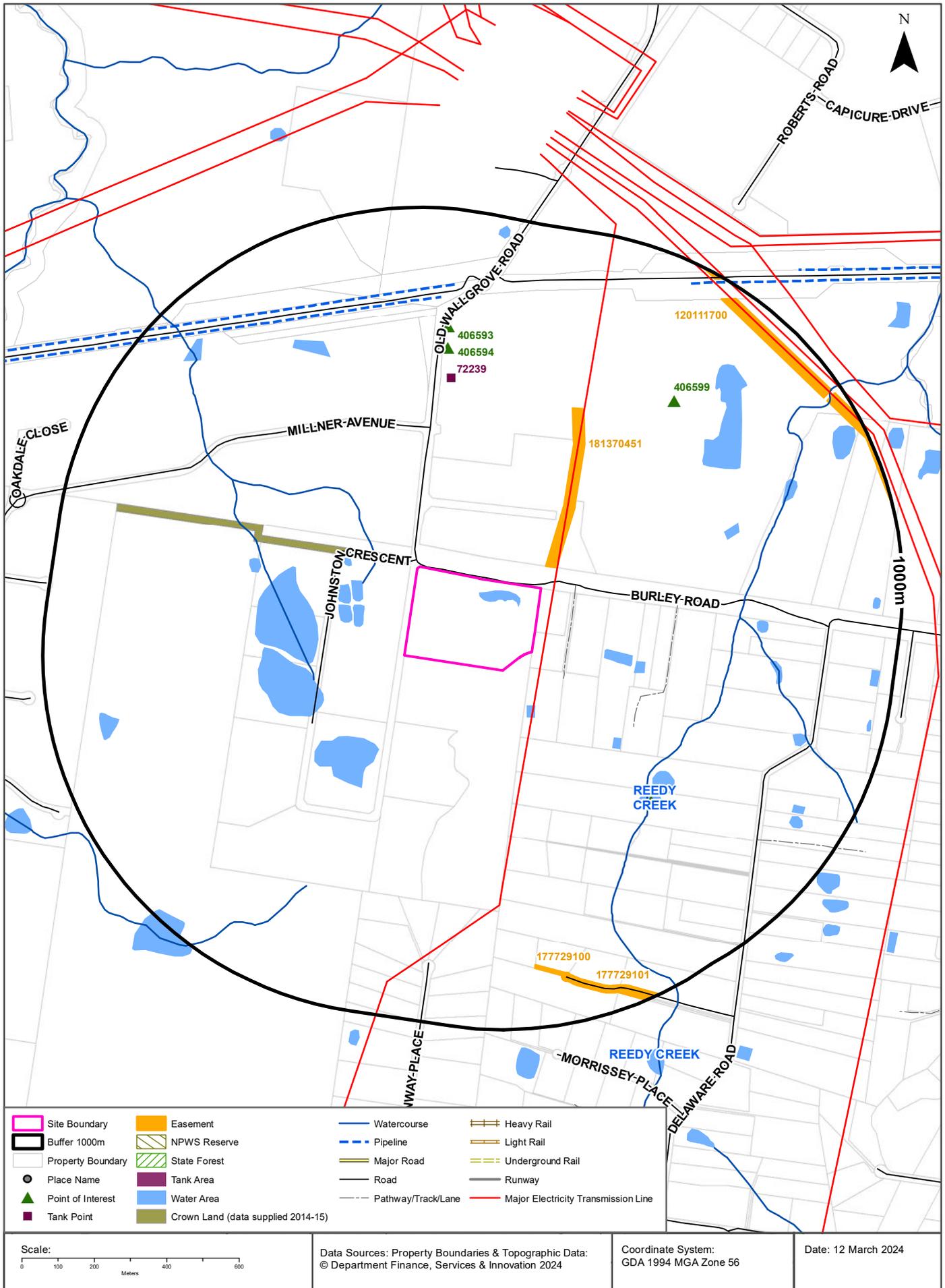
Data Sources: Australia 1:63360  
Produced by Australian Section Imperial General Staff

Coordinate System:  
GDA 1994 MGA Zone 56

Date: 12 March 2024

# Topographic Features

16 Johnston Crescent, Horsley Park, NSW 2175



# Topographic Features

16 Johnston Crescent, Horsley Park, NSW 2175

## Points of Interest

What Points of Interest exist within the dataset buffer?

Map Id	Feature Type	Label	Distance	Direction
385572	Manmade Waterbody	REEDY CREEK	530m	South East
406594	Parking Area	Parking Area	615m	North
406599	Quarry - Open Cut	Quarry - Open Cut	638m	North East
406593	Parking Area	Parking Area	673m	North

Topographic Data Source: © Land and Property Information (2015)

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# Topographic Features

16 Johnston Crescent, Horsley Park, NSW 2175

## Tanks (Areas)

What are the Tank Areas located within the dataset buffer?

Note. The large majority of tank features provided by LPI are derived from aerial imagery & are therefore primarily above ground tanks.

Map Id	Tank Type	Status	Name	Feature Currency	Distance	Direction
N/A	No records in buffer					

## Tanks (Points)

What are the Tank Points located within the dataset buffer?

Note. The large majority of tank features provided by LPI are derived from aerial imagery & are therefore primarily above ground tanks.

Map Id	Tank Type	Status	Name	Feature Currency	Distance	Direction
72239	Water	Feature on Previous LPI Tank Area Supply		08/09/2000	532m	North

Tanks Data Source: © Land and Property Information (2015)

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## Major Easements

What Major Easements exist within the dataset buffer?

Note. Easements provided by LPI are not at the detail of local governments. They are limited to major easements such as Right of Carriageway, Electrical Lines (66kVa etc.), Easement to drain water & Significant subterranean pipelines (gas, water etc.).

Map Id	Easement Class	Easement Type	Easement Width	Distance	Direction
181370451	Primary	Electricity	30.48m	63m	North East
177729100	Primary	Right of way	10 metre	824m	South
177729101	Primary	Right of way	20 m & variable	858m	South
120111700	Primary	Undefined		925m	North East

Easements Data Source: © Land and Property Information (2015)

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# Topographic Features

16 Johnston Crescent, Horsley Park, NSW 2175

## State Forest

What State Forest exist within the dataset buffer?

State Forest Number	State Forest Name	Distance	Direction
N/A	No records in buffer		

State Forest Data Source: © NSW Department of Finance, Services & Innovation (2018)  
Creative Commons 3.0 © Commonwealth of Australia <http://creativecommons.org/licenses/by/3.0/au/deed.en>

## National Parks and Wildlife Service Reserves

What NPWS Reserves exist within the dataset buffer?

Reserve Number	Reserve Type	Reserve Name	Gazetted Date	Distance	Direction
N/A	No records in buffer				

NPWS Data Source: © NSW Department of Finance, Services & Innovation (2018)  
Creative Commons 3.0 © Commonwealth of Australia <http://creativecommons.org/licenses/by/3.0/au/deed.en>

# Elevation Contours (m AHD)

16 Johnston Crescent, Horsley Park, NSW 2175



# Hydrogeology & Groundwater

16 Johnston Crescent, Horsley Park, NSW 2175

## Hydrogeology

Description of aquifers within the dataset buffer:

Description	Distance	Direction
Porous, extensive aquifers of low to moderate productivity	0m	On-site

Hydrogeology Map of Australia : Commonwealth of Australia (Geoscience Australia)  
Creative Commons 3.0 © Commonwealth of Australia <http://creativecommons.org/licenses/by/3.0/au/deed.en>

## Temporary Water Restriction (Botany Sands Groundwater Source) Order 2018

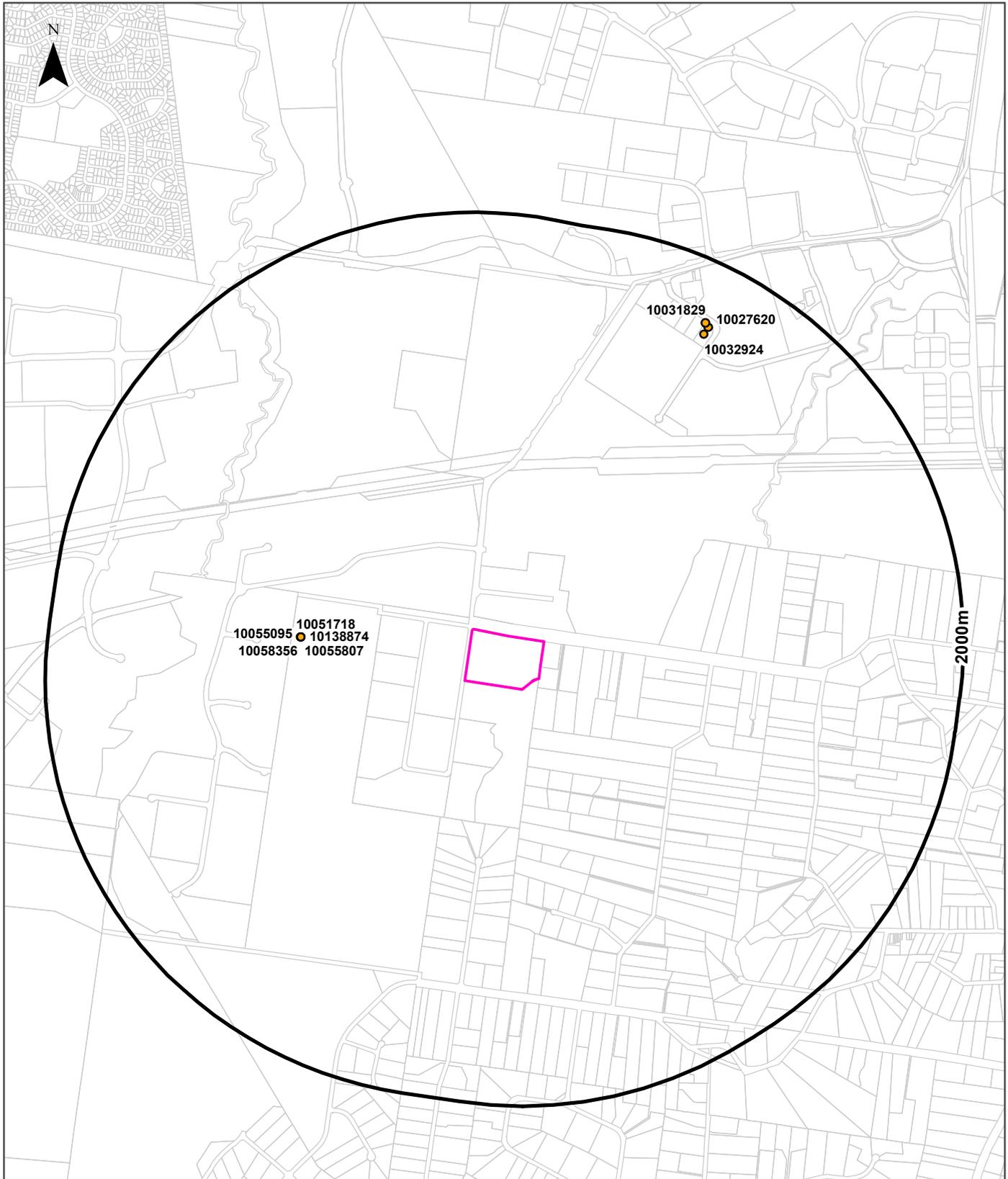
Temporary water restrictions relating to the Botany Sands aquifer within the dataset buffer:

Prohibition Area No.	Prohibition	Distance	Direction
N/A	No records in buffer		

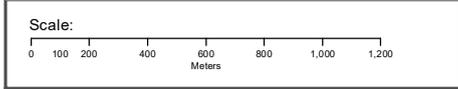
Temporary Water Restriction (Botany Sands Groundwater Source) Order 2018 Data Source : NSW Department of Primary Industries

# Groundwater Boreholes

16 Johnston Crescent, Horsley Park, NSW 2175



Legend		
Site Boundary	Borehole	Monitoring
Buffer 2000m	Commercial and Industrial	Other; Unknown
Property Boundary	Dewatering	Stock and Domestic
	Exploration	Water Supply
	Irrigation	



Data Sources: Property Boundaries & Topographic Data:  
© Department Finance, Services & Innovation 2024

Coordinate System:  
GDA 1994 MGA Zone 56

Date: 12 March 2024

# Hydrogeology & Groundwater

16 Johnston Crescent, Horsley Park, NSW 2175

## Groundwater Boreholes

Boreholes within the dataset buffer:

NGIS Bore ID	NSW Bore ID	Bore Type	Status	Drill Date	Bore Depth (m)	Reference Elevation	Height Datum	Salinity (mg/L)	Yield (L/s)	SWL (mbgl)	Distance	Direction
10051718	GW100290	Monitoring	Functional	21/10/1994	80.00		AHD	1970			803m	West
10055095	GW100447	Unknown	Functional	11/11/1996			AHD	22900	0.100	2.89	803m	West
10055807	GW100447	Unknown	Functional	11/11/1996			AHD	22900	0.100	2.89	803m	West
10058356	GW100447	Monitoring	Functional	11/11/1996	29.60		AHD	22900	0.100	2.89	803m	West
10138874	GW100447	Unknown	Functional	11/11/1996			AHD	22900	0.100	2.89	803m	West
10032924	GW114926	Monitoring	Functional	08/07/2015	13.50		AHD				1659m	North East
10027620	GW114927	Monitoring	Functional	08/07/2015	18.00		AHD				1699m	North East
10031829	GW114928	Monitoring	Functional	10/10/2011	11.50		AHD				1711m	North East

Borehole Data Source: Bureau of Meteorology; Water NSW. Creative Commons 3.0 © Commonwealth of Australia <http://creativecommons.org/licenses/by/3.0/au/deed.en>

# Hydrogeology & Groundwater

16 Johnston Crescent, Horsley Park, NSW 2175

## Driller's Logs

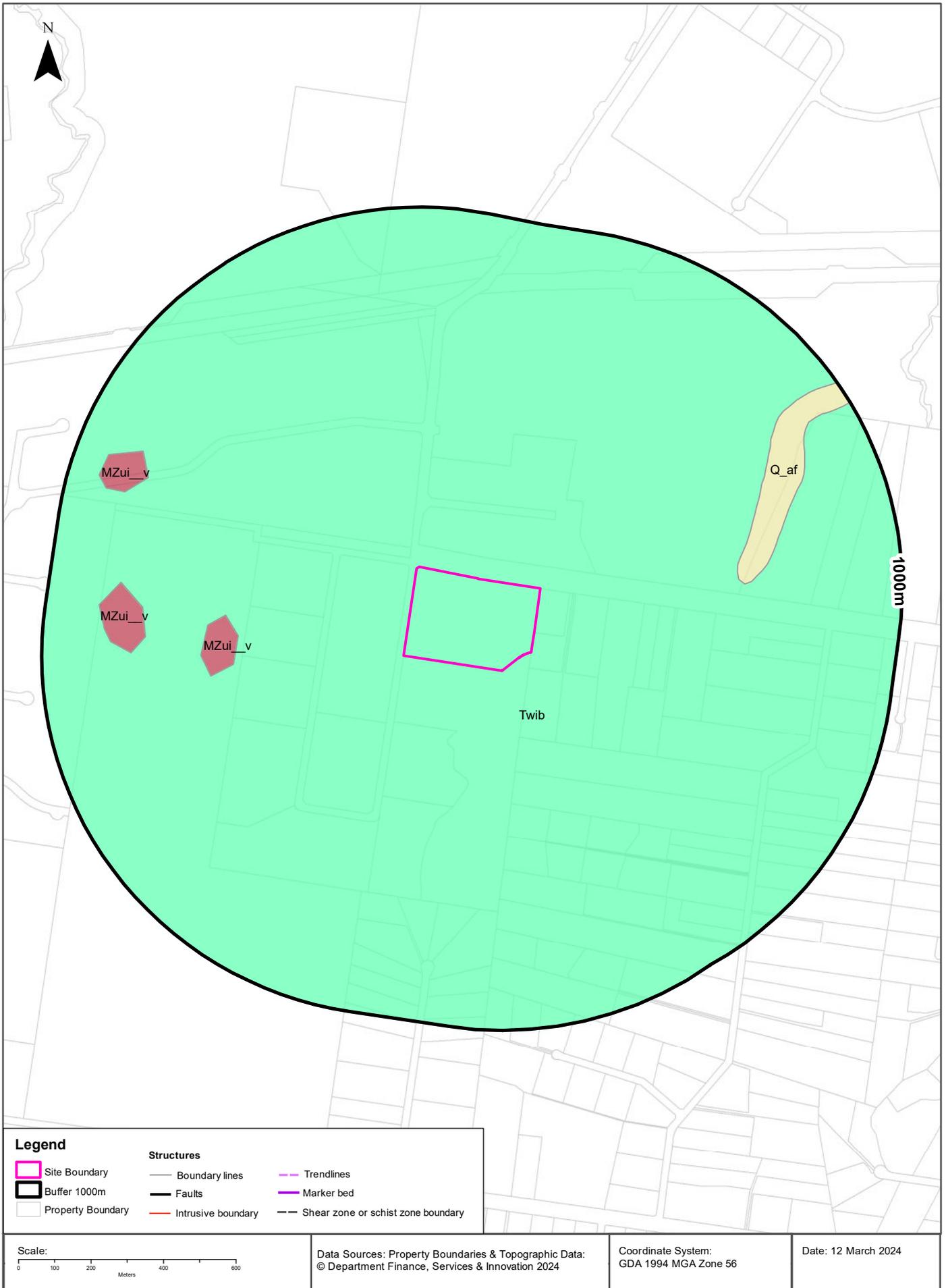
Drill log data relevant to the boreholes within the dataset buffer:

NGIS Bore ID	Drillers Log	Distance	Direction
10051718	0.00m-1.00m FILL DOLERITE GRAVEL 1.00m-2.00m CLAY/ BLUE/ GREY 2.00m-4.00m SANDSTONE/ BROWN / YELLOW 4.00m-10.00m INTERBEDDED SILTSTONE / SANDSTONE 10.00m-12.00m SILTSTONE / DARK GREY 12.00m-15.00m SILTSTONE / SHALE & CLAY INTERBEDS 15.00m-17.00m SILTSTONE AND SHALE 17.00m-23.00m SILTSTONE MASSIVE 23.00m-53.00m SILTSTONE & SHALE INTERBEDDED 53.00m-54.00m SANDSTONE & SHALE INTERBEDDED 54.00m-57.00m SHALE & SILTSTONE INTERBEDDED 57.00m-61.00m SANDSTONE, SHALE, SILTSTONE INTERBEDDED 61.00m-63.00m SHALE, CARBONACEOUS 63.00m-64.00m SHALE, SILTSTONE, SANDSTONE: INTERBEDDED 64.00m-65.00m SHALE: CARBOINACEOUS 65.00m-68.00m SILTSTONE, SHALE: INTERBEDDED 68.00m-69.00m SHALE: CARBONACEOUS 69.00m-70.00m SHALE AND SILTSTONE :INTERBEDDED 70.00m-71.00m SHALE, SILTSTONE , SANDSTONE INTERBEDDED 71.00m-75.00m SHALE & SILTSTONE INTERBEDDED 75.00m-76.00m SHALE, CLAY, SILTSTONE INTERBEDDED 76.00m-80.00m SHALE, SILTSTONE: INTERBEDDED	803m	West
10055095	0.00m-1.00m CLAY 1.00m-29.60m SILTSTONE/SHALE	803m	West
10055807	0.00m-1.00m CLAY 1.00m-29.60m SILTSTONE/SHALE	803m	West
10058356	0.00m-1.00m CLAY 1.00m-29.60m SILTSTONE/SHALE	803m	West
10138874	0.00m-1.00m CLAY 1.00m-29.60m SILTSTONE/SHALE	803m	West
10032924	0.00m-0.15m FILL 0.15m-1.70m SILTY CLAY RED BROWN, L.PLASTICITY 1.70m-2.20m SILTY CLAY DARK BROWN 2.20m-3.00m SHALE, LIGHT BROWN 3.00m-4.70m SHALE LIGHT BROWN HARD 4.70m-6.80m SHALE GREY BROWN 6.80m-12.00m SHALE, DARK GREY, DRY 12.00m-13.50m SHALE, DARK GREY, WET	1659m	North East
10027620	0.00m-2.70m SILTY CLAY, RED BROWN MOTTLED L.PLASTICITY 2.70m-2.90m SILTY CLAY GRADING INTO EATHERED SHALE 2.90m-12.00m SHALE, WEATHERED BEDROCK, DARK GREY, DRY 12.00m-18.00m AS ABOVE BUT HARD.	1699m	North East
10031829	0.00m-0.15m FILL 0.15m-0.35m SILTY CLAY, LIGHT BROWN L/M PLASTICITY 0.35m-3.20m SHALE GREY BROWN 3.20m-6.30m AS ABOVE BUT SOFTER 6.30m-9.50m SHALE, DARK GREY, HARD, DRY 9.50m-11.50m AS ABOVE BUT WET.	1711m	North East

Drill Log Data Source: Bureau of Meteorology; Water NSW. Creative Commons 3.0 © Commonwealth of Australia <http://creativecommons.org/licenses/by/3.0/au/deed.en>

# Geology

16 Johnston Crescent, Horsley Park, NSW 2175



# Geology

16 Johnston Crescent, Horsley Park, NSW 2175

## Geological Units

What are the Geological Units within the dataset buffer?

Unit Code	Unit Name	Description	Unit Stratigraphy	Age	Dominant Lithology	Distance
Twib	Bringelly Shale	Shale, carbonaceous claystone, laminite, lithic sandstone, rare coal.	Wianamatta Group\ Bringelly Shale	Middle Triassic (base) to Middle Triassic (top)	Shale	0m
MZui__v	Ungrouped Mesozoic igneous units - breccia	Volcanic breccia, varying amounts of sedimentary breccia, and basalt.	Ungrouped Mesozoic igneous units\ Ungrouped Mesozoic igneous units - breccia	Jurassic (base) to Cretaceous (top)	Undifferentiated breccia	460m
Q_af	Alluvial floodplain deposits	Silt, very fine- to medium-grained lithic to quartz-rich sand, clay.	Alluvium\ Alluvial floodplain deposits	Quaternary (base) to Now (top)	Clastic sediment	546m

## Linear Geological Structures

What are the Dyke, Sill, Fracture, Lineament and Vein trendlines within the dataset buffer?

Map ID	Feature Description	Map Sheet Name	Distance
No Features			

What are the Faults, Shear zones or Schist zones, Intrusive boundaries & Marker beds within the dataset buffer?

Map ID	Boundary Type	Description	Map Sheet Name	Distance
No Features				

Geological Data Source: Statewide Seamless Geology v2.1, Department of Regional NSW

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# Naturally Occurring Asbestos Potential

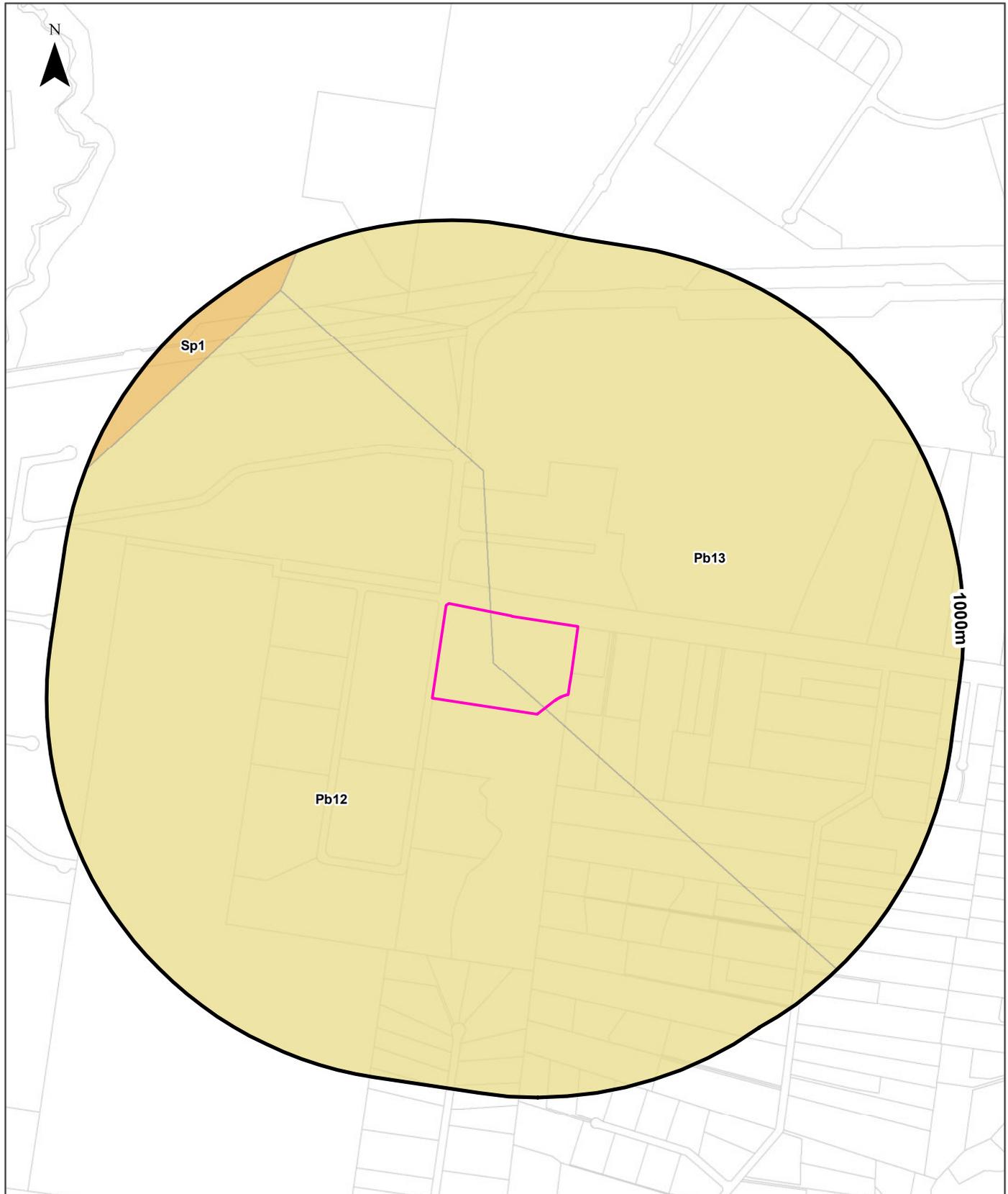
16 Johnston Crescent, Horsley Park, NSW 2175

## Naturally Occurring Asbestos Potential

Naturally Occurring Asbestos Potential within the dataset buffer:

Potential	Sym	Strat Name	Group	Formation	Scale	Min Age	Max Age	Rock Type	Dom Lith	Description	Dist	Dir
No records in buffer												

Naturally Occurring Asbestos Potential Data Source: © State of New South Wales through NSW Department of Industry, Resources & Energy



<b>Legend</b>		<b>Australian Soil Classification Orders</b>					
Site Boundary	Anthrosol	Dermosol	Kandosol	Podosol	Tenosol	No Data	
Buffer 1000m	Calcarosol	Ferrosol	Kurosol	Rudosol	Vertosol		
Property Boundary	Chromosol	Hydrosol	Organosol	Sodosol	Lake		
<b>Scale:</b> 0 100 200 400 600 Meters	Data Sources: Property Boundaries & Topographic Data: © Department Finance, Services & Innovation 2024		Coordinate System: GDA 1994 MGA Zone 56		Date: 12 March 2024		

## Soils

16 Johnston Crescent, Horsley Park, NSW 2175

### Atlas of Australian Soils

Soil mapping units and Australian Soil Classification orders within the dataset buffer:

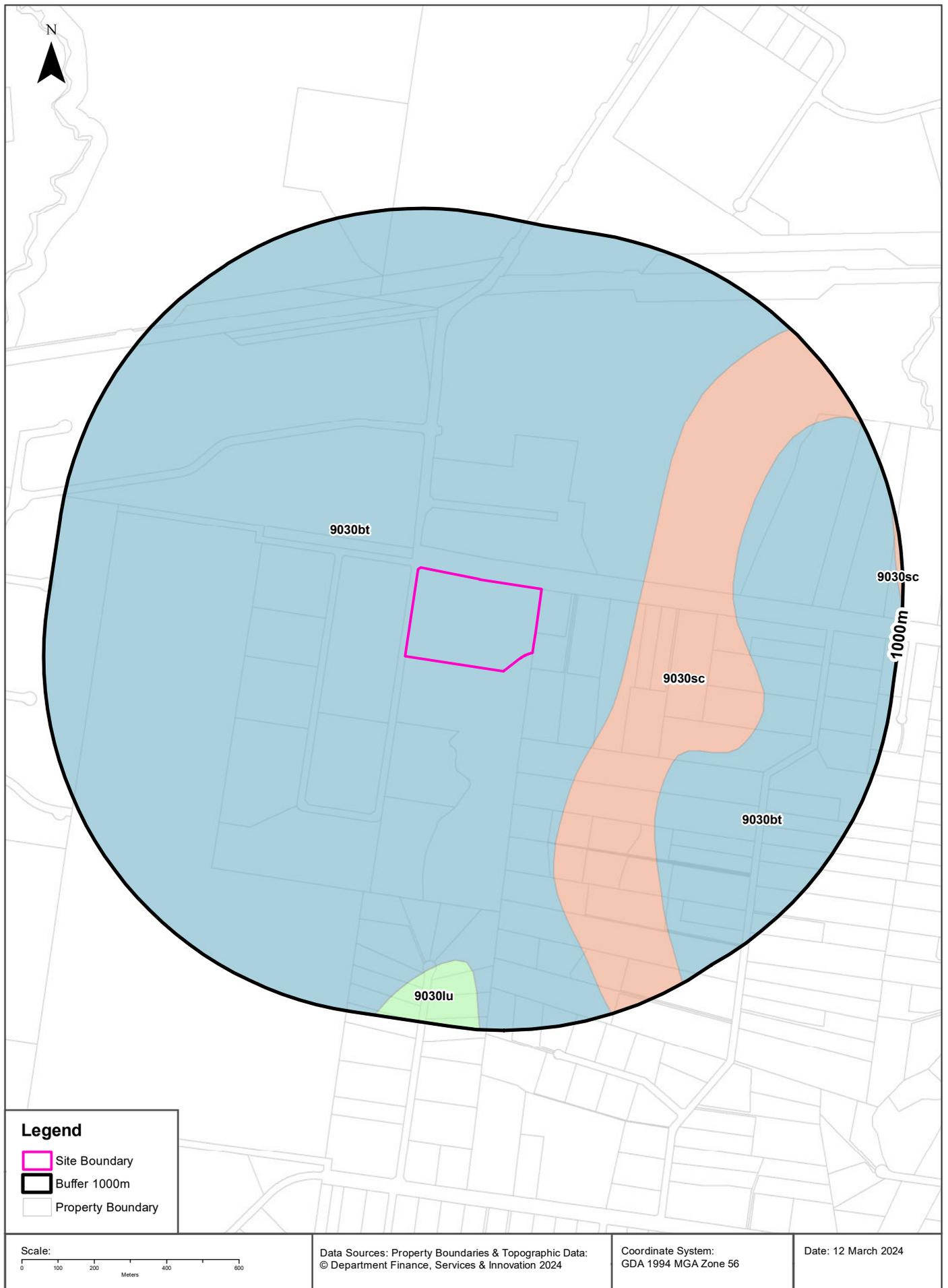
Map Unit Code	Soil Order	Map Unit Description	Distance	Direction
Pb12	Kurosol	Gently rolling to rounded hilly country with some steep slopes and broad valleys: chief soils are hard acidic red soils (Dr2.21) with hard neutral and acidic yellow mottled soils (Dy3.42 and Dy3.41) on lower slopes and in valleys. Associated are small areas of various soils including (Gn3.54) on some ridges, (Dr3.31) on some slopes; (Dr2.23) in saddles and some mid-slope positions, and some low-lying swampy areas of (Uf6) soils and (Uc1.2) soils with peaty surfaces. Small areas of other soils such as (Db1.2) are likely throughout.	0m	On-site
Pb13	Kurosol	Ridge and valley country of gently undulating ridge tops and steep side slopes often with slumping, also rounded hilly to steep hilly areas and relatively narrow valleys: chief soils are hard acidic red soils (Dr2.21) with hard acidic yellow mottled soils (Dy3.41); in places some ironstone gravels occur in both these soils. Associated are hard neutral and alkaline red soils (Dr2.22 and Dr2.23) in saddles and some mid-slope positions; (Dy3.42 and Dy3.43) soils, usually in depressions; and small areas of undescribed soils in wet soaks and valley areas. Small areas of other soils are likely throughout.	0m	On-site
Sp1	Chromosol	Gently undulating plain usually with a surface scatter of ironstone gravel: chief soils are hard acidic yellow soils (Dy2.61) on flat-topped ridges and higher situations generally and hard acidic yellow mottled soils (Dy3.41) or (Dy3.81) in lower-lying situations. They all commonly contain ironstone gravel through the profile. Associated are (Dy5.41) or (Dy5.81) soils, containing ironstone gravels; and shallow (Gn2.1) gravelly soils also with indurated materials below the solum. Iron-cemented and/or silica-cemented strata have been recorded in many areas below the soils. As mapped, areas of units X9, Pb12, and Tb35 may be included.	896m	North West

Atlas of Australian Soils Data Source: CSIRO

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# Soil Landscapes of Central and Eastern NSW

16 Johnston Crescent, Horsley Park, NSW 2175



## Soils

16 Johnston Crescent, Horsley Park, NSW 2175

### Soil Landscapes of Central and Eastern NSW

Soil Landscapes of Central and Eastern NSW within the dataset buffer:

Soil Code	Name	Distance	Direction
<a href="#">9030bt</a>	Blacktown	0m	On-site
<a href="#">9030sc</a>	South Creek	255m	East
<a href="#">9030lu</a>	Luddenham	815m	South

Soil Landscapes of Central and Eastern NSW: NSW Department of Planning, Industry and Environment  
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## Acid Sulfate Soils

16 Johnston Crescent, Horsley Park, NSW 2175

### Environmental Planning Instrument - Acid Sulfate Soils

What is the on-site Acid Sulfate Soil Plan Class that presents the largest environmental risk?

Soil Class	Description	EPI Name
N/A		

If the on-site Soil Class is 5, what other soil classes exist within 500m?

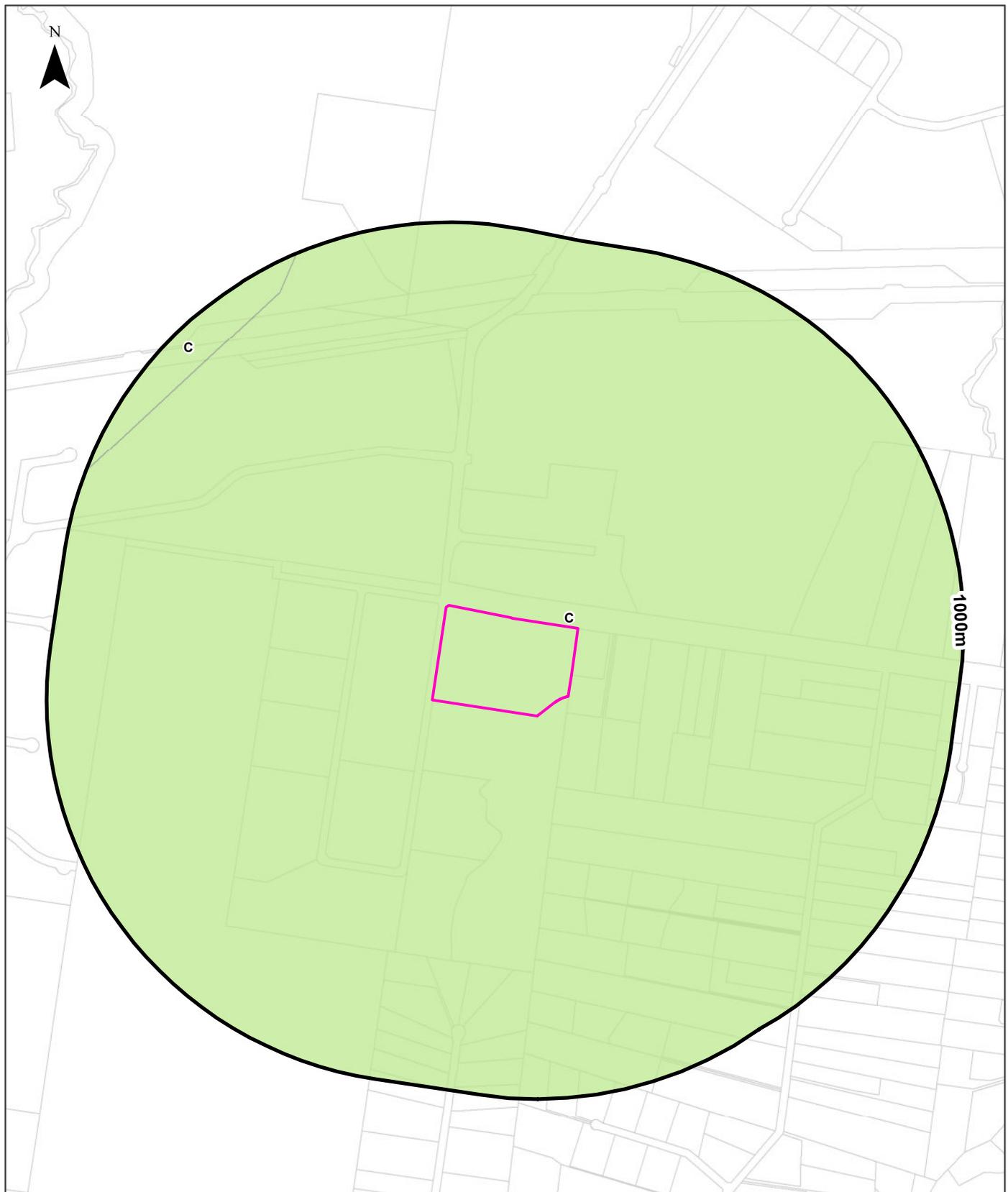
Soil Class	Description	EPI Name	Distance	Direction
N/A				

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# Atlas of Australian Acid Sulfate Soils

16 Johnston Crescent, Horsley Park, NSW 2175



<b>Legend</b>			
Site Boundary	<b>Probability of occurrence of Acid Sulfate Soils</b>		
Buffer 1000m	A. High (>70%)	C. Extremely Low (1-5%)	No Data
Property Boundary	B. Low (6-70%)	D. No Chance (0%)	
<b>Scale:</b> 0 100 200 400 600 Meters	Data Sources: Property Boundaries & Topographic Data: © Department Finance, Services & Innovation 2024	Coordinate System: GDA 1994 MGA Zone 56	Date: 12March 2024

## Acid Sulfate Soils

16 Johnston Crescent, Horsley Park, NSW 2175

### Atlas of Australian Acid Sulfate Soils

Atlas of Australian Acid Sulfate Soil categories within the dataset buffer:

Class	Description	Distance	Direction
C	Extremely low probability of occurrence. 1-5% chance of occurrence with occurrences in small localised areas.	0m	On-site

Atlas of Australian Acid Sulfate Soils Data Source: CSIRO

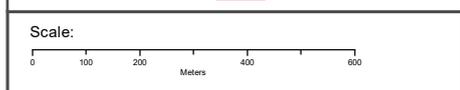
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# Dryland Salinity

16 Johnston Crescent, Horsley Park, NSW 2175



<p> Site Boundary</p> <p> Buffer 1000m</p> <p> Property Boundary</p>	<p><b>Dryland Salinity - National Assessment</b></p> <p> Delineated risk area but no high hazard or risk rating for either 2000, 2020, 2050</p> <p> High hazard or risk in 2050 only</p> <p> High hazard or risk defined for 2050, but no assessment made for 2000 or 2020</p> <p> High hazard or risk in 2020 and 2050</p> <p> High hazard or risk in 2000 and 2050. 2020 not defined as high hazard</p> <p> High hazard or risk defined for all years: 2000, 2020, 2050</p>	<p><b>Salinity Potential of Western Sydney</b></p> <p> Area of Known Salinity</p> <p> Area of High Salinity Potential</p> <p> Area of Moderate Salinity Potential</p> <p> Area of Very Low Salinity Potential</p> <p> Area of Water</p>
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Data Sources: Property Boundaries & Topographic Data:  
© Department Finance, Services & Innovation 2024

Coordinate System:  
GDA 1994 MGA Zone 56

Date: 12 March 2024

# Dryland Salinity

16 Johnston Crescent, Horsley Park, NSW 2175

## Dryland Salinity - National Assessment

Is there Dryland Salinity - National Assessment data onsite?

Yes

Is there Dryland Salinity - National Assessment data within the dataset buffer?

Yes

What Dryland Salinity assessments are given?

Assessment 2000	Assessment 2020	Assessment 2050	Distance	Direction
High hazard or risk	High hazard or risk	High hazard or risk	0m	On-site

Dryland Salinity Data Source : National Land and Water Resources Audit

The Commonwealth and all suppliers of source data used to derive the maps of "Australia, Forecast Areas Containing Land of High Hazard or Risk of Dryland Salinity from 2000 to 2050" do not warrant the accuracy or completeness of information in this product. Any person using or relying upon such information does so on the basis that the Commonwealth and data suppliers shall bear no responsibility or liability whatsoever for any errors, faults, defects or omissions in the information. Any persons using this information do so at their own risk.

In many cases where a high risk is indicated, less than 100% of the area will have a high hazard or risk.

## Dryland Salinity Potential of Western Sydney

Dryland Salinity Potential of Western Sydney within the dataset buffer?

Feature Id	Classification	Description	Distance	Direction
274	MODERATE	Area of Moderate Salinity Potential	0m	On-site
321	HIGH	Area of High Salinity Potential	154m	West
227	HIGH	Area of High Salinity Potential	369m	East

Dryland Salinity Potential of Western Sydney Data Source : NSW Office of Environment and Heritage

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# Mining

16 Johnston Crescent, Horsley Park, NSW 2175

## Mining Subsidence Districts

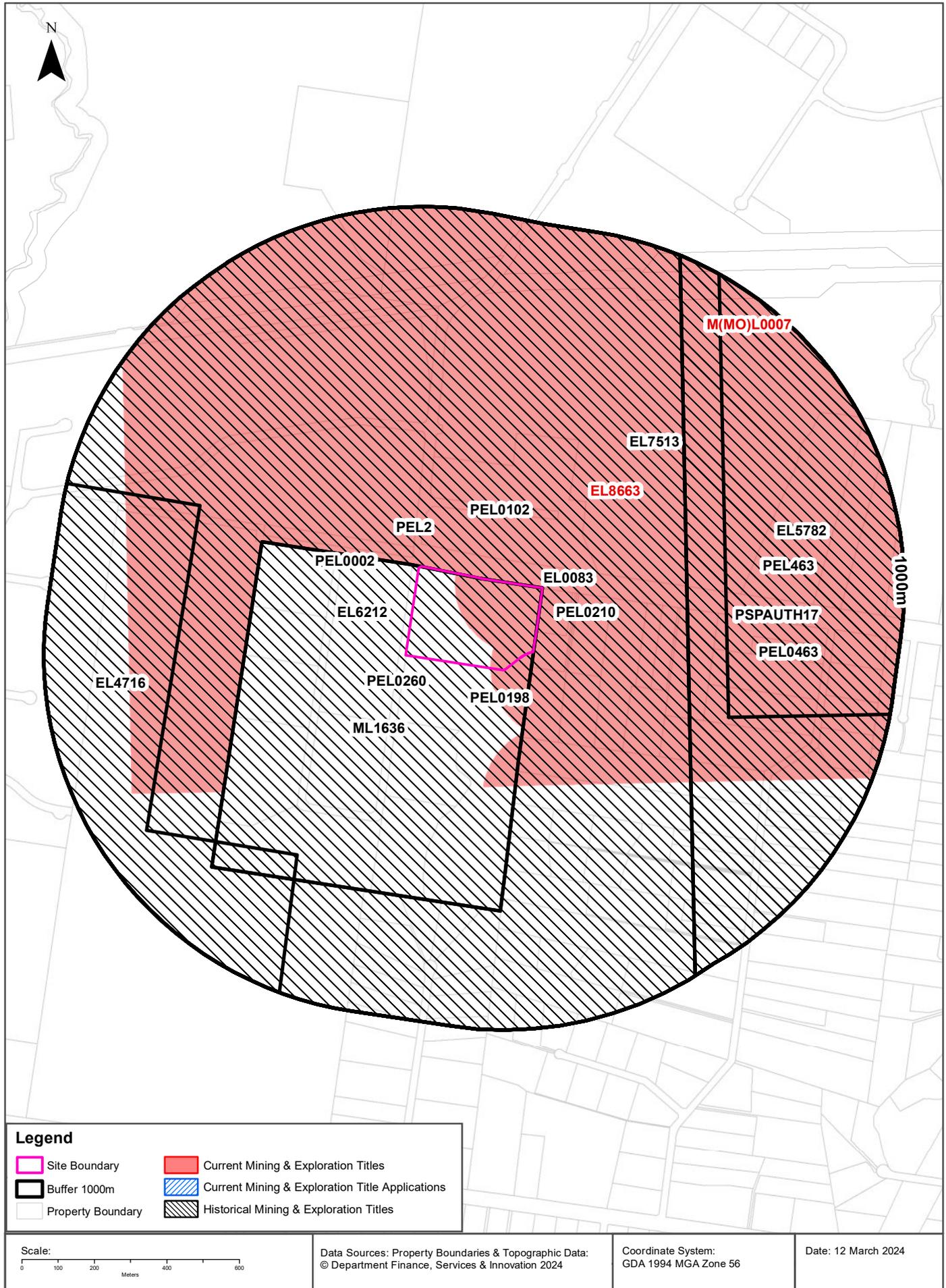
Mining Subsidence Districts within the dataset buffer:

District	Distance	Direction
There are no Mining Subsidence Districts within the report buffer		

Mining Subsidence District Data Source: © Land and Property Information (2016)  
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# Mining & Exploration Titles

16 Johnston Crescent, Horsley Park, NSW 2175



## Mining

16 Johnston Crescent, Horsley Park, NSW 2175

### Current Mining & Exploration Titles

Current Mining & Exploration Titles within the dataset buffer:

Title Ref	Holder	Grant Date	Expiry Date	Last Renewed	Operation	Resource	Minerals	Dist	Dir
EL8663	THE AUSTRAL BRICK CO PTY LTD	23/10/2017	23/10/2026	20231222	EXPLORING	MINERALS	Group 5	0m	On-site
M (MO)L0007	THE AUSTRAL BRICK CO PTY LTD	04/04/2018	04/04/2039	20230210	MINING	MINERALS	Clay/Shale, Kaolin, Structural Clay	924m	North East

Current Mining & Exploration Titles Data Source: © State of New South Wales through NSW Department of Industry

### Current Mining & Exploration Title Applications

Current Mining & Exploration Title Applications within the dataset buffer:

Application Ref	Applicant	Application Date	Operation	Resource	Minerals	Dist	Dir
N/A	No records in buffer						

Current Mining & Exploration Title Applications Data Source: © State of New South Wales through NSW Department of Industry

# Mining

16 Johnston Crescent, Horsley Park, NSW 2175

## Historical Mining & Exploration Titles

Historical Mining & Exploration Titles within the dataset buffer:

Title Ref	Holder	Start Date	End Date	Resource	Minerals	Dist	Dir
EL0083	CONTINENTAL OIL CO OF AUSTRALIA LIMITED	19670201	19680201	MINERALS		0m	On-site
ML1636	CSR BUILDING PRODUCTS LIMITED	20090921	20190227	MINERALS		0m	On-site
PEL0102	AUSTRALIAN OIL AND GAS CORPORATION LTD			PETROLEUM	Petroleum	0m	On-site
PEL0260	NORTH BULLI COLLIERIES PTY LTD, AGL PETROLEUM OPERATIONS PTY LTD, THE AUSTRALIAN GAS LIGHT CO.	19810909	19930803	PETROLEUM	Petroleum	0m	On-site
PEL0210	THE AUSTRALIAN GAS LIGHT COMPANY (AGL), NORTH BULLI COLLIERIES PTY LTD			PETROLEUM	Petroleum	0m	On-site
PEL2	AGL UPSTREAM INVESTMENTS PTY LIMITED	20000120	20001108	MINERALS		0m	On-site
PEL0198	JOHN STREVENS (TERRIGAL) NL			PETROLEUM	Petroleum	0m	On-site
EL6212	HOT ROCK ENERGY PTY LTD, LONGREACH OIL LIMITED	20040304	20130303	MINERALS	Geothermal	0m	On-site
PEL0002	AGL UPSTREAM INVESTMENTS PTY LIMITED	19950503	20150607	PETROLEUM	Petroleum	0m	On-site
EL7513	GRADIENT ENERGY LIMITED	20100407	20110415	MINERALS	Geothermal	0m	North East
PEL463	DART ENERGY (APOLLO) PTY LTD	20081022	20130227	MINERALS		399m	East
PSPAUTH17	MACQUARIE ENERGY PTY LTD	20070803	20080703	PETROLEUM	Petroleum	399m	East
PEL0463	DART ENERGY (APOLLO) PTY LTD	20091010	20150603	PETROLEUM	Petroleum	399m	East
EL5782	THE AUSTRAL BRICK CO PTY LTD	20001005	20020222	MINERALS	Clay shale, Brick clay	507m	East
EL4716	JACFIN PTY LIMITED	19941110	19961109	MINERALS	Breccia, Aggregate	625m	West

Historical Mining & Exploration Titles Data Source: © State of New South Wales through NSW Department of Industry

# State Environmental Planning Policy

16 Johnston Crescent, Horsley Park, NSW 2175

## State Significant Precincts

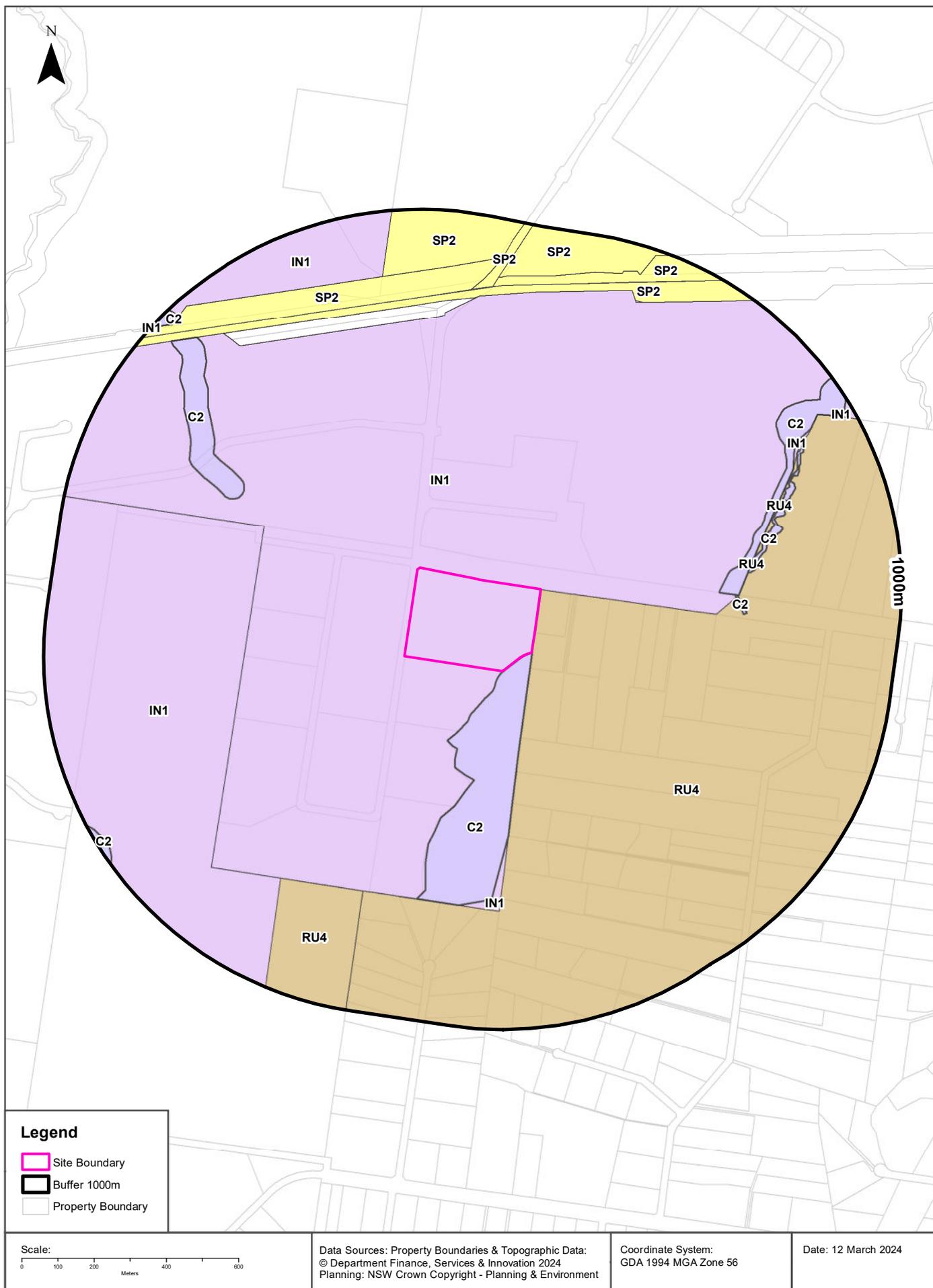
What SEPP State Significant Precincts exist within the dataset buffer?

Map Id	Precinct	EPI Name	Published Date	Commenced Date	Currency Date	Amendment	Distance	Direction
N/A	No records in buffer							

State Environment Planning Policy Data Source: NSW Crown Copyright - Planning & Environment  
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# EPI Planning Zones

16 Johnston Crescent, Horsley Park, NSW 2175



# Environmental Planning Instrument

16 Johnston Crescent, Horsley Park, NSW 2175

## Land Zoning

What EPI Land Zones exist within the dataset buffer?

Zone	Description	Purpose	EPI Name	Published Date	Commenced Date	Currency Date	Amendment	Distance	Direction
IN1	General Industrial		State Environmental Planning Policy (Industry and Employment) 2021	17/08/2022	17/08/2022	17/08/2022	State Environmental Planning Policy (Biodiversity and Conservation) Amendment (Strategic Conservation Planning) 2022	0m	On-site
RU4	Primary Production Small Lots		Fairfield Local Environmental Plan 2013	28/04/2023	28/04/2023	17/11/2023	Map Amendment No 5	0m	South East
C2	Environmental Conservation		State Environmental Planning Policy (Industry and Employment) 2021	17/08/2022	17/08/2022	17/08/2022	State Environmental Planning Policy (Biodiversity and Conservation) Amendment (Strategic Conservation Planning) 2022	0m	South
IN1	General Industrial		State Environmental Planning Policy (Industry and Employment) 2021	02/12/2021	01/03/2022	17/08/2022		439m	West
IN1	General Industrial		State Environmental Planning Policy (Industry and Employment) 2021	02/12/2021	01/03/2022	17/08/2022		460m	South
C2	Environmental Conservation		State Environmental Planning Policy (Industry and Employment) 2021	02/12/2021	01/03/2022	17/08/2022		494m	North East
C2	Environmental Conservation		State Environmental Planning Policy (Industry and Employment) 2021	02/12/2021	01/03/2022	17/08/2022		530m	North West
C2	Environmental Conservation		Fairfield Local Environmental Plan 2013	28/04/2023	28/04/2023	17/11/2023	Map Amendment No 5	536m	East
C2	Environmental Conservation		Fairfield Local Environmental Plan 2013	28/04/2023	28/04/2023	17/11/2023	Map Amendment No 5	574m	East
RU4	Primary Production Small Lots		Fairfield Local Environmental Plan 2013	28/04/2023	28/04/2023	17/11/2023	Map Amendment No 5	582m	East
RU4	Primary Production Small Lots		Fairfield Local Environmental Plan 2013	28/04/2023	28/04/2023	17/11/2023	Map Amendment No 5	595m	East
RU4	Primary Production Small Lots		Penrith Local Environmental Plan 2010	24/06/2016	24/06/2016	30/06/2023	State Environmental Planning Policy (Western Sydney Employment Area) Amendment 2016	664m	South West
SP2	Infrastructure	Water Supply System	Fairfield Local Environmental Plan 2013	28/04/2023	28/04/2023	17/11/2023	Map Amendment No 5	728m	North
SP2	Infrastructure	Water Supply System	Blacktown Local Environmental Plan 2015	21/04/2023	26/04/2023	03/11/2023	Map Amendment No 2	747m	North West

Zone	Description	Purpose	EPI Name	Published Date	Commenced Date	Currency Date	Amendment	Distance	Direction
IN1	General Industrial		State Environmental Planning Policy (Industry and Employment) 2021	02/12/2021	01/03/2022	17/08/2022		774m	North East
SP2	Infrastructure	Local Road	Blacktown Local Environmental Plan 2015	21/04/2023	26/04/2023	03/11/2023	Map Amendment No 2	790m	North
SP2	Infrastructure	Water Supply System	Blacktown Local Environmental Plan 2015	21/04/2023	26/04/2023	03/11/2023	Map Amendment No 2	810m	North East
IN1	General Industrial		State Environmental Planning Policy (Industry and Employment) 2021	02/12/2021	01/03/2022	17/08/2022		819m	North West
SP2	Infrastructure	Electricity Transmission & Distribution	Blacktown Local Environmental Plan 2015	21/04/2023	26/04/2023	03/11/2023	Map Amendment No 2	820m	North
SP2	Infrastructure	Electricity Transmission & Distribution	Blacktown Local Environmental Plan 2015	21/04/2023	26/04/2023	03/11/2023	Map Amendment No 2	837m	North
IN1	General Industrial		State Environmental Planning Policy (Industry and Employment) 2021	02/12/2021	01/03/2022	17/08/2022		859m	North East
IN1	General Industrial		State Environmental Planning Policy (Industry and Employment) 2021	02/12/2021	01/03/2022	17/08/2022		960m	North East
C2	Environmental Conservation		State Environmental Planning Policy (Industry and Employment) 2021	17/08/2022	17/08/2022	17/08/2022	State Environmental Planning Policy (Biodiversity and Conservation) Amendment (Strategic Conservation Planning) 2022	964m	North West
C2	Environmental Conservation		State Environmental Planning Policy (Industry and Employment) 2021	17/08/2022	17/08/2022	17/08/2022	State Environmental Planning Policy (Biodiversity and Conservation) Amendment (Strategic Conservation Planning) 2022	972m	South West
IN1	General Industrial		State Environmental Planning Policy (Industry and Employment) 2021	17/08/2022	17/08/2022	17/08/2022	State Environmental Planning Policy (Biodiversity and Conservation) Amendment (Strategic Conservation Planning) 2022	995m	North West

Environmental Planning Instrument Data Source: NSW Crown Copyright - Planning & Environment  
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## Heritage

16 Johnston Crescent, Horsley Park, NSW 2175

### Commonwealth Heritage List

What are the Commonwealth Heritage List Items located within the dataset buffer?

Place Id	Name	Address	Place File No	Class	Status	Register Date	Distance	Direction
N/A	No records in buffer							

Heritage Data Source: Australian Government Department of the Environment and Energy - Heritage Branch  
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### National Heritage List

What are the National Heritage List Items located within the dataset buffer?

Note. Please click on Place Id to activate a hyperlink to online website.

Place Id	Name	Address	Place File No	Class	Status	Register Date	Distance	Direction
N/A	No records in buffer							

Heritage Data Source: Australian Government Department of the Environment and Energy - Heritage Branch  
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### State Heritage Register - Curtilages

What are the State Heritage Register Items located within the dataset buffer?

Map Id	Name	Address	LGA	Listing Date	Listing No	Plan No	Distance	Direction
N/A	No records in buffer							

Heritage Data Source: NSW Crown Copyright - Office of Environment & Heritage  
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### Environmental Planning Instrument - Heritage

What are the EPI Heritage Items located within the dataset buffer?

Map Id	Name	Classification	Significance	EPI Name	Published Date	Commenced Date	Currency Date	Distance	Direction
N/A	No records in buffer								

Heritage Data Source: NSW Crown Copyright - Planning & Environment  
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# Natural Hazards - Bush Fire Prone Land

16 Johnston Crescent, Horsley Park, NSW 2175



## Natural Hazards

16 Johnston Crescent, Horsley Park, NSW 2175

### Bush Fire Prone Land

What are the nearest Bush Fire Prone Land Categories that exist within the dataset buffer?

Bush Fire Prone Land Category	Distance	Direction
Vegetation Category 1	0m	On-site
Vegetation Buffer	0m	On-site
Vegetation Category 2	5m	North East

NSW Bush Fire Prone Land - © NSW Rural Fire Service under Creative Commons 4.0 International Licence

# Ecological Constraints - Vegetation & Ramsar Wetlands

16 Johnston Crescent, Horsley Park, NSW 2175



Site Boundary	Dry Sclerophyll Forests (Shrub/grass sub-formation)	Semi-arid Woodlands (Grassy sub-formation)
Report Buffer	Dry Sclerophyll Forests (Shrubby sub-formation)	Semi-arid Woodlands (Shrubby sub-formation)
Property Boundary	Forested Wetlands	Wet Sclerophyll Forests (Grassy sub-formation)
Ramsar Wetland	Freshwater Wetlands	Wet Sclerophyll Forests (Shrubby sub-formation)
<b>Native Vegetation</b>	Grasslands	Non vegetated
Alpine Complex	Grassy Woodlands	Unattributed
Arid Shrublands (Acacia sub-formation)	Heathlands	Not classified
Arid Shrublands (Chenopod sub-formation)	Rainforests	Other
	Saline Wetlands	

<b>Scale:</b> 	<b>Data Sources:</b> Property Boundaries & Topographic Data. © Department Finance, Services & Innovation 2024	<b>Coordinate System:</b> GDA 1994 MGA Zone 56	<b>Date:</b> 12 March 2024
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# Ecological Constraints

16 Johnston Crescent, Horsley Park, NSW 2175

## Native Vegetation

What native vegetation exists within the dataset buffer?

Map ID	Vegetation Formation	Plant Community Type and Vegetation Formation	Vegetation Class	Dist	Dir
2849527	Grassy Woodlands	(Grassy Woodlands) Cumberland Shale Plains Woodland	Coastal Valley Grassy Woodlands	0m	On-site
2963952	Not classified	(Not classified) Not classified	Not classified	0m	On-site
2849677	Forested Wetlands	(Forested Wetlands) Cumberland Red Gum Riverflat Forest	Coastal Floodplain Wetlands	391m	East
3153881	Forested Wetlands	(Forested Wetlands) Coastal Valleys Swamp Oak Riparian Forest	Coastal Floodplain Wetlands	799m	North West

Native Vegetation Type Map : NSW Department of Planning and Environment 2022

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## Ramsar Wetlands

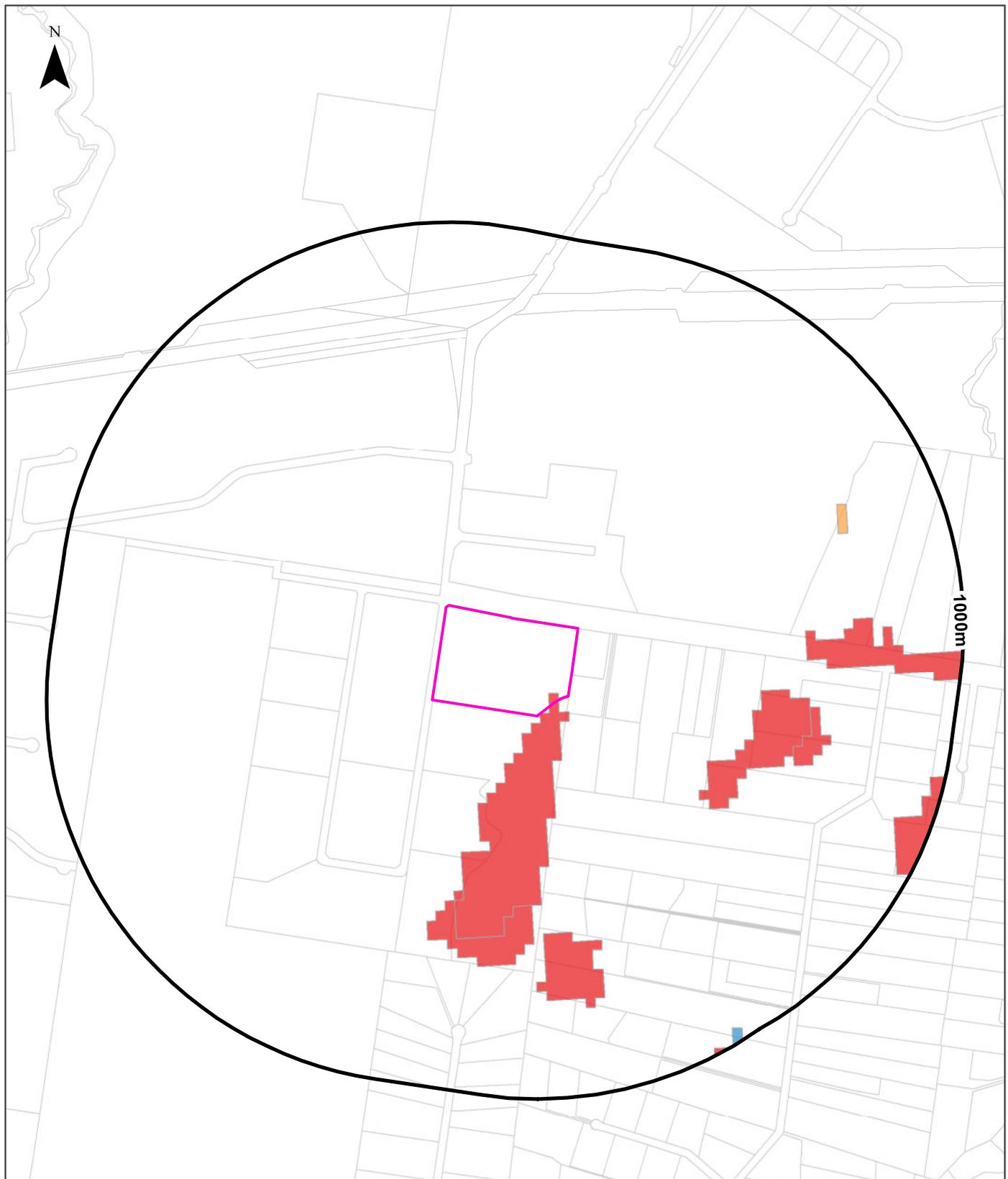
What Ramsar Wetland areas exist within the dataset buffer?

Map Id	Ramsar Name	Wetland Name	Designation Date	Source	Distance	Direction
N/A	No records in buffer					

Ramsar Wetlands Data Source: © Commonwealth of Australia - Department of Agriculture, Water and the Environment

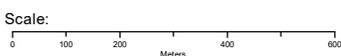
# Ecological Constraints - Groundwater Dependent Ecosystems Atlas

16 Johnston Crescent, Horsley Park, NSW 2175



## Legend

- |                     |   |   |
|---------------------|---|---|
| Site Boundary       | High potential GDE - from national assessment     | Low potential GDE - from national assessment          |
| Buffer 1000m        | High potential GDE - from regional studies        | Low potential GDE - from regional studies             |
| Property Boundaries | Moderate potential GDE - from national assessment | Known GDE - from regional studies                     |
|                     | Moderate potential GDE - from regional studies    | Unclassified potential GDE - from national assessment |
|                     |   | Unclassified potential GDE - from regional studies    |



Data Sources: Property Boundaries & Topographic Data:  
© Department Finance, Services & Innovation 2024

Coordinate System:  
GDA 1994 MGA Zone 56

Date: 12 March 2024

# Ecological Constraints

16 Johnston Crescent, Horsley Park, NSW 2175

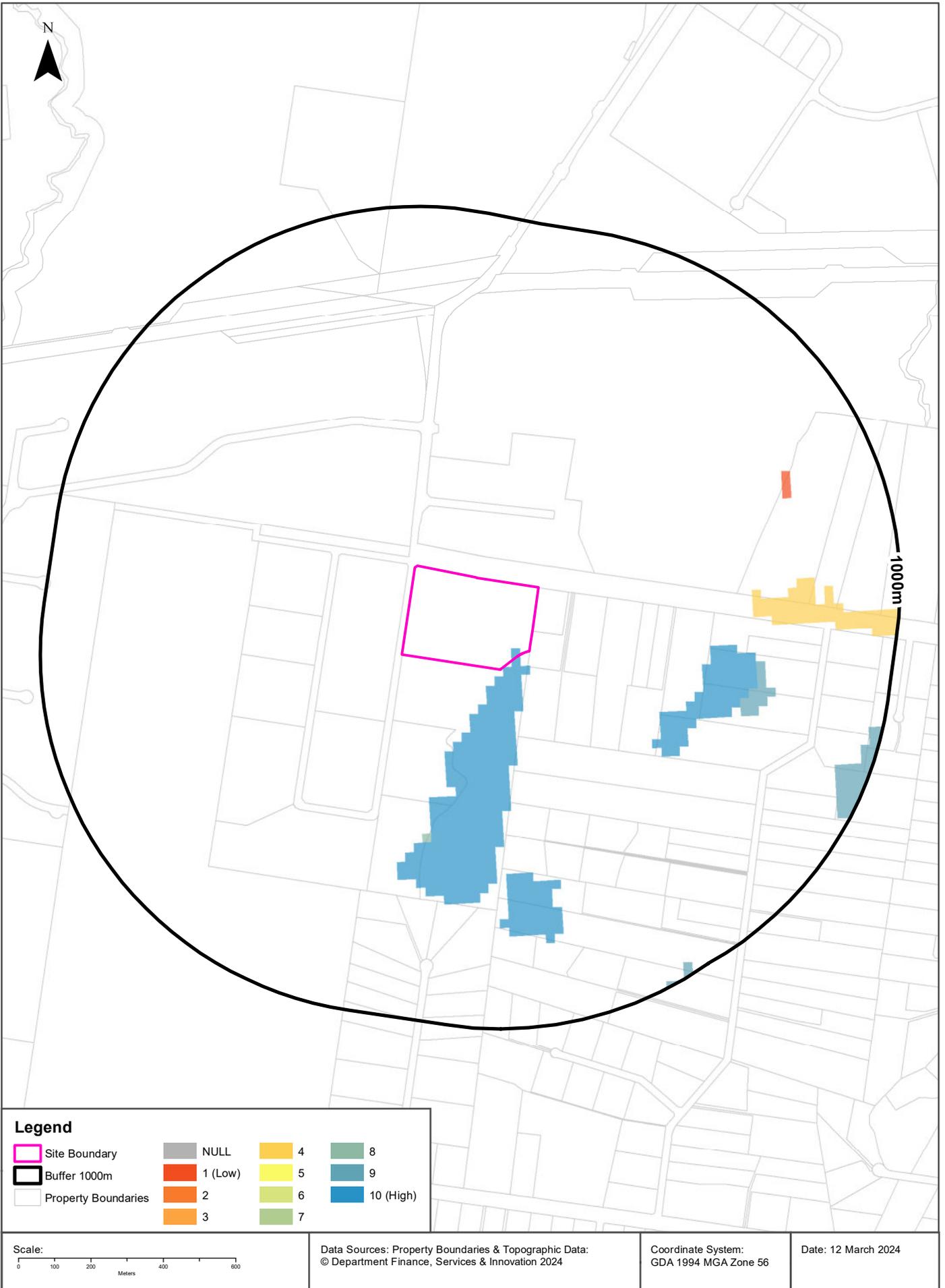
## Groundwater Dependent Ecosystems Atlas

Type	GDE Potential	Geomorphology	Ecosystem Type	Aquifer Geology	Distance	Direction
Terrestrial	High potential GDE - from national assessment	Undulating to low hilly country, mainly on shale.	Vegetation	Consolidated sedimentary	0m	On-site
Terrestrial	High potential GDE - from national assessment	Undulating to low hilly country, mainly on shale.	Vegetation	Unconsolidated sedimentary	395m	East
Terrestrial	Moderate potential GDE - from national assessment	Undulating to low hilly country, mainly on shale.	Vegetation	Consolidated sedimentary	718m	North East
Terrestrial	Low potential GDE - from national assessment	Undulating to low hilly country, mainly on shale.	Vegetation	Consolidated sedimentary	958m	South East

Groundwater Dependent Ecosystems Atlas Data Source: The Bureau of Meteorology  
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# Ecological Constraints - Inflow Dependent Ecosystems Likelihood

16 Johnston Crescent, Horsley Park, NSW 2175



# Ecological Constraints

16 Johnston Crescent, Horsley Park, NSW 2175

## Inflow Dependent Ecosystems Likelihood

Type	IDE Likelihood	Geomorphology	Ecosystem Type	Aquifer Geology	Distance	Direction
Terrestrial	10	Undulating to low hilly country, mainly on shale.	Vegetation	Consolidated sedimentary	0m	On-site
Terrestrial	10	Undulating to low hilly country, mainly on shale.	Vegetation	Unconsolidated sedimentary	395m	East
Terrestrial	8	Undulating to low hilly country, mainly on shale.	Vegetation	Consolidated sedimentary	479m	South
Terrestrial	4	Undulating to low hilly country, mainly on shale.	Vegetation	Consolidated sedimentary	588m	East
Terrestrial	9	Undulating to low hilly country, mainly on shale.	Vegetation	Unconsolidated sedimentary	595m	East
Terrestrial	1	Undulating to low hilly country, mainly on shale.	Vegetation	Consolidated sedimentary	718m	North East
Terrestrial	9	Undulating to low hilly country, mainly on shale.	Vegetation	Consolidated sedimentary	898m	East

Inflow Dependent Ecosystems Likelihood Data Source: The Bureau of Meteorology  
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## Ecological Constraints

16 Johnston Crescent, Horsley Park, NSW 2175

### NSW BioNet Atlas

Species on the NSW BioNet Atlas that have a NSW or federal conservation status, a NSW sensitivity status, or are listed under a migratory species agreement, and are within 10km of the site?

Kingdom	Class	Scientific	Common	NSW Conservation Status	NSW Sensitivity Class	Federal Conservation Status	Migratory Species Agreements
Animalia	Amphibia	Litoria aurea	Green and Golden Bell Frog	Endangered	Not Sensitive	Vulnerable	
Animalia	Aves	Anseranas semipalmata	Magpie Goose	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Anthochaera phrygia	Regent Honeyeater	Critically Endangered	Category 2	Critically Endangered	
Animalia	Aves	Apus pacificus	Fork-tailed Swift	Not Listed	Not Sensitive	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Ardenna pacifica	Wedge-tailed Shearwater	Not Listed	Not Sensitive	Not Listed	JAMBA
Animalia	Aves	Artamus cyanopterus cyanopterus	Dusky Woodswallow	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Burhinus grallarius	Bush Stone-curlew	Endangered	Not Sensitive	Not Listed	
Animalia	Aves	Calidris acuminata	Sharp-tailed Sandpiper	Not Listed	Not Sensitive	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Callocephalon fimbriatum	Gang-gang Cockatoo	Vulnerable	Category 3	Endangered	
Animalia	Aves	Calyptorhynchus banksii samueli	Red-tailed Black-Cockatoo (inland subspecies)	Vulnerable	Category 2	Not Listed	
Animalia	Aves	Calyptorhynchus lathami lathami	South-eastern Glossy Black-Cockatoo	Vulnerable	Category 2	Vulnerable	
Animalia	Aves	Chthonicola sagittata	Speckled Warbler	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Daphoenositta chrysoptera	Varied Sittella	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Ephippiorhynchus asiaticus	Black-necked Stork	Endangered	Not Sensitive	Not Listed	
Animalia	Aves	Gallinago hardwickii	Latham's Snipe	Not Listed	Not Sensitive	Not Listed	ROKAMBA;JAMBA
Animalia	Aves	Geophaps scripta scripta	Squatter Pigeon (southern subspecies)	Critically Endangered	Not Sensitive	Vulnerable	
Animalia	Aves	Glossopsitta pusilla	Little Lorikeet	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Haliaeetus leucogaster	White-bellied Sea-Eagle	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Hieraaetus morphnoides	Little Eagle	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Hirundapus caudacutus	White-throated Needletail	Not Listed	Not Sensitive	Vulnerable	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Ixobrychus flavicollis	Black Bittern	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Lathamus discolor	Swift Parrot	Endangered	Not Sensitive	Critically Endangered	
Animalia	Aves	Lophochroa leadbeateri	Major Mitchell's Cockatoo	Vulnerable	Category 2	Not Listed	
Animalia	Aves	Lophoictinia isura	Square-tailed Kite	Vulnerable	Category 3	Not Listed	

Kingdom	Class	Scientific	Common	NSW Conservation Status	NSW Sensitivity Class	Federal Conservation Status	Migratory Species Agreements
Animalia	Aves	Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subspecies)	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Neophema pulchella	Turquoise Parrot	Vulnerable	Category 3	Not Listed	
Animalia	Aves	Ninox connivens	Barking Owl	Vulnerable	Category 3	Not Listed	
Animalia	Aves	Ninox strenua	Powerful Owl	Vulnerable	Category 3	Not Listed	
Animalia	Aves	Onychoprion fuscata	Sooty Tern	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Oxyura australis	Blue-billed Duck	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Petroica boodang	Scarlet Robin	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Petroica phoenicea	Flame Robin	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Pezoporus wallicus wallicus	Eastern Ground Parrot	Vulnerable	Category 3	Not Listed	
Animalia	Aves	Pluvialis squatarola	Grey Plover	Not Listed	Not Sensitive	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Polytelis swainsonii	Superb Parrot	Vulnerable	Category 3	Vulnerable	
Animalia	Aves	Rostratula australis	Australian Painted Snipe	Endangered	Not Sensitive	Endangered	
Animalia	Aves	Stagonopleura guttata	Diamond Firetail	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Stictonetta naevosa	Freckled Duck	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Thinornis cucullatus cucullatus	Eastern Hooded Dotterel	Critically Endangered	Not Sensitive	Vulnerable	
Animalia	Aves	Todiramphus chloris	Collared Kingfisher	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Tringa nebularia	Common Greenshank	Not Listed	Not Sensitive	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Tyto novaehollandiae	Masked Owl	Vulnerable	Category 3	Not Listed	
Animalia	Gastropoda	Meridolum corneovirens	Cumberland Plain Land Snail	Endangered	Not Sensitive	Not Listed	
Animalia	Mammalia	Dasyurus maculatus	Spotted-tailed Quoll	Vulnerable	Not Sensitive	Endangered	
Animalia	Mammalia	Falsistrellus tasmaniensis	Eastern False Pipistrelle	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	Micronomus norfolkensis	Eastern Coastal Free-tailed Bat	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	Miniopterus australis	Little Bent-winged Bat	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	Miniopterus orianae oceanensis	Large Bent-winged Bat	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	Myotis macropus	Southern Myotis	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	Phascolarctos cinereus	Koala	Endangered	Not Sensitive	Endangered	
Animalia	Mammalia	Pteropus poliocephalus	Grey-headed Flying-fox	Vulnerable	Not Sensitive	Vulnerable	
Animalia	Mammalia	Saccolaimus flaviventris	Yellow-bellied Sheath-tail-bat	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	Scoteanax rueppellii	Greater Broad-nosed Bat	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	Vespadelus trougtoni	Eastern Cave Bat	Vulnerable	Not Sensitive	Not Listed	
Animalia	Reptilia	Antaresia stimsoni	Stimson's Python	Vulnerable	Not Sensitive	Not Listed	
Animalia	Reptilia	Aspidites ramsayi	Woma	Vulnerable	Not Sensitive	Not Listed	
Animalia	Reptilia	Caretta caretta	Loggerhead Turtle	Endangered	Not Sensitive	Endangered	

Kingdom	Class	Scientific	Common	NSW Conservation Status	NSW Sensitivity Class	Federal Conservation Status	Migratory Species Agreements
Animalia	Reptilia	<i>Chelonia mydas</i>	Green Turtle	Vulnerable	Not Sensitive	Vulnerable	
Animalia	Reptilia	<i>Hemiaspis damelii</i>	Grey Snake	Endangered	Not Sensitive	Endangered	
Animalia	Reptilia	<i>Strophurus elderi</i>	Jewelled Gecko	Vulnerable	Not Sensitive	Not Listed	
Animalia	Reptilia	<i>Tiliqua occipitalis</i>	Western Blue-tongued Lizard	Vulnerable	Not Sensitive	Not Listed	
Animalia	Reptilia	<i>Uvidicolus sphyrurus</i>	Border Thick-tailed Gecko	Vulnerable	Not Sensitive	Vulnerable	
Plantae	Flora	<i>Acacia pubescens</i>	Downy Wattle	Vulnerable	Not Sensitive	Vulnerable	
Plantae	Flora	<i>Allocasuarina glareicola</i>		Endangered	Not Sensitive	Endangered	
Plantae	Flora	<i>Argyrotegium nitidulum</i>	Shining Cudweed	Vulnerable	Not Sensitive	Vulnerable	
Plantae	Flora	<i>Callistemon linearifolius</i>	Netted Bottle Brush	Vulnerable	Category 3	Not Listed	
Plantae	Flora	<i>Cynanchum elegans</i>	White-flowered Wax Plant	Endangered	Not Sensitive	Endangered	
Plantae	Flora	<i>Dichanthium setosum</i>	Bluegrass	Vulnerable	Not Sensitive	Vulnerable	
Plantae	Flora	<i>Dillwynia tenuifolia</i>		Endangered Population, Vulnerable	Not Sensitive	Not Listed	
Plantae	Flora	<i>Dillwynia tenuifolia</i>		Vulnerable	Not Sensitive	Not Listed	
Plantae	Flora	<i>Eucalyptus leucoxylon</i> subsp. <i>pruinosa</i>	Yellow Gum	Vulnerable	Not Sensitive	Not Listed	
Plantae	Flora	<i>Eucalyptus nicholii</i>	Narrow-leaved Black Peppermint	Vulnerable	Not Sensitive	Vulnerable	
Plantae	Flora	<i>Eucalyptus scoparia</i>	Wallangarra White Gum	Endangered	Not Sensitive	Vulnerable	
Plantae	Flora	<i>Grevillea juniperina</i> subsp. <i>juniperina</i>	Juniper-leaved Grevillea	Vulnerable	Not Sensitive	Not Listed	
Plantae	Flora	<i>Grevillea parviflora</i> subsp. <i>parviflora</i>	Small-flower Grevillea	Vulnerable	Not Sensitive	Vulnerable	
Plantae	Flora	<i>Isotoma fluviatilis</i> subsp. <i>fluviatilis</i>		Not Listed	Category 3	Extinct	
Plantae	Flora	<i>Macadamia integrifolia</i>	Macadamia Nut	Not Listed	Not Sensitive	Vulnerable	
Plantae	Flora	<i>Macadamia tetraphylla</i>	Rough-shelled Bush Nut	Vulnerable	Not Sensitive	Vulnerable	
Plantae	Flora	<i>Marsdenia viridiflora</i> subsp. <i>viridiflora</i>	Native Pear	Endangered Population	Not Sensitive	Not Listed	
Plantae	Flora	<i>Persoonia nutans</i>	Nodding Geebung	Endangered	Not Sensitive	Endangered	
Plantae	Flora	<i>Pilularia novae-hollandiae</i>	Austral Pillwort	Endangered	Category 3	Not Listed	
Plantae	Flora	<i>Pimelea curviflora</i> var. <i>curviflora</i>		Vulnerable	Not Sensitive	Vulnerable	
Plantae	Flora	<i>Pimelea spicata</i>	Spiked Rice-flower	Endangered	Not Sensitive	Endangered	
Plantae	Flora	<i>Pterostylis saxicola</i>	Sydney Plains Greenhood	Endangered	Category 2	Endangered	
Plantae	Flora	<i>Pultenaea parviflora</i>		Endangered	Not Sensitive	Vulnerable	
Plantae	Flora	<i>Pultenaea pedunculata</i>	Matted Bush-pea	Endangered	Not Sensitive	Not Listed	
Plantae	Flora	<i>Senna acclinis</i>	Rainforest Cassia	Endangered	Not Sensitive	Not Listed	

Data does not include NSW category 1 sensitive species.

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Where Lotsearch has had to georeference features from supplied addresses, a location confidence has been assigned to the data record. This indicates a confidence to the positional accuracy of the feature. Where applicable, a code is given under the field heading "LC" or "LocConf". These codes lookup to the following location confidences:

LC Code	Location Confidence
Premise Match	Georeferenced to the site location / premise or part of site
Area Match	Georeferenced to an approximate or general area
Road Match	Georeferenced to a road or rail corridor
Road Intersection	Georeferenced to a road intersection
Buffered Point	A point feature buffered to x metres
Adjacent Match	Land adjacent to a georeferenced feature
Network of Features	Georeferenced to a network of features
Suburb Match	Georeferenced to a suburb boundary
As Supplied	Spatial data supplied by provider

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## Appendix H: Borehole Logs

# JKEnvironments

## ENVIRONMENTAL LOG



Log No. **BH/MW1**  
1/2

Environmental logs are not to be used for geotechnical purposes

**Client:** NEXTDC LIMITED  
**Project:** PROPOSED DATA STORAGE CENTRE  
**Location:** 16 JOHNSTON CRESCENT, HORSLEY PARK, NSW

**Job No.:** E36628BR      **Method:** SPIRAL AUGER      **R.L. Surface:** ≈ 83.9m  
**Date:** 18/3/24      **Datum:** AHD  
**Plant Type:** JK500      **Logged/Checked by:** J.T.L. & O.B./T.H.

Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks	
	FS	ASS	ASB	SAL										DB
DRY ON COMPLETION						0			FILL: Sandy clay, low to medium plasticity, grey, fine to medium grained sand, trace of igneous gravel.	w<PL				
						1			FILL: Silty clay, low to medium plasticity, grey.					
						2			FILL: Silty clay, medium to high plasticity, light brown, trace of igneous and sandstone gravel.	w≈PL				
						3								
						4								
						5								
						6			as above, but trace of ash.					
						7		-	Extremely Weathered siltstone: silty CLAY, low to medium plasticity, trace of siltstone bands.	XW			BRINGELLY SHALE	

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# JKEnvironments

## ENVIRONMENTAL LOG



Log No. **BH/MW1**  
2/2

Environmental logs are not to be used for geotechnical purposes

**Client:** NEXTDC LIMITED  
**Project:** PROPOSED DATA STORAGE CENTRE  
**Location:** 16 JOHNSTON CRESCENT, HORSLEY PARK, NSW

**Job No.:** E36628BR      **Method:** SPIRAL AUGER      **R.L. Surface:** ≈ 83.9m  
**Date:** 18/3/24      **Datum:** AHD  
**Plant Type:** JK500      **Logged/Checked by:** J.T.L. & O.B./T.H.

Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	FS	ASS	ASB	SAL									
									Extremely Weathered siltstone: silty CLAY, low to medium plasticity, trace of siltstone bands.	XW			
					N = SPT 11/ 100mm REFUSAL	8			SILTSTONE: grey brown.	DW			LOW TO MODERATE 'TC' BIT RESISTANCE
ON 25/3/24 ▼						9							
ON 27/3/24 ▼						10							
ON 21/3/24 ▼						11							
						12			END OF BOREHOLE AT 12.0m				GROUNDWATER MONITORING WELL INSTALLED TO 12.0m. CLASS 18
						13							MACHINE SLOTTED 50mm DIA. PVC STANDPIPE 12.0m TO 3.0m. CASING 3.0m TO 0m. 2mm SAND FILTER PACK 12. 0m TO 2.5m. BENTONITE SEAL 2.5m TO 1.0m. BACKFILLED WITH SAND TO THE SURFACE. COMPLETED WITH A CONCRETED GATIC COVER.
						14							

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# JKEnvironments

## ENVIRONMENTAL LOG



Log No.  
**BH/MW2**

1/2

Environmental logs are not to be used for geotechnical purposes

<b>Client:</b>	NEXTDC LIMITED
<b>Project:</b>	PROPOSED DATA STORAGE CENTRE
<b>Location:</b>	16 JOHNSTON CRESCENT, HORSLEY PARK, NSW

<b>Job No.:</b> E36628BR	<b>Method:</b> SPIRAL AUGER	<b>R.L. Surface:</b> ≈ 83.1m
<b>Date:</b> 18/3/24		<b>Datum:</b> AHD
<b>Plant Type:</b> JK500	<b>Logged/Checked by:</b> J.T.L. & O.B./T.H.	

Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/Weathering	Strength/Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	FS	ASS	ASB	SAL									
DRY ON COMPLETION						0			FILL: Gravelly sand, fine grained, grey, fine to medium grained igneous gravel.	D			
					N = 20 4,14,6	1		FILL: Sandy clay, medium to high plasticity, brown.	w>PL				
					N = 16 8,7,9	2		FILL: Silty clay, low to medium plasticity, grey, trace of sand.	w<PL				
					N = 16 6,7,9	3							
					N = 41 7,17,24	4							
					N > 12 4,12/ 150mm REFUSAL	5			FILL: Silty clay, low to medium plasticity, grey, trace igneous and ironstone gravel, and sand.				
					6		FILL: Silty clay, low to medium plasticity, grey, trace of igneous, ironstone and sandstone gravel, sand and ash.						
					7								

▼  
▼  
BETWEEN  
21/3/24  
AND  
27/3/24

# JKEnvironments

## ENVIRONMENTAL LOG



Log No. **BH/MW2**  
2/2

Environmental logs are not to be used for geotechnical purposes

**Client:** NEXTDC LIMITED  
**Project:** PROPOSED DATA STORAGE CENTRE  
**Location:** 16 JOHNSTON CRESCENT, HORSLEY PARK, NSW

**Job No.:** E36628BR      **Method:** SPIRAL AUGER      **R.L. Surface:** ≈ 83.1m  
**Date:** 18/3/24      **Datum:** AHD  
**Plant Type:** JK500      **Logged/Checked by:** J.T.L. & O.B./T.H.

Groundwater Record	SAMPLES					Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	FS	ASS	ASB	SAL	DB									
							8			FILL: Silty clay, low to medium plasticity, grey, trace of igneous, ironstone and sandstone gravel, sand and ash.				
						N > 11 6,11/ 150mm REFUSAL	8		-	Extremely Weathered siltstone: silty CLAY, low to medium plasticity, brown, trace of siltstone bands.	XW			BRINGELLY SHALE  LOW 'C'BIT RESISTANCE
						N = SPT 10/75mm REFUSAL	9			SILTSTONE: grey brown.	DW			
							10							
							11			as above, but grey.				
							12			END OF BOREHOLE AT 12.0m				GROUNDWATER MONITORING WELL INSTALLED TO 12.0m. CLASS 18
							13							MACHINE SLOTTED 50mm DIA. PVC STANDPIPE 12.0m TO 3.0m. CASING 3.0m TO 0m. 2mm SAND FILTER PACK 12.0m TO 1.9m. BENTONITE SEAL 1.9m TO 0.5m. BACKFILLED WITH SAND TO THE SURFACE. COMPLETED WITH A CONCRETED GATIC COVER.
							14							

# JKEnvironments

## ENVIRONMENTAL LOG



Log No.

**BH3**

1/1

Environmental logs are not to be used for geotechnical purposes

<b>Client:</b>	NEXTDC LIMITED
<b>Project:</b>	PROPOSED DATA STORAGE CENTRE
<b>Location:</b>	16 JOHNSTON CRESCENT, HORSLEY PARK, NSW

<b>Job No.:</b> E36628BR	<b>Method:</b> SPIRAL AUGER	<b>R.L. Surface:</b> ≈ 83.7m
<b>Date:</b> 19/3/24		<b>Datum:</b> AHD
<b>Plant Type:</b> JK500	<b>Logged/Checked by:</b> J.T.L./T.H.	

Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/Weathering	Strength/Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks	
	FS	ASS	ASB	SAL										DB
DRY ON COMPLETION						0			FILL: Gravelly sand, fine to medium grained, brown, fine to medium grained sandstone gravel.	D				
					N = 24 8,10,14	1			FILL: Silty clay, low to medium plasticity, grey, trace of sandstone gravel.	w<PL				
					N = 30 8,13,17	2								
					N = 16 6,7,9	3				FILL: Silty clay, medium to high plasticity, brown, trace of igneous gravel.	w≈PL			
					N = 12 3,3,9	4				FILL: Silty clay, medium to high plasticity, brown, trace of igneous and sandstone gravel, and ash				
					N > 13 5,13/ 50mm REFUSAL	5				as above, but with trace of metal fragments.				
						6								
					7		-	Extremely Weathered siltstone: silty CLAY, low to medium plasticity, grey, trace of siltstone bands.	XW				BRINGELLY SHALE	
								END OF BOREHOLE AT 7.0m						

# JKEnvironments

## ENVIRONMENTAL LOG



Log No.

**BH4**

1/1

Environmental logs are not to be used for geotechnical purposes

<b>Client:</b>	NEXTDC LIMITED
<b>Project:</b>	PROPOSED DATA STORAGE CENTRE
<b>Location:</b>	16 JOHNSTON CRESCENT, HORSLEY PARK, NSW

<b>Job No.:</b> E36628BR	<b>Method:</b> SPIRAL AUGER	<b>R.L. Surface:</b> ≈ 84.1m
<b>Date:</b> 20/3/24		<b>Datum:</b> AHD
<b>Plant Type:</b> JK500	<b>Logged/Checked by:</b> J.T.L./T.H.	

Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	FS	ASS	ASB	SAL									
DRY ON COMPLETION						0			FILL: Silty clay, low to medium plasticity, brown, trace of siltstone gravel.	w<PL			
					N = 16 7,9,7	1		CI-CH	Silty CLAY: medium to high plasticity, grey mottled red and orange.	w<PL			RESIDUAL
					N = 27 5,13,14	2		-	Extremely Weathered siltstone: silty CLAY, low to medium plasticity, grey, trace of siltstone bands.	XW			BRINGELLY SHALE
						3							
						4							
						5			END OF BOREHOLE AT 4.5m				
						6							
						7							

# JKEnvironments

## ENVIRONMENTAL LOG



Log No. **BH5**  
1/1

Environmental logs are not to be used for geotechnical purposes

**Client:** NEXTDC LIMITED  
**Project:** PROPOSED DATA STORAGE CENTRE  
**Location:** 16 JOHNSTON CRESCENT, HORSLEY PARK, NSW

**Job No.:** E36628BR      **Method:** SPIRAL AUGER      **R.L. Surface:** ≈ 82.8m  
**Date:** 20/3/24      **Datum:** AHD  
**Plant Type:** JK500      **Logged/Checked by:** J.T.L./T.H.

Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	FS	ASS	ASB	SAL									
DRY ON COMPLETION						0			FILL: Silty clay, low to medium plasticity, brown, trace of siltstone and sandstone gravel.	w<PL			
						1							
						2							
						3							
						4							
					5			FILL: Silty clay, medium to high plasticity, brown, trace of ironstone and igneous gravel.	w≈PL				
					6			FILL: Silty clay, medium to high plasticity, brown, trace of igneous gravel and ash.					
					7			Extremely Weathered siltstone: silty CLAY, low to medium plasticity, grey, trace of siltstone bands.	XW				BRINGELLY SHALE
								END OF BOREHOLE AT 7.0m					

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# JKEnvironments

## ENVIRONMENTAL LOG



Log No.

**BH6**

1/1

Environmental logs are not to be used for geotechnical purposes

<b>Client:</b>	NEXTDC LIMITED
<b>Project:</b>	PROPOSED DATA STORAGE CENTRE
<b>Location:</b>	16 JOHNSTON CRESCENT, HORSLEY PARK, NSW

<b>Job No.:</b> E36628BR	<b>Method:</b> SPIRAL AUGER	<b>R.L. Surface:</b> ≈ 83.4m
<b>Date:</b> 19/3/24		<b>Datum:</b> AHD
<b>Plant Type:</b> JK500	<b>Logged/Checked by:</b> J.T.L./T.H.	

Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks	
	FS	ASS	ASB	SAL										DB
DRY ON COMPLETION						0			FILL: Clayey sand, fine to medium grained, brown, trace of siltstone gravel.	D				
					N = 21 3,13,8	1			FILL: Clayey sand, fine to medium grained, brown, trace of sandstone gravel.	D				
					N = 17 9,7,10	2			FILL: Silty clay, low to medium plasticity, grey, trace of ironstone and siltstone gravel.	w<PL				
					N = 29 6,13,16	3								
					N = 17 6,8,9	4								
					5			FILL: Silty clay, medium to high plasticity, brown.	w≈PL					
					6		-	Extremely Weathered siltstone: silty CLAY, low to medium plasticity, brown, trace of siltstone bands.	XW				BRINGELLY SHALE	
					7			END OF BOREHOLE AT 7.0m						

# JKEnvironments

## ENVIRONMENTAL LOG



Log No.

**BH7**

1/1

Environmental logs are not to be used for geotechnical purposes

<b>Client:</b>	NEXTDC LIMITED
<b>Project:</b>	PROPOSED DATA STORAGE CENTRE
<b>Location:</b>	16 JOHNSTON CRESCENT, HORSLEY PARK, NSW

<b>Job No.:</b> E36628BR	<b>Method:</b> SPIRAL AUGER	<b>R.L. Surface:</b> ≈ 84.0m
<b>Date:</b> 19/3/24		<b>Datum:</b> AHD
<b>Plant Type:</b> JK500	<b>Logged/Checked by:</b> J.T.L./T.H.	

Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/Weathering	Strength/Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks	
	FS	ASS	ASB	SAL										DB
DRY ON COMPLETION						0			FILL: Gravelly sand, fine to medium grained, brown, fine to medium grained sandstone gravel.	D				
					N = 28 6,9,19	1			FILL: Silty clay, low to medium plasticity, brown.	w<PL				
					N = 25 6,8,17	2			FILL: Silty clay, medium plasticity, brown, trace of igneous and sandstone gravel.	w≈PL				
					N = 22 4,11,11	3								
					N = 25 4,12,13	4								
					N = SPT 9/100mm REFUSAL	5				FILL: Silty clay, medium to high plasticity, brown, trace of igneous gravel.				
					6		-	Extremely Weathered siltstone: silty CLAY, low to medium plasticity, grey, trace of siltstone bands.	XW			BRINGELLY SHALE		
					7			END OF BOREHOLE AT 7.0m						

# JKEnvironments

## ENVIRONMENTAL LOG



Log No. **BH8**  
1/1

Environmental logs are not to be used for geotechnical purposes

**Client:** NEXTDC LIMITED  
**Project:** PROPOSED DATA STORAGE CENTRE  
**Location:** 16 JOHNSTON CRESCENT, HORSLEY PARK, NSW

**Job No.:** E36628BR      **Method:** SPIRAL AUGER      **R.L. Surface:** ≈ 84.5m  
**Date:** 20/3/24      **Datum:** AHD  
**Plant Type:** JK500      **Logged/Checked by:** J.T.L./T.H.

Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	FS	ASS	ASB	SAL									
DRY ON COMPLETION						0			FILL: Gravelly sand, fine to medium grained, brown, fine to medium grained sandstone gravel, trace of igneous and sandstone gravel.	D			
						1		-	Extremely Weathered siltstone: silty CLAY, low to medium plasticity, grey, with siltstone bands. END OF BOREHOLE AT 0.6m	XW			BRINGELLY SHALE MODERATE 'TC' BIT RESISTANCE 'TC' BIT REFUSAL
						2							
						3							
						4							
						5							
						6							
						7							

# JKEnvironments

## ENVIRONMENTAL LOG



Log No.

**BH9**

1/1

Environmental logs are not to be used for geotechnical purposes

<b>Client:</b>	NEXTDC LIMITED
<b>Project:</b>	PROPOSED DATA STORAGE CENTRE
<b>Location:</b>	16 JOHNSTON CRESCENT, HORSLEY PARK, NSW

<b>Job No.:</b> E36628BR	<b>Method:</b> SPIRAL AUGER	<b>R.L. Surface:</b> ≈ 82.9m
<b>Date:</b> 20/3/24		<b>Datum:</b> AHD
<b>Plant Type:</b> JK500	<b>Logged/Checked by:</b> J.T.L./T.H.	

Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/Weathering	Strength/Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks	
	FS	ASS	ASB	SAL										DB
DRY ON COMPLETION						0			FILL: Silty clay, low to medium plasticity, grey, trace of fine to medium grained sand.	w<PL				
					N > 1 4,1/50mm REFUSAL	1								
					N = 31 4,16,15	2			FILL: Silty clay, medium to high plasticity, brown, trace of siltstone gravel.					
					N = 14 3,2,12	3								
					N = 14 6,7,7	4			FILL: Silty clay, medium to high plasticity, brown, trace of igneous and siltstone gravel and ash.					
					5									
					6			-	Extremely Weathered siltstone: silty CLAY, low to medium plasticity, grey, trace of siltstone bands.	XW			BRINGELLY SHALE	
					7				END OF BOREHOLE AT 6.5m					

# JKEnvironments

## ENVIRONMENTAL LOG



Log No.

**BH10**

1/1

Environmental logs are not to be used for geotechnical purposes

<b>Client:</b>	NEXTDC LIMITED
<b>Project:</b>	PROPOSED DATA STORAGE CENTRE
<b>Location:</b>	16 JOHNSTON CRESCENT, HORSLEY PARK, NSW

<b>Job No.:</b> E36628BR	<b>Method:</b> SPIRAL AUGER	<b>R.L. Surface:</b> ≈ 83.6m
<b>Date:</b> 19/3/24		<b>Datum:</b> AHD
<b>Plant Type:</b> JK500	<b>Logged/Checked by:</b> J.T.L./T.H.	

Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/Weathering	Strength/Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	FS	ASS	ASB	SAL									
DRY ON COMPLETION						0			FILL: Gravelly sand, fine to medium grained, brown, fine to medium grained siltstone, trace of sandstone gravel.	D			
					N = 27 5,12,15	1			FILL: Silty clay, low to medium plasticity, grey, trace of siltstone gravel.	w<PL			
					N = 24 2,11,13	2							
					N = 8 1,3,5	3			FILL: Silty clay, medium to high plasticity, brown, trace of siltstone gravel.	w≈PL			
					N = 20 3,11,9	4							
					5		-	Extremely Weathered siltstone: silty CLAY, low to medium plasticity, grey, trace of siltstone bands.	XW			BRINGELLY SHALE	
					6			END OF BOREHOLE AT 6.0m					
					7								

# JKEnvironments

## ENVIRONMENTAL LOG



Log No.

**BH11**

1/1

Environmental logs are not to be used for geotechnical purposes

<b>Client:</b>	NEXTDC LIMITED
<b>Project:</b>	PROPOSED DATA STORAGE CENTRE
<b>Location:</b>	16 JOHNSTON CRESCENT, HORSLEY PARK, NSW

<b>Job No.:</b> E36628BR	<b>Method:</b> SPIRAL AUGER	<b>R.L. Surface:</b> ≈ 84.4m
<b>Date:</b> 19/3/24		<b>Datum:</b> AHD
<b>Plant Type:</b> JK500	<b>Logged/Checked by:</b> J.T.L./T.H.	

Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	FS	ASS	ASB	SAL									
DRY ON COMPLETION						0			FILL: Gravelly sand, fine to medium grained, brown, fine to medium grained sandstone gravel.	D			
						1		-	Extremely Weathered siltstone: silty CLAY, low to medium plasticity, grey, trace of siltstone bands.	XW			BRINGELLY SHALE  MODERATE TO HIGH 'TC' BIT RESISTANCE
						2			SILTSTONE: grey.	DW			
						3							
						4							
						5			END OF BOREHOLE AT 4.5m				
						6							
						7							

# JKEnvironments

## ENVIRONMENTAL LOG



Log No. **BH12**  
1/1

Environmental logs are not to be used for geotechnical purposes

**Client:** NEXTDC LIMITED  
**Project:** PROPOSED DATA STORAGE CENTRE  
**Location:** 16 JOHNSTON CRESCENT, HORSLEY PARK, NSW

**Job No.:** E36628BR      **Method:** SPIRAL AUGER      **R.L. Surface:** ≈ 85.0m  
**Date:** 20/3/24      **Datum:** AHD  
**Plant Type:** JK500      **Logged/Checked by:** J.T.L./T.H.

Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks	
	FS	ASS	ASB	SAL										DB
DRY ON COMPLETION	█	█	█	█	█	0		-	FILL: Gravelly sand, fine to medium grained, brown, fine to medium grained sandstone gravel.	D				
						1			FILL: Silty clay, medium to high plasticity, brown, trace of igneous and siltstone gravel. Extremely Weathered siltstone: silty CLAY, low to medium plasticity, grey, trace of siltstone bands.	w≈PL XW			BRINGELLY SHALE	
						2								
						3			END OF BOREHOLE AT 2.5m					'TC' BIT REFUSAL
						4								
						5								
						6								
						7								

N > 16  
5,13,3/  
0mm  
REFUSAL

# JKEnvironments

## ENVIRONMENTAL LOG



Log No.

**BH13**

1/1

Environmental logs are not to be used for geotechnical purposes

<b>Client:</b>	NEXTDC LIMITED
<b>Project:</b>	PROPOSED DATA STORAGE CENTRE
<b>Location:</b>	16 JOHNSTON CRESCENT, HORSLEY PARK, NSW

<b>Job No.:</b> E36628BR	<b>Method:</b> SPIRAL AUGER	<b>R.L. Surface:</b> ≈ 83.2m
<b>Date:</b> 20/3/24		<b>Datum:</b> AHD
<b>Plant Type:</b> JK500	<b>Logged/Checked by:</b> J.T.L./T.H.	

Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	FS	ASS	ASB	SAL									
DRY ON COMPLETION						0			FILL: Gravelly sand, fine to medium grained, brown, fine to medium grained sandstone gravel.	D			BRINGELLY SHALE
						1			Extremely Weathered siltstone: silty CLAY, low to medium plasticity, grey, trace of siltstone bands.	XW			
						2			SILTSTONE: grey and brown.	DW			
						3							
						4							
						5			END OF BOREHOLE AT 4.5m				
						6							
						7							

# JKEnvironments

## ENVIRONMENTAL LOG



Log No.

**BH14**

1/1

Environmental logs are not to be used for geotechnical purposes

<b>Client:</b>	NEXTDC LIMITED
<b>Project:</b>	PROPOSED DATA STORAGE CENTRE
<b>Location:</b>	16 JOHNSTON CRESCENT, HORSLEY PARK, NSW

<b>Job No.:</b> E36628BR	<b>Method:</b> SPIRAL AUGER	<b>R.L. Surface:</b> ≈ 83.9m
<b>Date:</b> 19/3/24		<b>Datum:</b> AHD
<b>Plant Type:</b> JK500	<b>Logged/Checked by:</b> J.T.L./T.H.	

Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/Weathering	Strength/Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	FS	ASS	ASB	SAL									
DRY ON COMPLETION						0			FILL: Gravelly sand, fine to medium grained, brown, fine to medium grained sandstone gravel.	D			
						1		-	Extremely Weathered siltstone: silty CLAY, low to medium plasticity, grey, trace of siltstone bands.	XW			BRINGELLY SHALE MODERATE 'TC' BIT RESISTANCE
						2			SILTSTONE: grey.	DW			
						3							
						4							
						5			END OF BOREHOLE AT 4.5m				
						6							
						7							

# JKEnvironments

## ENVIRONMENTAL LOG



Log No. **BH15**  
1/2

Environmental logs are not to be used for geotechnical purposes

**Client:** NEXTDC LIMITED  
**Project:** PROPOSED DATA STORAGE CENTRE  
**Location:** 16 JOHNSTON CRESCENT, HORSLEY PARK, NSW

**Job No.:** E36628BR      **Method:** SPIRAL AUGER      **R.L. Surface:** ≈ 84.5m  
**Date:** 18/3/24      **Datum:** AHD  
**Plant Type:** JK500      **Logged/Checked by:** J.T.L./T.H.

Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	FS	ASS	ASB	SAL									
DRY ON COMPLETION						0			FILL: Silty clay, low to medium plasticity, brown, trace of igneous and sandstone gravel and sand.	w <sub>z</sub> PL XW			BRINGELLY SHALE
						1			Extremely Weathered siltstone: silty CLAY, low to medium plasticity, grey, trace of siltstone bands.				MODERATE TO HIGH 'TC' BIT RESISTANCE
						2			SILTSTONE: grey.	DW			HIGH RESISTANCE
						3							LOW TO MODERATE RESISTANCE
						4							HIGH RESISTANCE BAND
						5							MODERATE RESISTANCE
						6							HIGH RESISTANCE BAND
					7							MODERATE RESISTANCE	

▼  
BETWEEN  
21/3/24  
AND  
27/3/24

# JKEnvironments

## ENVIRONMENTAL LOG



Log No. **BH15**  
2/2

Environmental logs are not to be used for geotechnical purposes

**Client:** NEXTDC LIMITED  
**Project:** PROPOSED DATA STORAGE CENTRE  
**Location:** 16 JOHNSTON CRESCENT, HORSLEY PARK, NSW

**Job No.:** E36628BR      **Method:** SPIRAL AUGER      **R.L. Surface:** ≈ 84.5m  
**Date:** 18/3/24      **Datum:** AHD  
**Plant Type:** JK500      **Logged/Checked by:** J.T.L./T.H.

Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	FS	ASS	ASB	SAL									
						8			SILTSTONE: grey.	DW			
						9							MODERATE RESISTANCE
						10			END OF BOREHOLE AT 9.5m				HIGH RESISTANCE 'TC' BIT REFUSAL
						11							GROUNDWATER MONITORING WELL INSTALLED TO 9.5m. CLASS 18 MACHINE SLOTTED 50mm DIA. PVC STANDPIPE 9.5m TO 3.0m. CASING 3.0m TO 0m. 2mm SAND FILTER PACK 9.5m TO 2.5m. BENTONITE SEAL 2.5m TO 0.4m. BACKFILLED WITH SAND TO THE SURFACE. COMPLETED WITH A CONCRETED GATIC COVER.
						12							
						13							
						14							

# JKEnvironments

## ENVIRONMENTAL LOG



Log No. **BH16**  
1/1

Environmental logs are not to be used for geotechnical purposes

**Client:** NEXTDC LIMITED  
**Project:** PROPOSED DATA STORAGE CENTRE  
**Location:** 16 JOHNSTON CRESCENT, HORSLEY PARK, NSW

**Job No.:** E36628BR      **Method:** SPIRAL AUGER      **R.L. Surface:** ≈ 85.4m  
**Date:** 20/3/24      **Datum:** AHD  
**Plant Type:** JK500      **Logged/Checked by:** J.T.L./T.H.

Groundwater Record	SAMPLES					Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	FS	ASS	ASB	SAL	DB									
DRY ON COMPLETION	█	█	█	█	█	N > 6 3,6/50mm REFUSAL	0		-	FILL: Gravelly sand, fine to medium grained, brown, fine to medium grained sandstone gravel, trace of siltstone gravel.	D			
							1			FILL: Silty clay, low to medium plasticity, brown, trace of siltstone gravel. Extremely Weathered siltstone: silty CLAY, low to medium plasticity, grey, trace of siltstone bands.	XW			
							2			END OF BOREHOLE AT 2.1m				'TC' BIT REFUSAL
							3							
							4							
							5							
							6							
							7							

# JKEnvironments

## ENVIRONMENTAL LOG



Log No.

**BH17**

1/2

Environmental logs are not to be used for geotechnical purposes

<b>Client:</b>	NEXTDC LIMITED
<b>Project:</b>	PROPOSED DATA STORAGE CENTRE
<b>Location:</b>	16 JOHNSTON CRESCENT, HORSLEY PARK, NSW

<b>Job No.:</b> E36628BR	<b>Method:</b> SPIRAL AUGER	<b>R.L. Surface:</b> ≈ 83.4m
<b>Date:</b> 20/3/24		<b>Datum:</b> AHD
<b>Plant Type:</b> JK500	<b>Logged/Checked by:</b> J.T.L./T.H.	

Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/Weathering	Strength/Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks	
	FS	ASS	ASB	SAL										DB
DRY ON COMPLETION						0			FILL: Silty clay, low to medium plasticity, brown, trace of siltstone gravel.	w<PL				
					N = 17 2,7,10	1								
					N = 29 6,14,15	2								
					N = 20 3,10,10	3				FILL: Silty clay, medium to high plasticity, brown, trace of igneous and siltstone gravel.	w≈PL			
					N = 16 3,10,6	4								
					N > 7 5,4,3/ 100mm REFUSAL	5				FILL: Silty clay, medium plasticity, brown, trace of igneous gravel and ash.				
					6									
					7		-	Extremely Weathered siltstone: silty CLAY, low to medium plasticity, grey, trace of siltstone bands.	XW				BRINGELLY SHALE	

# JKEnvironments

## ENVIRONMENTAL LOG



Log No.

**BH17**

2/2

Environmental logs are not to be used for geotechnical purposes

<b>Client:</b>	NEXTDC LIMITED
<b>Project:</b>	PROPOSED DATA STORAGE CENTRE
<b>Location:</b>	16 JOHNSTON CRESCENT, HORSLEY PARK, NSW

<b>Job No.:</b> E36628BR	<b>Method:</b> SPIRAL AUGER	<b>R.L. Surface:</b> ≈ 83.4m
<b>Date:</b> 20/3/24		<b>Datum:</b> AHD
<b>Plant Type:</b> JK500	<b>Logged/Checked by:</b> J.T.L./T.H.	

Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/Weathering	Strength/Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	FS	ASS	ASB	SAL									
									Extremely Weathered siltstone: silty CLAY, low to medium plasticity, grey, trace of siltstone bands.	XW			
						8			END OF BOREHOLE AT 7.5m				
						9							
						10							
						11							
						12							
						13							
						14							

# JKEnvironments

## ENVIRONMENTAL LOG



Log No.

**BH18**

1/1

Environmental logs are not to be used for geotechnical purposes

<b>Client:</b>	NEXTDC LIMITED
<b>Project:</b>	PROPOSED DATA STORAGE CENTRE
<b>Location:</b>	16 JOHNSTON CRESCENT, HORSLEY PARK, NSW

<b>Job No.:</b> E36628BR	<b>Method:</b> SPIRAL AUGER	<b>R.L. Surface:</b> ≈ 84.1m
<b>Date:</b> 19/3/24		<b>Datum:</b> AHD
<b>Plant Type:</b> JK500	<b>Logged/Checked by:</b> J.T.L./T.H.	

Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	FS	ASS	ASB	SAL									
DRY ON COMPLETION						0			FILL: Gravelly sand, fine to medium grained, brown, fine to medium grained sandstone gravel, trace of siltstone gravel.	D			
						1			Extremely Weathered siltstone: silty CLAY, low to medium plasticity, grey, trace of siltstone gravel.	XW			BRINGELLY SHALE MODERATE 'TC' BIT RESISTANCE
						2			SILTSTONE: grey and brown.				
						3							
						4							
						5			END OF BOREHOLE AT 4.5m				
						6							
						7							

# JKEnvironments

## ENVIRONMENTAL LOG



Log No.

**BH19**

1/1

Environmental logs are not to be used for geotechnical purposes

<b>Client:</b>	NEXTDC LIMITED
<b>Project:</b>	PROPOSED DATA STORAGE CENTRE
<b>Location:</b>	16 JOHNSTON CRESCENT, HORSLEY PARK, NSW

<b>Job No.:</b> E36628BR	<b>Method:</b> SPIRAL AUGER	<b>R.L. Surface:</b> ≈ 84.6m
<b>Date:</b> 20/3/24		<b>Datum:</b> AHD
<b>Plant Type:</b> JK500	<b>Logged/Checked by:</b> J.T.L./T.H.	

Groundwater Record	SAMPLES					Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	FS	ASS	ASB	SAL	DB									
DRY ON COMPLETION							0			FILL: Gravelly sand, fine to medium grained, brown, fine to medium grained sandstone gravel.	D			
							1		-	Extremely Weathered siltstone: silty CLAY, low to medium plasticity, grey, trace of siltstone bands.	XW			BRINGELLY SHALE
							2			SILTSTONE: grey and brown.	DW			
							3			END OF BOREHOLE AT 3.1m				'TC' BIT REFUSAL
							4							
							5							
							6							
							7							

# JKEnvironments

## ENVIRONMENTAL LOG



Log No.

**BH20**

1/1

Environmental logs are not to be used for geotechnical purposes

<b>Client:</b>	NEXTDC LIMITED
<b>Project:</b>	PROPOSED DATA STORAGE CENTRE
<b>Location:</b>	16 JOHNSTON CRESCENT, HORSLEY PARK, NSW

<b>Job No.:</b> E36628BR	<b>Method:</b> SPIRAL AUGER	<b>R.L. Surface:</b> N/A
<b>Date:</b> 20/3/24		<b>Datum:</b> -
<b>Plant Type:</b> JK500	<b>Logged/Checked by:</b> J.T.L./T.H.	

Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/Weathering	Strength/Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	FS	ASS	ASB	SAL									
DRY ON COMPLETION						0			FILL: Silty clay, low to medium plasticity, brown, trace of siltstone gravel.	w<PL			
					N = 20 2,8,12	1			as above, but trace of sand.				
					N = 18 6,10,8	2			FILL: Silty clay, medium to high plasticity, brown.	w≈PL			
						2			FILL: Silty clay, low to medium plasticity, brown.	w<PL			
						3		-	Extremely Weathered siltstone: silty CLAY, low to medium plasticity, grey, trace of siltstone bands.	XW			BRINGELLY SHALE
						4							
						5			END OF BOREHOLE AT 4.5m				
						6							
						7							



# ENVIRONMENTAL LOGS EXPLANATION NOTES

## INTRODUCTION

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

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

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

## DESCRIPTION AND CLASSIFICATION METHODS

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

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

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

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

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

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

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

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

## INVESTIGATION METHODS

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

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

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

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

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

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

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

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

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

**Standard Penetration Tests:** Standard Penetration Tests (SPT) are used mainly in non-cohesive soils, but can also be used in cohesive soils, as a means of indicating density or strength and also of obtaining a relatively undisturbed sample. The test procedure is

described in Australian Standard 1289.6.3.1–2004 (R2016) ‘*Methods of Testing Soils for Engineering Purposes, Soil Strength and Consolidation Tests – Determination of the Penetration Resistance of a Soil – Standard Penetration Test (SPT)*’.

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

The test results are reported in the following form:

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

N = 13  
4, 6, 7

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

N > 30  
15, 30/40mm

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

A modification to the SPT is where the same driving system is used with a solid 60° tipped steel cone of the same diameter as the SPT hollow sampler. The solid cone can be continuously driven for some distance in soft clays or loose sands, or may be used where damage would otherwise occur to the SPT. The results of this Solid Cone Penetration Test (SCPT) are shown as ‘N<sub>c</sub>’ 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.

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## **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 68% 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	

**Laboratory Classification Criteria**

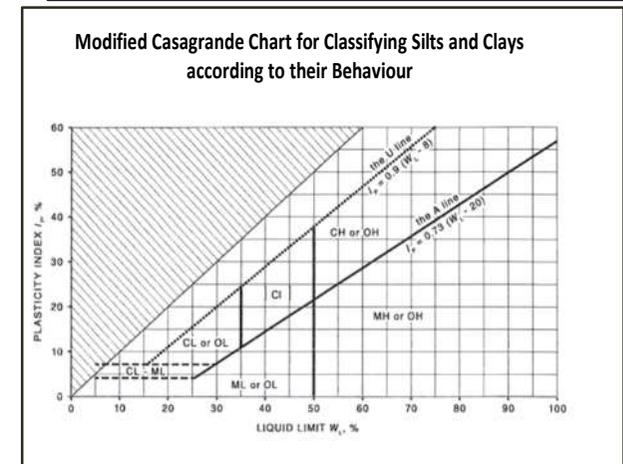
A well graded coarse grained soil is one for which the coefficient of uniformity  $C_u > 4$  and the coefficient of curvature  $1 < C_c < 3$ . Otherwise, the soil is poorly graded. These coefficients are given by:

$$C_u = \frac{D_{60}}{D_{10}} \quad \text{and} \quad C_c = \frac{(D_{30})^2}{D_{10} D_{60}}$$

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:**
- 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.
  - 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.
  - Clay soils with liquid limits  $> 35\%$  and  $\leq 50\%$  may be classified as being of medium plasticity.
  - The U line on the Modified Casagrande Chart is an approximate upper bound for most natural soils.

Major Divisions	Group Symbol	Typical Names	Field Classification of Silt and Clay			Laboratory Classification	
			Dry Strength	Dilatancy	Toughness		
fine 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	–	–	–	–





## 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 <sub>c</sub> =	5	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.	
		7		
		3R		
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	Moisture content estimated to be greater than plastic limit.		
	w ≈ PL	Moisture content estimated to be approximately equal to plastic limit.		
	w < PL	Moisture content estimated to be less than plastic limit.		
	w ≈ LL	Moisture content estimated to be near liquid limit.		
	w > LL	Moisture content estimated to be wet of liquid limit.		
	(Coarse Grained Soils)	D	DRY – runs freely through fingers.	
M		MOIST – does not run freely but no free water visible on soil surface.		
W		WET – free water visible on soil surface.		
Strength (Consistency) Cohesive Soils	VS	VERY SOFT – unconfined compressive strength ≤ 25kPa.		
	S	SOFT – unconfined compressive strength > 25kPa and ≤ 50kPa.		
	F	FIRM – unconfined compressive strength > 50kPa and ≤ 100kPa.		
	St	STIFF – unconfined compressive strength > 100kPa and ≤ 200kPa.		
	VSt	VERY STIFF – unconfined compressive strength > 200kPa and ≤ 400kPa.		
	Hd	HARD – unconfined compressive strength > 400kPa.		
	Fr	FRIABLE – strength not attainable, soil crumbles.		
	( )	Bracketed symbol indicates estimated consistency based on tactile examination or other assessment.		
Density Index/ Relative Density (Cohesionless Soils)		<b>Density Index (I<sub>D</sub>) Range (%)</b>	<b>SPT 'N' Value Range (Blows/300mm)</b>	
	VL	VERY LOOSE	≤ 15	0 – 4
	L	LOOSE	> 15 and ≤ 35	4 – 10
	MD	MEDIUM DENSE	> 35 and ≤ 65	10 – 30
	D	DENSE	> 65 and ≤ 85	30 – 50
	VD	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 'TC' bit <b>T</b> <sub>60</sub> Soil Origin	<p>Hardened steel 'V' shaped bit.</p> <p>Twin pronged tungsten carbide bit.</p> <p>Penetration of auger string in mm under static load of rig applied by drill head hydraulics without rotation of augers.</p> <p>The geological origin of the soil can generally be described as:</p> <p><b>RESIDUAL</b> – soil formed directly from insitu weathering of the underlying rock. No visible structure or fabric of the parent rock.</p> <p><b>EXTREMELY WEATHERED</b> – 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.</p> <p><b>ALLUVIAL</b> – soil deposited by creeks and rivers.</p> <p><b>ESTUARINE</b> – soil deposited in coastal estuaries, including sediments caused by inflowing creeks and rivers, and tidal currents.</p> <p><b>MARINE</b> – soil deposited in a marine environment.</p> <p><b>AEOLIAN</b> – soil carried and deposited by wind.</p> <p><b>COLLUVIAL</b> – 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.</p> <p><b>LITTORAL</b> – beach deposited soil.</p>



## 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)	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		
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.



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## **Appendix I: Laboratory Reports & COC Documents**

## CERTIFICATE OF ANALYSIS 347259

### Client Details

<b>Client</b>	JK Environments
<b>Attention</b>	C Ridley
<b>Address</b>	PO Box 976, North Ryde BC, NSW, 1670

### Sample Details

<b>Your Reference</b>	<b><u>E36628BR, Horsley Park</u></b>
<b>Number of Samples</b>	192 Soil
<b>Date samples received</b>	22/03/2024
<b>Date completed instructions received</b>	22/03/2024

### 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

<b>Date results requested by</b>	02/04/2024
<b>Date of Issue</b>	02/04/2024
NATA Accreditation Number 2901. This document shall not be reproduced except in full.	
Accredited for compliance with ISO/IEC 17025 - Testing. <b>Tests not covered by NATA are denoted with *</b>	

#### **Results Approved By**

Diego Bigolin, Inorganics Supervisor  
 Loren Bardwell, Development Chemist

#### **Authorised By**

Nancy Zhang, Laboratory Manager

Client Reference: E36628BR, Horsley Park

Misc Inorg - Soil						
Our Reference		347259-1	347259-3	347259-5	347259-7	347259-8
Your Reference	UNITS	BH1	BH1	BH1	BH1	BH1
Depth		0.0-0.1	0.8-1.0	2.3-2.5	3.8-4.0	4.8-5.0
Date Sampled		18/03/2024	18/03/2024	18/03/2024	18/03/2024	18/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	22/03/2024	22/03/2024	22/03/2024	22/03/2024	22/03/2024
Date analysed	-	26/03/2024	26/03/2024	26/03/2024	26/03/2024	26/03/2024
pH 1:5 soil:water	pH Units	5.2	8.5	4.5	8.4	8.8
Chloride, Cl 1:5 soil:water	mg/kg	580	290	21	370	220
Sulphate, SO4 1:5 soil:water	mg/kg	570	290	220	310	180
Resistivity in soil*	ohm m	13	19	67	17	22

Misc Inorg - Soil						
Our Reference		347259-10	347259-12	347259-14	347259-16	347259-17
Your Reference	UNITS	BH1	BH1	BH2	BH2	BH2
Depth		7.3-7.5	10.2-10.5	0.0-0.1	0.8-1.0	1.4-1.5
Date Sampled		18/03/2024	18/03/2024	18/03/2024	18/03/2024	18/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	22/03/2024	22/03/2024	22/03/2024	22/03/2024	22/03/2024
Date analysed	-	26/03/2024	26/03/2024	26/03/2024	26/03/2024	26/03/2024
pH 1:5 soil:water	pH Units	9.4	8.6	9.4	8.5	7.5
Chloride, Cl 1:5 soil:water	mg/kg	66	110	450	170	63
Sulphate, SO4 1:5 soil:water	mg/kg	34	67	190	200	250
Resistivity in soil*	ohm m	32	62	18	30	46

Misc Inorg - Soil						
Our Reference		347259-21	347259-22	347259-23	347259-24	347259-25
Your Reference	UNITS	BH2	BH2	BH2	BH2	BH2
Depth		3.8-4.0	4.8-5.0	5.8-6.0	7.3-7.5	8.8-9.0
Date Sampled		18/03/2024	18/03/2024	18/03/2024	18/03/2024	18/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	22/03/2024	22/03/2024	22/03/2024	22/03/2024	22/03/2024
Date analysed	-	26/03/2024	26/03/2024	26/03/2024	26/03/2024	26/03/2024
pH 1:5 soil:water	pH Units	7.8	8.4	8.4	9.4	8.6
Chloride, Cl 1:5 soil:water	mg/kg	<10	91	84	230	220
Sulphate, SO4 1:5 soil:water	mg/kg	<10	160	180	240	58
Resistivity in soil*	ohm m	50	28	32	22	35

Client Reference: E36628BR, Horsley Park

Misc Inorg - Soil						
Our Reference		347259-27	347259-29	347259-30	347259-32	347259-34
Your Reference	UNITS	BH2	BH3	BH3	BH3	BH3
Depth		11.8-12.0	0.3-0.5	0.8-1.0	1.8-2.0	2.8-3.0
Date Sampled		18/03/2024	19/03/2024	19/03/2024	19/03/2024	19/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	22/03/2024	22/03/2024	22/03/2024	22/03/2024	22/03/2024
Date analysed	-	26/03/2024	26/03/2024	26/03/2024	26/03/2024	26/03/2024
pH 1:5 soil:water	pH Units	9.5	8.8	7.5	9.1	9.2
Chloride, Cl 1:5 soil:water	mg/kg	180	490	130	160	120
Sulphate, SO4 1:5 soil:water	mg/kg	74	150	160	100	150
Resistivity in soil*	ohm m	43	19	46	27	28

Misc Inorg - Soil						
Our Reference		347259-35	347259-36	347259-37	347259-38	347259-39
Your Reference	UNITS	BH3	BH3	BH3	BH3	BH4
Depth		3.7-4.0	4.8-5.0	5.7-6.0	6.7-7.0	0.0-0.1
Date Sampled		19/03/2024	19/03/2024	19/03/2024	19/03/2024	20/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	22/03/2024	22/03/2024	22/03/2024	22/03/2024	22/03/2024
Date analysed	-	26/03/2024	26/03/2024	26/03/2024	26/03/2024	26/03/2024
pH 1:5 soil:water	pH Units	8.8	8.3	8.6	8.7	8.8
Chloride, Cl 1:5 soil:water	mg/kg	160	130	220	160	160
Sulphate, SO4 1:5 soil:water	mg/kg	170	230	300	230	38
Resistivity in soil*	ohm m	24	27	25	45	22

Misc Inorg - Soil						
Our Reference		347259-41	347259-42	347259-43	347259-44	347259-45
Your Reference	UNITS	BH4	BH4	BH4	BH4	BH4
Depth		0.8-1.0	1.4-1.5	1.8-2.0	2.4-2.5	2.8-3.0
Date Sampled		20/03/2024	20/03/2024	20/03/2024	20/03/2024	20/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	27/03/2024	27/03/2024	27/03/2024	27/03/2024	27/03/2024
Date analysed	-	27/03/2024	27/03/2024	27/03/2024	27/03/2024	27/03/2024
pH 1:5 soil:water	pH Units	7.5	4.8	4.8	5.4	7.2
Chloride, Cl 1:5 soil:water	mg/kg	260	430	340	300	250
Sulphate, SO4 1:5 soil:water	mg/kg	230	260	230	240	130
Resistivity in soil*	ohm m	22	20	23	26	33

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Misc Inorg - Soil						
Our Reference		347259-46	347259-48	347259-50	347259-51	347259-52
Your Reference	UNITS	BH4	BH5	BH5	BH5	BH5
Depth		3.8-4.0	0.0-0.1	0.8-1.0	1.3-1.5	1.8-2.0
Date Sampled		20/03/2024	20/03/2024	20/03/2024	20/03/2024	20/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	27/03/2024	27/03/2024	27/03/2024	27/03/2024	27/03/2024
Date analysed	-	27/03/2024	27/03/2024	27/03/2024	27/03/2024	27/03/2024
pH 1:5 soil:water	pH Units	8.0	5.8	5.0	6.1	9.1
Chloride, Cl 1:5 soil:water	mg/kg	260	120	20	110	200
Sulphate, SO4 1:5 soil:water	mg/kg	62	490	300	280	130
Resistivity in soil*	ohm m	37	26	51	37	23

Misc Inorg - Soil						
Our Reference		347259-54	347259-55	347259-56	347259-58	347259-59
Your Reference	UNITS	BH5	BH5	BH5	BH5	BH6
Depth		2.7-3.0	3.7-4.0	4.8-5.0	6.8-7.0	0.0-0.1
Date Sampled		20/03/2024	20/03/2024	20/03/2024	20/03/2024	19/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	27/03/2024	27/03/2024	27/03/2024	27/03/2024	22/03/2024
Date analysed	-	27/03/2024	27/03/2024	27/03/2024	27/03/2024	26/03/2024
pH 1:5 soil:water	pH Units	8.7	9.4	8.4	9.0	9.5
Chloride, Cl 1:5 soil:water	mg/kg	330	120	7,300	110	310
Sulphate, SO4 1:5 soil:water	mg/kg	150	250	920	42	260
Resistivity in soil*	ohm m	20	23	20	55	20

Misc Inorg - Soil						
Our Reference		347259-60	347259-61	347259-63	347259-64	347259-66
Your Reference	UNITS	BH6	BH6	BH6	BH6	BH6
Depth		0.4-0.5	0.8-1.0	1.7-2.0	2.3-2.5	3.7-4.0
Date Sampled		19/03/2024	19/03/2024	19/03/2024	19/03/2024	19/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	22/03/2024	27/03/2024	27/03/2024	27/03/2024	27/03/2024
Date analysed	-	26/03/2024	27/03/2024	27/03/2024	27/03/2024	27/03/2024
pH 1:5 soil:water	pH Units	8.8	8.9	6.6	4.8	8.7
Chloride, Cl 1:5 soil:water	mg/kg	83	45	85	27	210
Sulphate, SO4 1:5 soil:water	mg/kg	170	160	250	72	110
Resistivity in soil*	ohm m	39	50	42	130	25

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Misc Inorg - Soil						
Our Reference		347259-67	347259-68	347259-70	347259-71	347259-73
Your Reference	UNITS	BH6	BH6	BH7	BH7	BH7
Depth		4.8-5.0	5.7-6.0	0.0-0.1	0.8-1.0	1.8-2.0
Date Sampled		19/03/2024	19/03/2024	19/03/2024	19/03/2024	19/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	27/03/2024	27/03/2024	27/03/2024	27/03/2024	27/03/2024
Date analysed	-	27/03/2024	27/03/2024	27/03/2024	27/03/2024	27/03/2024
pH 1:5 soil:water	pH Units	8.9	8.6	8.9	7.3	9.3
Chloride, Cl 1:5 soil:water	mg/kg	230	120	180	97	160
Sulphate, SO4 1:5 soil:water	mg/kg	120	90	200	140	88
Resistivity in soil*	ohm m	23	33	29	43	26

Misc Inorg - Soil						
Our Reference		347259-74	347259-76	347259-78	347259-80	347259-82
Your Reference	UNITS	BH7	BH7	BH7	BH8	BH8
Depth		2.4-2.5	3.8-4.0	5.8-6.0	0.0-0.1	0.5-0.6
Date Sampled		19/03/2024	19/03/2024	19/03/2024	20/03/2024	20/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	27/03/2024	27/03/2024	27/03/2024	27/03/2024	27/03/2024
Date analysed	-	27/03/2024	27/03/2024	27/03/2024	27/03/2024	27/03/2024
pH 1:5 soil:water	pH Units	8.6	8.7	8.7	9.2	9.2
Chloride, Cl 1:5 soil:water	mg/kg	120	240	170	190	76
Sulphate, SO4 1:5 soil:water	mg/kg	200	280	230	290	53
Resistivity in soil*	ohm m	26	19	22	21	41

Misc Inorg - Soil						
Our Reference		347259-84	347259-86	347259-87	347259-89	347259-90
Your Reference	UNITS	BH9	BH9	BH9	BH9	BH9
Depth		0.4-0.5	1.4-1.5	1.8-2.0	2.8-3.0	3.8-4.0
Date Sampled		20/03/2024	20/03/2024	20/03/2024	20/03/2024	20/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	27/03/2024	27/03/2024	27/03/2024	27/03/2024	27/03/2024
Date analysed	-	27/03/2024	27/03/2024	27/03/2024	27/03/2024	27/03/2024
pH 1:5 soil:water	pH Units	5.3	9.3	9.4	9.1	9.8
Chloride, Cl 1:5 soil:water	mg/kg	76	150	160	140	160
Sulphate, SO4 1:5 soil:water	mg/kg	360	130	100	230	340
Resistivity in soil*	ohm m	38	28	28	25	21

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Misc Inorg - Soil						
Our Reference		347259-91	347259-92	347259-94	347259-96	347259-98
Your Reference	UNITS	BH9	BH9	BH10	BH10	BH10
Depth		4.8-5.0	5.8-6.0	0.0-0.1	0.8-1.0	1.8-2.0
Date Sampled		20/03/2024	20/03/2024	19/03/2024	19/03/2024	19/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	27/03/2024	27/03/2024	27/03/2024	27/03/2024	27/03/2024
Date analysed	-	27/03/2024	27/03/2024	27/03/2024	27/03/2024	27/03/2024
pH 1:5 soil:water	pH Units	8.6	9.3	9.2	9.1	9.4
Chloride, Cl 1:5 soil:water	mg/kg	210	39	110	130	140
Sulphate, SO4 1:5 soil:water	mg/kg	250	61	120	220	79
Resistivity in soil*	ohm m	21	46	41	30	27

Misc Inorg - Soil						
Our Reference		347259-100	347259-102	347259-104	347259-105	347259-107
Your Reference	UNITS	BH10	BH10	BH11	BH11	BH11
Depth		2.7-3.0	4.8-5.0	0.0-0.1	0.4-0.5	1.4-1.5
Date Sampled		19/03/2024	19/03/2024	19/03/2024	19/03/2024	19/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	27/03/2024	27/03/2024	27/03/2024	22/03/2024	27/03/2024
Date analysed	-	27/03/2024	27/03/2024	27/03/2024	26/03/2024	27/03/2024
pH 1:5 soil:water	pH Units	7.8	9.3	9.0	9.7	9.4
Chloride, Cl 1:5 soil:water	mg/kg	150	63	54	20	47
Sulphate, SO4 1:5 soil:water	mg/kg	240	81	220	60	71
Resistivity in soil*	ohm m	31	44	46	39	42

Misc Inorg - Soil						
Our Reference		347259-110	347259-113	347259-115	347259-117	347259-119
Your Reference	UNITS	BH11	BH12	BH12	BH12	BH13
Depth		2.7-3.0	0.0-0.1	0.8-1.0	1.8-2.0	0.0-0.1
Date Sampled		19/03/2024	19/03/2024	20/03/2024	20/03/2024	20/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	27/03/2024	27/03/2024	27/03/2024	27/03/2024	27/03/2024
Date analysed	-	27/03/2024	27/03/2024	27/03/2024	27/03/2024	27/03/2024
pH 1:5 soil:water	pH Units	9.4	7.3	9.2	9.6	9.1
Chloride, Cl 1:5 soil:water	mg/kg	100	87	95	59	170
Sulphate, SO4 1:5 soil:water	mg/kg	77	260	60	59	88
Resistivity in soil*	ohm m	34	41	41	42	31

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Misc Inorg - Soil						
Our Reference		347259-120	347259-122	347259-125	347259-127	347259-128
Your Reference	UNITS	BH13	BH13	BH13	BH13	BH14
Depth		0.4-0.5	1.4-1.5	2.8-3.0	4.3-4.5	0.0-0.1
Date Sampled		20/03/2024	20/03/2024	20/03/2024	20/03/2024	20/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	27/03/2024	27/03/2024	27/03/2024	27/03/2024	27/03/2024
Date analysed	-	27/03/2024	27/03/2024	27/03/2024	27/03/2024	27/03/2024
pH 1:5 soil:water	pH Units	9.2	9.4	9.5	9.4	9.1
Chloride, Cl 1:5 soil:water	mg/kg	10	41	35	35	170
Sulphate, SO4 1:5 soil:water	mg/kg	20	43	27	37	130
Resistivity in soil*	ohm m	55	46	94	69	29

Misc Inorg - Soil						
Our Reference		347259-130	347259-132	347259-134	347259-136	347259-137
Your Reference	UNITS	BH14	BH14	BH14	BH14	BH15
Depth		0.8-1.0	1.8-2.0	2.8-3.0	4.3-4.5	0.0-0.1
Date Sampled		19/03/2024	19/03/2024	19/03/2024	19/03/2024	19/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	27/03/2024	27/03/2024	27/03/2024	27/03/2024	27/03/2024
Date analysed	-	27/03/2024	27/03/2024	27/03/2024	27/03/2024	27/03/2024
pH 1:5 soil:water	pH Units	9.4	9.4	9.4	9.5	8.9
Chloride, Cl 1:5 soil:water	mg/kg	47	27	36	24	230
Sulphate, SO4 1:5 soil:water	mg/kg	50	89	69	31	250
Resistivity in soil*	ohm m	46	47	65	58	21

Misc Inorg - Soil						
Our Reference		347259-139	347259-142	347259-144	347259-146	347259-148
Your Reference	UNITS	BH15	BH15	BH15	BH15	BH15
Depth		0.7-1.0	2.4-2.5	3.7-3.0	5.7-6.0	8.7-9.0
Date Sampled		18/03/2024	18/03/2024	18/03/2024	18/03/2024	18/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	22/03/2024	27/03/2024	27/03/2024	27/03/2024	27/03/2024
Date analysed	-	26/03/2024	27/03/2024	27/03/2024	27/03/2024	27/03/2024
pH 1:5 soil:water	pH Units	9.6	9.6	9.5	9.7	9.6
Chloride, Cl 1:5 soil:water	mg/kg	27	29	31	39	32
Sulphate, SO4 1:5 soil:water	mg/kg	39	47	72	41	68
Resistivity in soil*	ohm m	44	39	57	58	66

Misc Inorg - Soil						
Our Reference		347259-149	347259-150	347259-151	347259-152	347259-154
Your Reference	UNITS	BH15	BH16	BH16	BH16	BH16
Depth		9.3-9.5	0.0-0.1	0.4-0.5	0.8-1.0	1.8-2.0
Date Sampled		18/03/2024	18/03/2024	20/03/2024	20/03/2024	20/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	27/03/2024	27/03/2024	27/03/2024	27/03/2024	27/03/2024
Date analysed	-	27/03/2024	27/03/2024	27/03/2024	27/03/2024	27/03/2024
pH 1:5 soil:water	pH Units	9.5	7.7	9.2	9.4	9.8
Chloride, Cl 1:5 soil:water	mg/kg	460	210	160	73	59
Sulphate, SO4 1:5 soil:water	mg/kg	120	280	40	76	63
Resistivity in soil*	ohm m	18	29	28	43	32

Misc Inorg - Soil						
Our Reference		347259-156	347259-158	347259-160	347259-162	347259-164
Your Reference	UNITS	BH17	BH17	BH17	BH17	BH17
Depth		0.4-0.5	1.4-1.5	2.3-2.5	3.8-4.0	5.8-6.0
Date Sampled		20/03/2024	20/03/2024	20/03/2024	20/03/2024	20/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	27/03/2024	27/03/2024	27/03/2024	27/03/2024	27/03/2024
Date analysed	-	27/03/2024	27/03/2024	27/03/2024	27/03/2024	27/03/2024
pH 1:5 soil:water	pH Units	8.8	8.8	8.8	8.5	8.5
Chloride, Cl 1:5 soil:water	mg/kg	160	460	220	260	250
Sulphate, SO4 1:5 soil:water	mg/kg	150	340	240	250	340
Resistivity in soil*	ohm m	26	14	21	21	19

Misc Inorg - Soil						
Our Reference		347259-166	347259-167	347259-168	347259-170	347259-172
Your Reference	UNITS	BH17	BH18	BH18	BH18	BH18
Depth		7.3-7.5	0.0-0.1	0.4-0.5	1.4-1.5	2.3-2.5
Date Sampled		20/03/2024	20/03/2024	19/03/2024	19/03/2024	19/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	27/03/2024	27/03/2024	27/03/2024	27/03/2024	27/03/2024
Date analysed	-	27/03/2024	27/03/2024	27/03/2024	27/03/2024	27/03/2024
pH 1:5 soil:water	pH Units	9.3	9.4	9.4	9.7	9.5
Chloride, Cl 1:5 soil:water	mg/kg	52	100	10	<10	10
Sulphate, SO4 1:5 soil:water	mg/kg	77	150	130	66	60
Resistivity in soil*	ohm m	62	27	43	56	96

Misc Inorg - Soil						
Our Reference		347259-174	347259-176	347259-178	347259-180	347259-182
Your Reference	UNITS	BH18	BH19	BH19	BH19	BH19
Depth		3.7-4.0	0.0-0.1	0.7-1.0	1.8-2.0	2.8-3.0
Date Sampled		19/03/2024	19/03/2024	20/03/2024	20/03/2024	20/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	27/03/2024	27/03/2024	27/03/2024	27/03/2024	27/03/2024
Date analysed	-	27/03/2024	27/03/2024	27/03/2024	27/03/2024	27/03/2024
pH 1:5 soil:water	pH Units	9.5	8.8	9.3	9.8	9.7
Chloride, Cl 1:5 soil:water	mg/kg	10	90	52	38	73
Sulphate, SO4 1:5 soil:water	mg/kg	49	120	40	35	38
Resistivity in soil*	ohm m	82	44	55	53	43

Misc Inorg - Soil						
Our Reference		347259-184	347259-186	347259-187	347259-188	347259-189
Your Reference	UNITS	BH20	BH20	BH20	BH20	BH20
Depth		0.4-0.5	1.4-1.5	1.8-2.0	2.4-2.5	2.8-3.0
Date Sampled		20/03/2024	20/03/2024	20/03/2024	20/03/2024	20/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	27/03/2024	27/03/2024	27/03/2024	27/03/2024	27/03/2024
Date analysed	-	27/03/2024	27/03/2024	27/03/2024	27/03/2024	27/03/2024
pH 1:5 soil:water	pH Units	7.7	8.7	8.2	8.8	9.1
Chloride, Cl 1:5 soil:water	mg/kg	460	310	290	110	75
Sulphate, SO4 1:5 soil:water	mg/kg	270	290	220	100	88
Resistivity in soil*	ohm m	18	18	23	42	42

Misc Inorg - Soil			
Our Reference		347259-190	347259-192
Your Reference	UNITS	BH20	BH7
Depth		3.8-4.0	0.4-0.5
Date Sampled		20/03/2024	20/03/2024
Type of sample		Soil	Soil
Date prepared	-	27/03/2024	22/03/2024
Date analysed	-	27/03/2024	26/03/2024
pH 1:5 soil:water	pH Units	9.6	8.6
Chloride, Cl 1:5 soil:water	mg/kg	10	190
Sulphate, SO4 1:5 soil:water	mg/kg	44	230
Resistivity in soil*	ohm m	100	25

Texture and Salinity*						
Our Reference		347259-1	347259-3	347259-5	347259-7	347259-8
Your Reference	UNITS	BH1	BH1	BH1	BH1	BH1
Depth		0.0-0.1	0.8-1.0	2.3-2.5	3.8-4.0	4.8-5.0
Date Sampled		18/03/2024	18/03/2024	18/03/2024	18/03/2024	18/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	22/03/2024	22/03/2024	22/03/2024	22/03/2024	22/03/2024
Date analysed	-	26/03/2024	26/03/2024	26/03/2024	26/03/2024	26/03/2024
Electrical Conductivity 1:5 soil:water	µS/cm	770	520	150	600	450
Texture Value	-	9.0	9.0	9.0	9.0	9.0
Texture	-	CLAY LOAM	CLAY LOAM	CLAY LOAM	CLAY LOAM	CLAY LOAM
ECe	dS/m	6.9	4.7	<2	5.4	4.0
Class	-	MODERATELY SALINE	MODERATELY SALINE	NON SALINE	MODERATELY SALINE	MODERATELY SALINE

Texture and Salinity*						
Our Reference		347259-10	347259-12	347259-14	347259-16	347259-17
Your Reference	UNITS	BH1	BH1	BH2	BH2	BH2
Depth		7.3-7.5	10.2-10.5	0.0-0.1	0.8-1.0	1.4-1.5
Date Sampled		18/03/2024	18/03/2024	18/03/2024	18/03/2024	18/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	22/03/2024	22/03/2024	22/03/2024	22/03/2024	22/03/2024
Date analysed	-	26/03/2024	26/03/2024	26/03/2024	26/03/2024	26/03/2024
Electrical Conductivity 1:5 soil:water	µS/cm	310	160	550	330	220
Texture Value	-	9.0	9.0	9.0	9.0	9.0
Texture	-	CLAY LOAM	CLAY LOAM	CLAY LOAM	CLAY LOAM	CLAY LOAM
ECe	dS/m	2.8	<2	4.9	3.0	<2
Class	-	SLIGHTLY SALINE	NON SALINE	MODERATELY SALINE	SLIGHTLY SALINE	NON SALINE

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Texture and Salinity*						
Our Reference		347259-21	347259-22	347259-23	347259-24	347259-25
Your Reference	UNITS	BH2	BH2	BH2	BH2	BH2
Depth		3.8-4.0	4.8-5.0	5.8-6.0	7.3-7.5	8.8-9.0
Date Sampled		18/03/2024	18/03/2024	18/03/2024	18/03/2024	18/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	22/03/2024	22/03/2024	22/03/2024	22/03/2024	22/03/2024
Date analysed	-	26/03/2024	26/03/2024	26/03/2024	26/03/2024	26/03/2024
Electrical Conductivity 1:5 soil:water	µS/cm	200	360	320	450	290
Texture Value	-	7.0	6.0	9.0	9.0	9.0
Texture	-	MEDIUM CLAY	HEAVY CLAY	CLAY LOAM	CLAY LOAM	CLAY LOAM
ECe	dS/m	<2	2.1	2.9	4.0	2.6
Class	-	NON SALINE	SLIGHTLY SALINE	SLIGHTLY SALINE	MODERATELY SALINE	SLIGHTLY SALINE

Texture and Salinity*						
Our Reference		347259-27	347259-29	347259-30	347259-32	347259-34
Your Reference	UNITS	BH2	BH3	BH3	BH3	BH3
Depth		11.8-12.0	0.3-0.5	0.8-1.0	1.8-2.0	2.8-3.0
Date Sampled		18/03/2024	19/03/2024	19/03/2024	19/03/2024	19/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	22/03/2024	22/03/2024	22/03/2024	22/03/2024	22/03/2024
Date analysed	-	26/03/2024	26/03/2024	26/03/2024	26/03/2024	26/03/2024
Electrical Conductivity 1:5 soil:water	µS/cm	230	530	220	380	360
Texture Value	-	7.0	9.0	7.0	9.0	9.0
Texture	-	MEDIUM CLAY	CLAY LOAM	MEDIUM CLAY	CLAY LOAM	CLAY LOAM
ECe	dS/m	<2	4.8	<2	3.4	3.2
Class	-	NON SALINE	MODERATELY SALINE	NON SALINE	SLIGHTLY SALINE	SLIGHTLY SALINE

Texture and Salinity*						
Our Reference		347259-35	347259-36	347259-37	347259-38	347259-39
Your Reference	UNITS	BH3	BH3	BH3	BH3	BH4
Depth		3.7-4.0	4.8-5.0	5.7-6.0	6.7-7.0	0.0-0.1
Date Sampled		19/03/2024	19/03/2024	19/03/2024	19/03/2024	20/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	22/03/2024	22/03/2024	22/03/2024	22/03/2024	22/03/2024
Date analysed	-	26/03/2024	26/03/2024	26/03/2024	26/03/2024	26/03/2024
Electrical Conductivity 1:5 soil:water	µS/cm	420	380	400	220	460
Texture Value	-	7.0	7.0	7.0	9.0	7.0
Texture	-	MEDIUM CLAY	MEDIUM CLAY	MEDIUM CLAY	CLAY LOAM	MEDIUM CLAY
ECe	dS/m	2.9	2.6	2.8	<2	3.2
Class	-	SLIGHTLY SALINE	SLIGHTLY SALINE	SLIGHTLY SALINE	NON SALINE	SLIGHTLY SALINE

Client Reference: E36628BR, Horsley Park

Texture and Salinity*						
Our Reference		347259-41	347259-42	347259-43	347259-44	347259-45
Your Reference	UNITS	BH4	BH4	BH4	BH4	BH4
Depth		0.8-1.0	1.4-1.5	1.8-2.0	2.4-2.5	2.8-3.0
Date Sampled		20/03/2024	20/03/2024	20/03/2024	20/03/2024	20/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	22/03/2024	22/03/2024	22/03/2024	22/03/2024	22/03/2024
Date analysed	-	26/03/2024	26/03/2024	26/03/2024	26/03/2024	26/03/2024
Electrical Conductivity 1:5 soil:water	µS/cm	460	490	430	390	300
Texture Value	-	7.0	7.0	7.0	7.0	9.0
Texture	-	MEDIUM CLAY	MEDIUM CLAY	MEDIUM CLAY	MEDIUM CLAY	CLAY LOAM
ECe	dS/m	3.2	3.4	3.0	2.7	2.7
Class	-	SLIGHTLY SALINE				

Texture and Salinity*						
Our Reference		347259-46	347259-48	347259-50	347259-51	347259-52
Your Reference	UNITS	BH4	BH5	BH5	BH5	BH5
Depth		3.8-4.0	0.0-0.1	0.8-1.0	1.3-1.5	1.8-2.0
Date Sampled		20/03/2024	20/03/2024	20/03/2024	20/03/2024	20/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	22/03/2024	22/03/2024	22/03/2024	22/03/2024	22/03/2024
Date analysed	-	26/03/2024	26/03/2024	26/03/2024	26/03/2024	26/03/2024
Electrical Conductivity 1:5 soil:water	µS/cm	270	390	200	270	430
Texture Value	-	9.0	7.0	7.0	7.0	7.0
Texture	-	CLAY LOAM	MEDIUM CLAY	MEDIUM CLAY	MEDIUM CLAY	MEDIUM CLAY
ECe	dS/m	2.4	2.7	<2	<2	3.0
Class	-	SLIGHTLY SALINE	SLIGHTLY SALINE	NON SALINE	NON SALINE	SLIGHTLY SALINE

Texture and Salinity*						
Our Reference		347259-54	347259-55	347259-56	347259-58	347259-59
Your Reference	UNITS	BH5	BH5	BH5	BH5	BH6
Depth		2.7-3.0	3.7-4.0	4.8-5.0	6.8-7.0	0.0-0.1
Date Sampled		20/03/2024	20/03/2024	20/03/2024	20/03/2024	19/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	22/03/2024	22/03/2024	22/03/2024	22/03/2024	22/03/2024
Date analysed	-	26/03/2024	26/03/2024	26/03/2024	26/03/2024	26/03/2024
Electrical Conductivity 1:5 soil:water	µS/cm	510	430	490	180	500
Texture Value	-	9.0	9.0	9.0	7.0	7.0
Texture	-	CLAY LOAM	CLAY LOAM	CLAY LOAM	MEDIUM CLAY	MEDIUM CLAY
ECe	dS/m	4.6	3.8	4.4	<2	3.5
Class	-	MODERATELY SALINE	SLIGHTLY SALINE	MODERATELY SALINE	NON SALINE	SLIGHTLY SALINE

Client Reference: E36628BR, Horsley Park

Texture and Salinity*						
Our Reference		347259-60	347259-61	347259-63	347259-64	347259-66
Your Reference	UNITS	BH6	BH6	BH6	BH6	BH6
Depth		0.4-0.5	0.8-1.0	1.7-2.0	2.3-2.5	3.7-4.0
Date Sampled		19/03/2024	19/03/2024	19/03/2024	19/03/2024	19/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	22/03/2024	22/03/2024	22/03/2024	22/03/2024	22/03/2024
Date analysed	-	26/03/2024	26/03/2024	26/03/2024	26/03/2024	26/03/2024
Electrical Conductivity 1:5 soil:water	µS/cm	250	200	240	75	390
Texture Value	-	7.0	7.0	9.0	7.0	7.0
Texture	-	MEDIUM CLAY	MEDIUM CLAY	CLAY LOAM	MEDIUM CLAY	MEDIUM CLAY
ECe	dS/m	<2	<2	2.1	<2	2.8
Class	-	NON SALINE	NON SALINE	SLIGHTLY SALINE	NON SALINE	SLIGHTLY SALINE

Texture and Salinity*						
Our Reference		347259-67	347259-68	347259-70	347259-71	347259-73
Your Reference	UNITS	BH6	BH6	BH7	BH7	BH7
Depth		4.8-5.0	5.7-6.0	0.0-0.1	0.8-1.0	1.8-2.0
Date Sampled		19/03/2024	19/03/2024	19/03/2024	19/03/2024	19/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	22/03/2024	22/03/2024	22/03/2024	22/03/2024	22/03/2024
Date analysed	-	26/03/2024	26/03/2024	26/03/2024	26/03/2024	26/03/2024
Electrical Conductivity 1:5 soil:water	µS/cm	440	300	340	230	380
Texture Value	-	7.0	7.0	7.0	7.0	7.0
Texture	-	MEDIUM CLAY	MEDIUM CLAY	MEDIUM CLAY	MEDIUM CLAY	MEDIUM CLAY
ECe	dS/m	3.1	2.1	2.4	<2	2.6
Class	-	SLIGHTLY SALINE	SLIGHTLY SALINE	SLIGHTLY SALINE	NON SALINE	SLIGHTLY SALINE

Texture and Salinity*						
Our Reference		347259-74	347259-76	347259-78	347259-80	347259-82
Your Reference	UNITS	BH7	BH7	BH7	BH8	BH8
Depth		2.4-2.5	3.8-4.0	5.8-6.0	0.0-0.1	0.5-0.6
Date Sampled		19/03/2024	19/03/2024	19/03/2024	20/03/2024	20/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	22/03/2024	22/03/2024	22/03/2024	22/03/2024	22/03/2024
Date analysed	-	26/03/2024	26/03/2024	26/03/2024	26/03/2024	26/03/2024
Electrical Conductivity 1:5 soil:water	µS/cm	390	520	450	470	240
Texture Value	-	7.0	7.0	9.0	7.0	7.0
Texture	-	MEDIUM CLAY	MEDIUM CLAY	CLAY LOAM	MEDIUM CLAY	MEDIUM CLAY
ECe	dS/m	2.7	3.6	4.0	3.3	<2
Class	-	SLIGHTLY SALINE	SLIGHTLY SALINE	MODERATELY SALINE	SLIGHTLY SALINE	NON SALINE

Client Reference: E36628BR, Horsley Park

Texture and Salinity*						
Our Reference		347259-84	347259-86	347259-87	347259-89	347259-90
Your Reference	UNITS	BH9	BH9	BH9	BH9	BH9
Depth		0.4-0.5	1.4-1.5	1.8-2.0	2.8-3.0	3.8-4.0
Date Sampled		20/03/2024	20/03/2024	20/03/2024	20/03/2024	20/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	22/03/2024	22/03/2024	22/03/2024	22/03/2024	22/03/2024
Date analysed	-	26/03/2024	26/03/2024	26/03/2024	26/03/2024	26/03/2024
Electrical Conductivity 1:5 soil:water	µS/cm	260	360	360	400	470
Texture Value	-	7.0	7.0	9.0	9.0	9.0
Texture	-	MEDIUM CLAY	MEDIUM CLAY	CLAY LOAM	CLAY LOAM	CLAY LOAM
ECe	dS/m	<2	2.5	3.2	3.6	4.2
Class	-	NON SALINE	SLIGHTLY SALINE	SLIGHTLY SALINE	SLIGHTLY SALINE	MODERATELY SALINE

Texture and Salinity*						
Our Reference		347259-91	347259-92	347259-94	347259-96	347259-98
Your Reference	UNITS	BH9	BH9	BH10	BH10	BH10
Depth		4.8-5.0	5.8-6.0	0.0-0.1	0.8-1.0	1.8-2.0
Date Sampled		20/03/2024	20/03/2024	19/03/2024	19/03/2024	19/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	22/03/2024	22/03/2024	22/03/2024	22/03/2024	22/03/2024
Date analysed	-	26/03/2024	26/03/2024	26/03/2024	26/03/2024	26/03/2024
Electrical Conductivity 1:5 soil:water	µS/cm	480	220	240	330	370
Texture Value	-	7.0	7.0	7.0	9.0	9.0
Texture	-	MEDIUM CLAY	MEDIUM CLAY	MEDIUM CLAY	CLAY LOAM	CLAY LOAM
ECe	dS/m	3.4	<2	<2	3.0	3.3
Class	-	SLIGHTLY SALINE	NON SALINE	NON SALINE	SLIGHTLY SALINE	SLIGHTLY SALINE

Texture and Salinity*						
Our Reference		347259-100	347259-102	347259-104	347259-105	347259-107
Your Reference	UNITS	BH10	BH10	BH11	BH11	BH11
Depth		2.7-3.0	4.8-5.0	0.0-0.1	0.4-0.5	1.4-1.5
Date Sampled		19/03/2024	19/03/2024	19/03/2024	19/03/2024	19/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	22/03/2024	22/03/2024	22/03/2024	22/03/2024	22/03/2024
Date analysed	-	26/03/2024	26/03/2024	26/03/2024	26/03/2024	26/03/2024
Electrical Conductivity 1:5 soil:water	µS/cm	320	230	220	260	240
Texture Value	-	9.0	7.0	7.0	9.0	14
Texture	-	CLAY LOAM	MEDIUM CLAY	MEDIUM CLAY	CLAY LOAM	SANDY LOAM
ECe	dS/m	2.9	<2	<2	2.3	3.4
Class	-	SLIGHTLY SALINE	NON SALINE	NON SALINE	SLIGHTLY SALINE	SLIGHTLY SALINE

Client Reference: E36628BR, Horsley Park

Texture and Salinity*						
Our Reference		347259-110	347259-113	347259-115	347259-117	347259-119
Your Reference	UNITS	BH11	BH12	BH12	BH12	BH13
Depth		2.7-3.0	0.0-0.1	0.8-1.0	1.8-2.0	0.0-0.1
Date Sampled		19/03/2024	19/03/2024	20/03/2024	20/03/2024	20/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	22/03/2024	22/03/2024	22/03/2024	22/03/2024	22/03/2024
Date analysed	-	26/03/2024	26/03/2024	26/03/2024	26/03/2024	26/03/2024
Electrical Conductivity 1:5 soil:water	µS/cm	300	250	240	240	330
Texture Value	-	14	7.0	14	14	7.0
Texture	-	SANDY LOAM	MEDIUM CLAY	SANDY LOAM	SANDY LOAM	MEDIUM CLAY
ECe	dS/m	4.2	<2	3.4	3.3	2.3
Class	-	MODERATELY SALINE	NON SALINE	SLIGHTLY SALINE	SLIGHTLY SALINE	SLIGHTLY SALINE

Texture and Salinity*						
Our Reference		347259-120	347259-122	347259-125	347259-127	347259-128
Your Reference	UNITS	BH13	BH13	BH13	BH13	BH14
Depth		0.4-0.5	1.4-1.5	2.8-3.0	4.3-4.5	0.0-0.1
Date Sampled		20/03/2024	20/03/2024	20/03/2024	20/03/2024	20/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	22/03/2024	22/03/2024	22/03/2024	22/03/2024	22/03/2024
Date analysed	-	26/03/2024	26/03/2024	26/03/2024	26/03/2024	26/03/2024
Electrical Conductivity 1:5 soil:water	µS/cm	180	220	110	150	350
Texture Value	-	7.0	7.0	14	14	6.0
Texture	-	MEDIUM CLAY	MEDIUM CLAY	SANDY LOAM	SANDY LOAM	HEAVY CLAY
ECe	dS/m	<2	<2	<2	2.0	2.1
Class	-	NON SALINE	NON SALINE	NON SALINE	SLIGHTLY SALINE	SLIGHTLY SALINE

Texture and Salinity*						
Our Reference		347259-130	347259-132	347259-134	347259-136	347259-137
Your Reference	UNITS	BH14	BH14	BH14	BH14	BH15
Depth		0.8-1.0	1.8-2.0	2.8-3.0	4.3-4.5	0.0-0.1
Date Sampled		19/03/2024	19/03/2024	19/03/2024	19/03/2024	19/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	22/03/2024	22/03/2024	22/03/2024	22/03/2024	22/03/2024
Date analysed	-	26/03/2024	26/03/2024	26/03/2024	26/03/2024	26/03/2024
Electrical Conductivity 1:5 soil:water	µS/cm	220	210	150	170	470
Texture Value	-	14	14	14	14	7.0
Texture	-	SANDY LOAM	SANDY LOAM	SANDY LOAM	SANDY LOAM	MEDIUM CLAY
ECe	dS/m	3.0	3.0	2.2	2.4	3.3
Class	-	SLIGHTLY SALINE				

Texture and Salinity*						
Our Reference		347259-139	347259-142	347259-144	347259-146	347259-148
Your Reference	UNITS	BH15	BH15	BH15	BH15	BH15
Depth		0.7-1.0	2.4-2.5	3.7-3.0	5.7-6.0	8.7-9.0
Date Sampled		18/03/2024	18/03/2024	18/03/2024	18/03/2024	18/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	22/03/2024	22/03/2024	22/03/2024	22/03/2024	22/03/2024
Date analysed	-	26/03/2024	26/03/2024	26/03/2024	26/03/2024	26/03/2024
Electrical Conductivity 1:5 soil:water	µS/cm	230	260	180	170	150
Texture Value	-	14	14	14	14	14
Texture	-	SANDY LOAM				
ECe	dS/m	3.2	3.6	2.5	2.4	2.1
Class	-	SLIGHTLY SALINE				

Texture and Salinity*						
Our Reference		347259-149	347259-150	347259-151	347259-152	347259-154
Your Reference	UNITS	BH15	BH16	BH16	BH16	BH16
Depth		9.3-9.5	0.0-0.1	0.4-0.5	0.8-1.0	1.8-2.0
Date Sampled		18/03/2024	18/03/2024	20/03/2024	20/03/2024	20/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	22/03/2024	22/03/2024	22/03/2024	22/03/2024	22/03/2024
Date analysed	-	26/03/2024	26/03/2024	26/03/2024	26/03/2024	26/03/2024
Electrical Conductivity 1:5 soil:water	µS/cm	560	350	360	240	310
Texture Value	-	14	7.0	7.0	14	14
Texture	-	SANDY LOAM	MEDIUM CLAY	MEDIUM CLAY	SANDY LOAM	SANDY LOAM
ECe	dS/m	7.8	2.4	2.5	3.3	4.3
Class	-	MODERATELY SALINE	SLIGHTLY SALINE	SLIGHTLY SALINE	SLIGHTLY SALINE	MODERATELY SALINE

Texture and Salinity*						
Our Reference		347259-156	347259-158	347259-160	347259-162	347259-164
Your Reference	UNITS	BH17	BH17	BH17	BH17	BH17
Depth		0.4-0.5	1.4-1.5	2.3-2.5	3.8-4.0	5.8-6.0
Date Sampled		20/03/2024	20/03/2024	20/03/2024	20/03/2024	20/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	22/03/2024	22/03/2024	22/03/2024	22/03/2024	22/03/2024
Date analysed	-	26/03/2024	26/03/2024	26/03/2024	26/03/2024	26/03/2024
Electrical Conductivity 1:5 soil:water	µS/cm	380	700	470	470	530
Texture Value	-	7.0	9.0	9.0	7.0	7.0
Texture	-	MEDIUM CLAY	CLAY LOAM	CLAY LOAM	MEDIUM CLAY	MEDIUM CLAY
ECe	dS/m	2.6	6.3	4.2	3.3	3.7
Class	-	SLIGHTLY SALINE	MODERATELY SALINE	MODERATELY SALINE	SLIGHTLY SALINE	SLIGHTLY SALINE

Client Reference: E36628BR, Horsley Park

Texture and Salinity*						
Our Reference		347259-166	347259-167	347259-168	347259-170	347259-172
Your Reference	UNITS	BH17	BH18	BH18	BH18	BH18
Depth		7.3-7.5	0.0-0.1	0.4-0.5	1.4-1.5	2.3-2.5
Date Sampled		20/03/2024	20/03/2024	19/03/2024	19/03/2024	19/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	22/03/2024	22/03/2024	22/03/2024	22/03/2024	22/03/2024
Date analysed	-	26/03/2024	26/03/2024	26/03/2024	26/03/2024	26/03/2024
Electrical Conductivity 1:5 soil:water	µS/cm	160	360	230	180	100
Texture Value	-	14	7.0	9.0	14	14
Texture	-	SANDY LOAM	MEDIUM CLAY	CLAY LOAM	SANDY LOAM	SANDY LOAM
ECe	dS/m	2.3	2.6	2.1	2.5	<2
Class	-	SLIGHTLY SALINE	SLIGHTLY SALINE	SLIGHTLY SALINE	SLIGHTLY SALINE	NON SALINE

Texture and Salinity*						
Our Reference		347259-174	347259-176	347259-178	347259-180	347259-182
Your Reference	UNITS	BH18	BH19	BH19	BH19	BH19
Depth		3.7-4.0	0.0-0.1	0.7-1.0	1.8-2.0	2.8-3.0
Date Sampled		19/03/2024	19/03/2024	20/03/2024	20/03/2024	20/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	22/03/2024	22/03/2024	22/03/2024	22/03/2024	22/03/2024
Date analysed	-	26/03/2024	26/03/2024	26/03/2024	26/03/2024	26/03/2024
Electrical Conductivity 1:5 soil:water	µS/cm	120	230	180	190	240
Texture Value	-	14	7.0	14	14	14
Texture	-	SANDY LOAM	MEDIUM CLAY	SANDY LOAM	SANDY LOAM	SANDY LOAM
ECe	dS/m	<2	<2	2.6	2.6	3.3
Class	-	NON SALINE	NON SALINE	SLIGHTLY SALINE	SLIGHTLY SALINE	SLIGHTLY SALINE

Texture and Salinity*						
Our Reference		347259-184	347259-186	347259-187	347259-188	347259-189
Your Reference	UNITS	BH20	BH20	BH20	BH20	BH20
Depth		0.4-0.5	1.4-1.5	1.8-2.0	2.4-2.5	2.8-3.0
Date Sampled		20/03/2024	20/03/2024	20/03/2024	20/03/2024	20/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	22/03/2024	22/03/2024	22/03/2024	22/03/2024	22/03/2024
Date analysed	-	26/03/2024	26/03/2024	26/03/2024	26/03/2024	26/03/2024
Electrical Conductivity 1:5 soil:water	µS/cm	560	540	440	240	240
Texture Value	-	7.0	7.0	7.0	7.0	9.0
Texture	-	MEDIUM CLAY	MEDIUM CLAY	MEDIUM CLAY	MEDIUM CLAY	CLAY LOAM
ECe	dS/m	3.9	3.8	3.1	<2	2.1
Class	-	SLIGHTLY SALINE	SLIGHTLY SALINE	SLIGHTLY SALINE	NON SALINE	SLIGHTLY SALINE

Texture and Salinity*			
Our Reference		347259-190	347259-192
Your Reference	UNITS	BH20	BH7
Depth		3.8-4.0	0.4-0.5
Date Sampled		20/03/2024	20/03/2024
Type of sample		Soil	Soil
Date prepared	-	22/03/2024	22/03/2024
Date analysed	-	26/03/2024	26/03/2024
Electrical Conductivity 1:5 soil:water	µS/cm	100	410
Texture Value	-	14	7.0
Texture	-	SANDY LOAM	MEDIUM CLAY
ECe	dS/m	<2	2.9
Class	-	NON SALINE	SLIGHTLY SALINE

CEC						
Our Reference		347259-1	347259-3	347259-14	347259-17	347259-29
Your Reference	UNITS	BH1	BH1	BH2	BH2	BH3
Depth		0.0-0.1	0.8-1.0	0.0-0.1	1.4-1.5	0.3-0.5
Date Sampled		18/03/2024	18/03/2024	18/03/2024	18/03/2024	19/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	02/04/2024	02/04/2024	02/04/2024	02/04/2024	02/04/2024
Date analysed	-	02/04/2024	02/04/2024	02/04/2024	02/04/2024	02/04/2024
Exchangeable Ca	meq/100g	3.7	9.4	2.2	3.1	1.7
Exchangeable K	meq/100g	0.2	0.2	0.3	0.3	0.2
Exchangeable Mg	meq/100g	2.8	6.8	4.6	3.2	4.7
Exchangeable Na	meq/100g	1.1	3.8	3.6	0.8	3.1
Cation Exchange Capacity	meq/100g	7.9	20	11	7.4	9.7

CEC						
Our Reference		347259-30	347259-39	347259-42	347259-48	347259-50
Your Reference	UNITS	BH3	BH4	BH4	BH5	BH5
Depth		0.8-1.0	0.0-0.1	1.4-1.5	0.0-0.1	0.8-1.0
Date Sampled		19/03/2024	20/03/2024	20/03/2024	20/03/2024	20/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	02/04/2024	02/04/2024	02/04/2024	02/04/2024	02/04/2024
Date analysed	-	02/04/2024	02/04/2024	02/04/2024	02/04/2024	02/04/2024
Exchangeable Ca	meq/100g	2.0	8.2	1.2	2.0	2.1
Exchangeable K	meq/100g	<0.1	0.2	0.5	0.2	0.2
Exchangeable Mg	meq/100g	9.2	4.3	11	3.2	2.3
Exchangeable Na	meq/100g	2.6	3.3	6.5	0.6	0.2
Cation Exchange Capacity	meq/100g	14	16	19	5.9	4.8

CEC						
Our Reference		347259-59	347259-61	347259-64	347259-70	347259-71
Your Reference	UNITS	BH6	BH6	BH6	BH7	BH7
Depth		0.0-0.1	0.8-1.0	2.3-2.5	0.0-0.1	0.8-1.0
Date Sampled		19/03/2024	19/03/2024	19/03/2024	19/03/2024	19/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	02/04/2024	02/04/2024	02/04/2024	02/04/2024	02/04/2024
Date analysed	-	02/04/2024	02/04/2024	02/04/2024	02/04/2024	02/04/2024
Exchangeable Ca	meq/100g	2.4	9.4	0.2	4.5	5.6
Exchangeable K	meq/100g	0.3	0.1	<0.1	0.2	0.2
Exchangeable Mg	meq/100g	3.8	0.6	0.2	3.1	4.3
Exchangeable Na	meq/100g	3.1	0.3	<0.1	2.1	1.8
Cation Exchange Capacity	meq/100g	9.6	10	<1	9.9	12

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CEC						
Our Reference		347259-80	347259-82	347259-84	347259-86	347259-87
Your Reference	UNITS	BH8	BH8	BH9	BH9	BH9
Depth		0.0-0.1	0.5-0.6	0.4-0.5	1.4-1.5	1.8-2.0
Date Sampled		20/03/2024	20/03/2024	20/03/2024	20/03/2024	20/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	02/04/2024	02/04/2024	02/04/2024	02/04/2024	02/04/2024
Date analysed	-	02/04/2024	02/04/2024	02/04/2024	02/04/2024	02/04/2024
Exchangeable Ca	meq/100g	8.5	23	4.6	9.1	13
Exchangeable K	meq/100g	0.2	<0.1	0.4	0.2	0.2
Exchangeable Mg	meq/100g	5.4	2.4	3.5	5.1	4.4
Exchangeable Na	meq/100g	4.2	1.6	0.4	3.9	3.4
Cation Exchange Capacity	meq/100g	18	27	8.9	18	21

CEC						
Our Reference		347259-94	347259-96	347259-104	347259-105	347259-113
Your Reference	UNITS	BH10	BH10	BH11	BH11	BH12
Depth		0.0-0.1	0.8-1.0	0.0-0.1	0.4-0.5	0.0-0.1
Date Sampled		19/03/2024	19/03/2024	19/03/2024	19/03/2024	19/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	02/04/2024	02/04/2024	02/04/2024	02/04/2024	02/04/2024
Date analysed	-	02/04/2024	02/04/2024	02/04/2024	02/04/2024	02/04/2024
Exchangeable Ca	meq/100g	5.1	12	8.0	21	7.8
Exchangeable K	meq/100g	0.2	0.3	0.2	0.2	0.2
Exchangeable Mg	meq/100g	2.6	5.0	0.9	3.0	3.0
Exchangeable Na	meq/100g	1.1	2.8	0.3	1.9	0.8
Cation Exchange Capacity	meq/100g	9.0	20	9.4	26	12

CEC						
Our Reference		347259-115	347259-119	347259-120	347259-128	347259-137
Your Reference	UNITS	BH12	BH13	BH13	BH14	BH15
Depth		0.8-1.0	0.0-0.1	0.4-0.5	0.0-0.1	0.0-0.1
Date Sampled		20/03/2024	20/03/2024	20/03/2024	20/03/2024	19/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	02/04/2024	02/04/2024	02/04/2024	02/04/2024	02/04/2024
Date analysed	-	02/04/2024	02/04/2024	02/04/2024	02/04/2024	02/04/2024
Exchangeable Ca	meq/100g	15	9.4	9.3	7.1	7.3
Exchangeable K	meq/100g	0.2	0.3	0.4	0.2	0.2
Exchangeable Mg	meq/100g	2.3	5.2	8.4	2.5	4.2
Exchangeable Na	meq/100g	1.2	2.8	2.6	1.5	2.7
Cation Exchange Capacity	meq/100g	18	18	21	11	14

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CEC						
Our Reference		347259-139	347259-150	347259-151	347259-156	347259-160
Your Reference	UNITS	BH15	BH16	BH16	BH17	BH17
Depth		0.7-1.0	0.0-0.1	0.4-0.5	0.4-0.5	2.3-2.5
Date Sampled		18/03/2024	18/03/2024	20/03/2024	20/03/2024	20/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	02/04/2024	02/04/2024	02/04/2024	02/04/2024	02/04/2024
Date analysed	-	02/04/2024	02/04/2024	02/04/2024	02/04/2024	02/04/2024
Exchangeable Ca	meq/100g	11	4.8	13	11	14
Exchangeable K	meq/100g	0.4	0.3	0.2	0.3	0.2
Exchangeable Mg	meq/100g	3.2	3.8	4.1	4.9	4.4
Exchangeable Na	meq/100g	1.4	0.9	2.5	2.1	2.0
Cation Exchange Capacity	meq/100g	16	9.7	20	19	21

CEC						
Our Reference		347259-162	347259-167	347259-168	347259-176	347259-184
Your Reference	UNITS	BH17	BH18	BH18	BH19	BH20
Depth		3.8-4.0	0.0-0.1	0.4-0.5	0.0-0.1	0.4-0.5
Date Sampled		20/03/2024	20/03/2024	19/03/2024	19/03/2024	20/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	02/04/2024	02/04/2024	02/04/2024	02/04/2024	02/04/2024
Date analysed	-	02/04/2024	02/04/2024	02/04/2024	02/04/2024	02/04/2024
Exchangeable Ca	meq/100g	9.8	15	5.5	7.7	3.8
Exchangeable K	meq/100g	0.3	0.3	0.6	0.2	0.3
Exchangeable Mg	meq/100g	6.0	3.6	4.8	2.1	8.1
Exchangeable Na	meq/100g	3.0	2.3	2.0	0.9	5.0
Cation Exchange Capacity	meq/100g	19	22	13	11	17

CEC			
Our Reference		347259-186	347259-187
Your Reference	UNITS	BH20	BH20
Depth		1.4-1.5	1.8-2.0
Date Sampled		20/03/2024	20/03/2024
Type of sample		Soil	Soil
Date prepared	-	02/04/2024	02/04/2024
Date analysed	-	02/04/2024	02/04/2024
Exchangeable Ca	meq/100g	13	7.9
Exchangeable K	meq/100g	0.2	0.3
Exchangeable Mg	meq/100g	3.8	6.9
Exchangeable Na	meq/100g	2.1	3.3
Cation Exchange Capacity	meq/100g	19	18

Method ID	Methodology Summary
<b>Inorg-001</b>	pH - Measured using pH meter and electrode. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times.
<b>Inorg-002</b>	Conductivity and Salinity - measured using a conductivity cell.
<b>Inorg-002</b>	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.
<b>Inorg-081</b>	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.
<b>INORG-123</b>	Determined using a "Texture by Feel" method.
<b>Metals-020</b>	Determination of exchangeable cations and cation exchange capacity in soils using 1M Ammonium Chloride exchange and ICP-OES analytical finish.

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QUALITY CONTROL: Misc Inorg - Soil					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	347259-7
Date prepared	-			22/03/2024	5	22/03/2024	22/03/2024		22/03/2024	22/03/2024
Date analysed	-			26/03/2024	5	26/03/2024	26/03/2024		26/03/2024	26/03/2024
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	5	4.5	4.4	2	100	[NT]
Chloride, Cl 1:5 soil:water	mg/kg	10	Inorg-081	<10	5	21	20	5	92	#
Sulphate, SO4 1:5 soil:water	mg/kg	10	Inorg-081	<10	5	220	220	0	106	#
Resistivity in soil*	ohm m	1	Inorg-002	<1	5	67	63	6	[NT]	[NT]

QUALITY CONTROL: Misc Inorg - Soil					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-2	347259-36
Date prepared	-			[NT]	21	22/03/2024	22/03/2024		22/03/2024	22/03/2024
Date analysed	-			[NT]	21	26/03/2024	26/03/2024		26/03/2024	26/03/2024
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	21	7.8	7.8	0	100	[NT]
Chloride, Cl 1:5 soil:water	mg/kg	10	Inorg-081	[NT]	21	<10	<10	0	95	#
Sulphate, SO4 1:5 soil:water	mg/kg	10	Inorg-081	[NT]	21	<10	<10	0	106	#
Resistivity in soil*	ohm m	1	Inorg-002	[NT]	21	50	44	13	[NT]	[NT]

QUALITY CONTROL: Misc Inorg - Soil					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-3	347259-78
Date prepared	-			[NT]	35	22/03/2024	22/03/2024		22/03/2024	22/03/2024
Date analysed	-			[NT]	35	26/03/2024	26/03/2024		26/03/2024	26/03/2024
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	35	8.8	8.7	1	100	[NT]
Chloride, Cl 1:5 soil:water	mg/kg	10	Inorg-081	[NT]	35	160	160	0	102	#
Sulphate, SO4 1:5 soil:water	mg/kg	10	Inorg-081	[NT]	35	170	170	0	102	#
Resistivity in soil*	ohm m	1	Inorg-002	[NT]	35	24	24	0	[NT]	[NT]

QUALITY CONTROL: Misc Inorg - Soil					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-4	347259-115
Date prepared	-			[NT]	51	27/03/2024	27/03/2024		22/03/2024	22/03/2024
Date analysed	-			[NT]	51	27/03/2024	27/03/2024		26/03/2024	26/03/2024
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	51	6.1	6.2	2	100	[NT]
Chloride, Cl 1:5 soil:water	mg/kg	10	Inorg-081	[NT]	51	110	92	18	96	#
Sulphate, SO4 1:5 soil:water	mg/kg	10	Inorg-081	[NT]	51	280	270	4	108	89
Resistivity in soil*	ohm m	1	Inorg-002	[NT]	51	37	53	36	[NT]	[NT]

QUALITY CONTROL: Misc Inorg - Soil					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-5	347259-151
Date prepared	-			[NT]	64	27/03/2024	27/03/2024		22/03/2024	22/03/2024
Date analysed	-			[NT]	64	27/03/2024	27/03/2024		26/03/2024	26/03/2024
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	64	4.8	4.8	0	100	[NT]
Chloride, Cl 1:5 soil:water	mg/kg	10	Inorg-081	[NT]	64	27	26	4	98	#
Sulphate, SO4 1:5 soil:water	mg/kg	10	Inorg-081	[NT]	64	72	67	7	110	89
Resistivity in soil*	ohm m	1	Inorg-002	[NT]	64	130	140	7	[NT]	[NT]

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QUALITY CONTROL: Misc Inorg - Soil					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-6	347259-187
Date prepared	-			[NT]	76	27/03/2024	27/03/2024		22/03/2024	22/03/2024
Date analysed	-			[NT]	76	27/03/2024	27/03/2024		26/03/2024	26/03/2024
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	76	8.7	8.7	0	100	[NT]
Chloride, Cl 1:5 soil:water	mg/kg	10	Inorg-081	[NT]	76	240	250	4	95	#
Sulphate, SO4 1:5 soil:water	mg/kg	10	Inorg-081	[NT]	76	280	310	10	102	#
Resistivity in soil*	ohm m	1	Inorg-002	[NT]	76	19	19	0	[NT]	[NT]

QUALITY CONTROL: Misc Inorg - Soil					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-7	[NT]
Date prepared	-			[NT]	92	27/03/2024	27/03/2024		22/03/2024	[NT]
Date analysed	-			[NT]	92	27/03/2024	27/03/2024		26/03/2024	[NT]
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	92	9.3	9.1	2	101	[NT]
Chloride, Cl 1:5 soil:water	mg/kg	10	Inorg-081	[NT]	92	39	35	11	96	[NT]
Sulphate, SO4 1:5 soil:water	mg/kg	10	Inorg-081	[NT]	92	61	56	9	106	[NT]
Resistivity in soil*	ohm m	1	Inorg-002	[NT]	92	46	54	16	[NT]	[NT]

QUALITY CONTROL: Misc Inorg - Soil					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	113	27/03/2024	27/03/2024		[NT]	[NT]
Date analysed	-			[NT]	113	27/03/2024	27/03/2024		[NT]	[NT]
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	113	7.3	7.1	3	[NT]	[NT]
Chloride, Cl 1:5 soil:water	mg/kg	10	Inorg-081	[NT]	113	87	83	5	[NT]	[NT]
Sulphate, SO4 1:5 soil:water	mg/kg	10	Inorg-081	[NT]	113	260	260	0	[NT]	[NT]
Resistivity in soil*	ohm m	1	Inorg-002	[NT]	113	41	39	5	[NT]	[NT]

QUALITY CONTROL: Misc Inorg - Soil					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	132	27/03/2024	27/03/2024		[NT]	[NT]
Date analysed	-			[NT]	132	27/03/2024	27/03/2024		[NT]	[NT]
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	132	9.4	9.3	1	[NT]	[NT]
Chloride, Cl 1:5 soil:water	mg/kg	10	Inorg-081	[NT]	132	27	30	11	[NT]	[NT]
Sulphate, SO4 1:5 soil:water	mg/kg	10	Inorg-081	[NT]	132	89	100	12	[NT]	[NT]
Resistivity in soil*	ohm m	1	Inorg-002	[NT]	132	47	40	16	[NT]	[NT]

QUALITY CONTROL: Misc Inorg - Soil					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	152	27/03/2024	27/03/2024		[NT]	[NT]
Date analysed	-			[NT]	152	27/03/2024	27/03/2024		[NT]	[NT]
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	152	9.4	9.4	0	[NT]	[NT]
Chloride, Cl 1:5 soil:water	mg/kg	10	Inorg-081	[NT]	152	73	73	0	[NT]	[NT]
Sulphate, SO4 1:5 soil:water	mg/kg	10	Inorg-081	[NT]	152	76	95	22	[NT]	[NT]
Resistivity in soil*	ohm m	1	Inorg-002	[NT]	152	43	42	2	[NT]	[NT]

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QUALITY CONTROL: Misc Inorg - Soil					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	167	27/03/2024	27/03/2024		[NT]	[NT]
Date analysed	-			[NT]	167	27/03/2024	27/03/2024		[NT]	[NT]
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	167	9.4	9.4	0	[NT]	[NT]
Chloride, Cl 1:5 soil:water	mg/kg	10	Inorg-081	[NT]	167	100	85	16	[NT]	[NT]
Sulphate, SO4 1:5 soil:water	mg/kg	10	Inorg-081	[NT]	167	150	120	22	[NT]	[NT]
Resistivity in soil*	ohm m	1	Inorg-002	[NT]	167	27	31	14	[NT]	[NT]

QUALITY CONTROL: Misc Inorg - Soil					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	184	27/03/2024	27/03/2024		[NT]	[NT]
Date analysed	-			[NT]	184	27/03/2024	27/03/2024		[NT]	[NT]
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	184	7.7	7.9	3	[NT]	[NT]
Chloride, Cl 1:5 soil:water	mg/kg	10	Inorg-081	[NT]	184	460	450	2	[NT]	[NT]
Sulphate, SO4 1:5 soil:water	mg/kg	10	Inorg-081	[NT]	184	270	270	0	[NT]	[NT]
Resistivity in soil*	ohm m	1	Inorg-002	[NT]	184	18	18	0	[NT]	[NT]

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QUALITY CONTROL: Texture and Salinity*				Duplicate				Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			22/03/2024	5	22/03/2024	22/03/2024		22/03/2024	[NT]
Date analysed	-			26/03/2024	5	26/03/2024	26/03/2024		26/03/2024	[NT]
Electrical Conductivity 1:5 soil:water	µS/cm	1	Inorg-002	<1	5	150	160	6	101	[NT]
Texture Value	-		INORG-123	[NT]	5	9.0	9.0	0	[NT]	[NT]

QUALITY CONTROL: Texture and Salinity*				Duplicate				Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-2	[NT]
Date prepared	-			[NT]	21	22/03/2024	22/03/2024		22/03/2024	[NT]
Date analysed	-			[NT]	21	26/03/2024	26/03/2024		26/03/2024	[NT]
Electrical Conductivity 1:5 soil:water	µS/cm	1	Inorg-002	[NT]	21	200	230	14	100	[NT]
Texture Value	-		INORG-123	[NT]	21	7.0	7.0	0	[NT]	[NT]

QUALITY CONTROL: Texture and Salinity*				Duplicate				Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-3	[NT]
Date prepared	-			[NT]	35	22/03/2024	22/03/2024		22/03/2024	[NT]
Date analysed	-			[NT]	35	26/03/2024	26/03/2024		26/03/2024	[NT]
Electrical Conductivity 1:5 soil:water	µS/cm	1	Inorg-002	[NT]	35	420	410	2	100	[NT]
Texture Value	-		INORG-123	[NT]	35	7.0	7.0	0	[NT]	[NT]

QUALITY CONTROL: Texture and Salinity*				Duplicate				Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-4	[NT]
Date prepared	-			[NT]	51	22/03/2024	22/03/2024		22/03/2024	[NT]
Date analysed	-			[NT]	51	26/03/2024	26/03/2024		26/03/2024	[NT]
Electrical Conductivity 1:5 soil:water	µS/cm	1	Inorg-002	[NT]	51	270	270	0	100	[NT]
Texture Value	-		INORG-123	[NT]	51	7.0	7.0	0	[NT]	[NT]

QUALITY CONTROL: Texture and Salinity*				Duplicate				Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-5	[NT]
Date prepared	-			[NT]	64	22/03/2024	22/03/2024		22/03/2024	[NT]
Date analysed	-			[NT]	64	26/03/2024	26/03/2024		26/03/2024	[NT]
Electrical Conductivity 1:5 soil:water	µS/cm	1	Inorg-002	[NT]	64	75	73	3	99	[NT]
Texture Value	-		INORG-123	[NT]	64	7.0	7.0	0	[NT]	[NT]

QUALITY CONTROL: Texture and Salinity*				Duplicate				Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-6	[NT]
Date prepared	-			[NT]	76	22/03/2024	22/03/2024		22/03/2024	[NT]
Date analysed	-			[NT]	76	26/03/2024	26/03/2024		26/03/2024	[NT]
Electrical Conductivity 1:5 soil:water	µS/cm	1	Inorg-002	[NT]	76	520	540	4	99	[NT]
Texture Value	-		INORG-123	[NT]	76	7.0	7.0	0	[NT]	[NT]

Client Reference: E36628BR, Horsley Park

QUALITY CONTROL: Texture and Salinity*					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	92	22/03/2024	22/03/2024		[NT]	[NT]
Date analysed	-			[NT]	92	26/03/2024	26/03/2024		[NT]	[NT]
Electrical Conductivity 1:5 soil:water	µS/cm	1	Inorg-002	[NT]	92	220	190	15	[NT]	[NT]
Texture Value	-		INORG-123	[NT]	92	7.0	7.0	0	[NT]	[NT]

QUALITY CONTROL: Texture and Salinity*					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	113	22/03/2024	22/03/2024		[NT]	[NT]
Date analysed	-			[NT]	113	26/03/2024	26/03/2024		[NT]	[NT]
Electrical Conductivity 1:5 soil:water	µS/cm	1	Inorg-002	[NT]	113	250	290	15	[NT]	[NT]
Texture Value	-		INORG-123	[NT]	113	7.0	7.0	0	[NT]	[NT]

QUALITY CONTROL: Texture and Salinity*					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	132	22/03/2024	22/03/2024		[NT]	[NT]
Date analysed	-			[NT]	132	26/03/2024	26/03/2024		[NT]	[NT]
Electrical Conductivity 1:5 soil:water	µS/cm	1	Inorg-002	[NT]	132	210	250	17	[NT]	[NT]
Texture Value	-		INORG-123	[NT]	132	14	14	0	[NT]	[NT]

QUALITY CONTROL: Texture and Salinity*					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	152	22/03/2024	22/03/2024		[NT]	[NT]
Date analysed	-			[NT]	152	26/03/2024	26/03/2024		[NT]	[NT]
Electrical Conductivity 1:5 soil:water	µS/cm	1	Inorg-002	[NT]	152	240	240	0	[NT]	[NT]
Texture Value	-		INORG-123	[NT]	152	14	14	0	[NT]	[NT]

QUALITY CONTROL: Texture and Salinity*					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	167	22/03/2024	22/03/2024		[NT]	[NT]
Date analysed	-			[NT]	167	26/03/2024	26/03/2024		[NT]	[NT]
Electrical Conductivity 1:5 soil:water	µS/cm	1	Inorg-002	[NT]	167	360	330	9	[NT]	[NT]
Texture Value	-		INORG-123	[NT]	167	7.0	7.0	0	[NT]	[NT]

QUALITY CONTROL: Texture and Salinity*					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	184	22/03/2024	22/03/2024		[NT]	[NT]
Date analysed	-			[NT]	184	26/03/2024	26/03/2024		[NT]	[NT]
Electrical Conductivity 1:5 soil:water	µS/cm	1	Inorg-002	[NT]	184	560	560	0	[NT]	[NT]
Texture Value	-		INORG-123	[NT]	184	7.0	7.0	0	[NT]	[NT]

Client Reference: E36628BR, Horsley Park

QUALITY CONTROL: CEC					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	347259-3
Date prepared	-			02/04/2024	1	02/04/2024	02/04/2024		02/04/2024	02/04/2024
Date analysed	-			02/04/2024	1	02/04/2024	02/04/2024		02/04/2024	02/04/2024
Exchangeable Ca	meq/100g	0.1	Metals-020	<0.1	1	3.7	3.6	3	112	#
Exchangeable K	meq/100g	0.1	Metals-020	<0.1	1	0.2	0.2	0	107	102
Exchangeable Mg	meq/100g	0.1	Metals-020	<0.1	1	2.8	2.7	4	113	112
Exchangeable Na	meq/100g	0.1	Metals-020	<0.1	1	1.1	0.9	20	106	121

QUALITY CONTROL: CEC					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	347259-96
Date prepared	-			[NT]	59	02/04/2024	02/04/2024		02/04/2024	02/04/2024
Date analysed	-			[NT]	59	02/04/2024	02/04/2024		02/04/2024	02/04/2024
Exchangeable Ca	meq/100g	0.1	Metals-020	[NT]	59	2.4	3.5	37	102	126
Exchangeable K	meq/100g	0.1	Metals-020	[NT]	59	0.3	0.3	0	116	95
Exchangeable Mg	meq/100g	0.1	Metals-020	[NT]	59	3.8	4.6	19	99	82
Exchangeable Na	meq/100g	0.1	Metals-020	[NT]	59	3.1	3.8	20	108	87

QUALITY CONTROL: CEC					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W3	347259-139
Date prepared	-			[NT]	94	02/04/2024	02/04/2024		02/04/2024	02/04/2024
Date analysed	-			[NT]	94	02/04/2024	02/04/2024		02/04/2024	02/04/2024
Exchangeable Ca	meq/100g	0.1	Metals-020	[NT]	94	5.1	4.9	4	111	#
Exchangeable K	meq/100g	0.1	Metals-020	[NT]	94	0.2	0.3	40	112	102
Exchangeable Mg	meq/100g	0.1	Metals-020	[NT]	94	2.6	3.1	18	96	107
Exchangeable Na	meq/100g	0.1	Metals-020	[NT]	94	1.1	1.4	24	112	114

QUALITY CONTROL: CEC					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	150	02/04/2024	02/04/2024		[NT]	[NT]
Date analysed	-			[NT]	150	02/04/2024	02/04/2024		[NT]	[NT]
Exchangeable Ca	meq/100g	0.1	Metals-020	[NT]	150	4.8	4.5	6	[NT]	[NT]
Exchangeable K	meq/100g	0.1	Metals-020	[NT]	150	0.3	0.2	40	[NT]	[NT]
Exchangeable Mg	meq/100g	0.1	Metals-020	[NT]	150	3.8	3.1	20	[NT]	[NT]
Exchangeable Na	meq/100g	0.1	Metals-020	[NT]	150	0.9	0.7	25	[NT]	[NT]

QUALITY CONTROL: CEC					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	186	02/04/2024	02/04/2024		[NT]	[NT]
Date analysed	-			[NT]	186	02/04/2024	02/04/2024		[NT]	[NT]
Exchangeable Ca	meq/100g	0.1	Metals-020	[NT]	186	13	11	17	[NT]	[NT]
Exchangeable K	meq/100g	0.1	Metals-020	[NT]	186	0.2	0.2	0	[NT]	[NT]
Exchangeable Mg	meq/100g	0.1	Metals-020	[NT]	186	3.8	3.9	3	[NT]	[NT]
Exchangeable Na	meq/100g	0.1	Metals-020	[NT]	186	2.1	2.3	9	[NT]	[NT]

**Result Definitions**

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

## Quality Control Definitions

<b>Blank</b>	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.
<b>Duplicate</b>	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.
<b>Matrix Spike</b>	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.
<b>LCS (Laboratory Control Sample)</b>	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.
<b>Surrogate Spike</b>	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.

Where matrix spike recoveries fall below the lower limit of the acceptance criteria (e.g. for non-labile or standard Organics <60%), positive result(s) in the parent sample will subsequently have a higher than typical estimated uncertainty (MU estimates supplied on request) and in these circumstances the sample result is likely biased significantly low.

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 applicable due to the high concentration of the analyte/s in the sample/s. However an acceptable recovery was obtained for the LCS.

CEC - # Poor spike recovery was obtained for this sample. The sample was re-extracted and re-spiked and the poor recovery was confirmed. This is due to matrix interferences. However, an acceptable recovery was obtained for the LCS.

## SAMPLE RECEIPT ADVICE

### Client Details

<b>Client</b>	JK Environments
<b>Attention</b>	C Ridley

### Sample Login Details

<b>Your reference</b>	E36628BR, Horsley Park
<b>Envirolab Reference</b>	347259
<b>Date Sample Received</b>	22/03/2024
<b>Date Instructions Received</b>	22/03/2024
<b>Date Results Expected to be Reported</b>	02/04/2024

### Sample Condition

<b>Samples received in appropriate condition for analysis</b>	Yes
<b>No. of Samples Provided</b>	192 Soil
<b>Turnaround Time Requested</b>	Standard
<b>Temperature on Receipt (°C)</b>	7
<b>Cooling Method</b>	Ice Pack
<b>Sampling Date Provided</b>	YES

### Comments

Nil

Please direct any queries to:

#### Aileen Hie

**Phone:** 02 9910 6200  
**Fax:** 02 9910 6201  
**Email:** ahie@envirolab.com.au

#### Jacinta Hurst

**Phone:** 02 9910 6200  
**Fax:** 02 9910 6201  
**Email:** jhurst@envirolab.com.au

*Analysis Underway, details on the following page:*



**Envirolab Services Pty Ltd**

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Sample ID	Misc Inorg - Soil	Texture and Salinity*	CEC	On Hold
BH1-0.0-0.1	✓	✓	✓	
BH1-0.5-0.6				✓
BH1-0.8-1.0	✓	✓	✓	
BH1-1.6-2.0				✓
BH1-2.3-2.5	✓	✓		
BH1-3.0-3.3				✓
BH1-3.8-4.0	✓	✓		
BH1-4.8-5.0	✓	✓		
BH1-5.8-6.0				✓
BH1-7.3-7.5	✓	✓		
BH1-8.7-9.0				✓
BH1-10.2-10.5	✓	✓		
BH1-11.7-12.0				✓
BH2-0.0-0.1	✓	✓	✓	
BH2-0.4-0.5				✓
BH2-0.8-1.0	✓	✓		
BH2-1.4-1.5	✓	✓	✓	
BH2-1.6-2.0				✓
BH2-2.4-2.5				✓
BH2-3.3-3.45				✓
BH2-3.8-4.0	✓	✓		
BH2-4.8-5.0	✓	✓		
BH2-5.8-6.0	✓	✓		
BH2-7.3-7.5	✓	✓		
BH2-8.8-9.0	✓	✓		
BH2-10.3-10.5				✓
BH2-11.8-12.0	✓	✓		
BH3-0.0-0.1				✓
BH3-0.3-0.5	✓	✓	✓	
BH3-0.8-1.0	✓	✓	✓	
BH3-1.3-1.5				✓
BH3-1.8-2.0	✓	✓		



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Sample ID	Misc Inorg - Soil	Texture and Salinity*	CEC	On Hold
BH3-2.4-2.5				✓
BH3-2.8-3.0	✓	✓		
BH3-3.7-4.0	✓	✓		
BH3-4.8-5.0	✓	✓		
BH3-5.7-6.0	✓	✓		
BH3-6.7-7.0	✓	✓		
BH4-0.0-0.1	✓	✓	✓	
BH4-0.4-0.5				✓
BH4-0.8-1.0	✓	✓		
BH4-1.4-1.5	✓	✓	✓	
BH4-1.8-2.0	✓	✓		
BH4-2.4-2.5	✓	✓		
BH4-2.8-3.0	✓	✓		
BH4-3.8-4.0	✓	✓		
BH4-4.3-4.5				✓
BH5-0.0-0.1	✓	✓	✓	
BH5-0.4-0.5				✓
BH5-0.8-1.0	✓	✓	✓	
BH5-1.3-1.5	✓	✓		
BH5-1.8-2.0	✓	✓		
BH5-2.4-2.5				✓
BH5-2.7-3.0	✓	✓		
BH5-3.7-4.0	✓	✓		
BH5-4.8-5.0	✓	✓		
BH5-5.8-6.0				✓
BH5-6.8-7.0	✓	✓		
BH6-0.0-0.1	✓	✓	✓	
BH6-0.4-0.5	✓	✓		
BH6-0.8-1.0	✓	✓	✓	
BH6-1.4-1.5				✓
BH6-1.7-2.0	✓	✓		
BH6-2.3-2.5	✓	✓	✓	



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Sample ID	Misc Inorg - Soil	Texture and Salinity*	CEC	On Hold
BH6-2.7-3.0				✓
BH6-3.7-4.0	✓	✓		
BH6-4.8-5.0	✓	✓		
BH6-5.7-6.0	✓	✓		
BH6-6.7-7.0				✓
BH7-0.0-0.1	✓	✓	✓	
BH7-0.8-1.0	✓	✓	✓	
BH7-1.3-1.5				✓
BH7-1.8-2.0	✓	✓		
BH7-2.4-2.5	✓	✓		
BH7-2.8-3.0				✓
BH7-3.8-4.0	✓	✓		
BH7-4.8-5.0				✓
BH7-5.8-6.0	✓	✓		
BH7-6.8-7.0				✓
BH8-0.0-0.1	✓	✓	✓	
BH8-0.4-0.5				✓
BH8-0.5-0.6	✓	✓	✓	
BH9-0.0-0.1				✓
BH9-0.4-0.5	✓	✓	✓	
BH9-0.8-1.0				✓
BH9-1.4-1.5	✓	✓	✓	
BH9-1.8-2.0	✓	✓	✓	
BH9-2.4-2.5				✓
BH9-2.8-3.0	✓	✓		
BH9-3.8-4.0	✓	✓		
BH9-4.8-5.0	✓	✓		
BH9-5.8-6.0	✓	✓		
BH9-6.3-6.5				✓
BH10-0.0-0.1	✓	✓	✓	
BH10-0.4-0.5				✓
BH10-0.8-1.0	✓	✓	✓	



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Sample ID	Misc Inorg - Soil	Texture and Salinity*	CEC	On Hold
BH10-1.3-1.5				✓
BH10-1.8-2.0	✓	✓		
BH10-2.3-2.5				✓
BH10-2.7-3.0	✓	✓		
BH10-3.8-4.0				✓
BH10-4.8-5.0	✓	✓		
BH10-5.5-6.0				✓
BH11-0.0-0.1	✓	✓	✓	
BH11-0.4-0.5	✓	✓	✓	
BH11-0.8-1.0				✓
BH11-1.4-1.5	✓	✓		
BH11-1.7-2.0				✓
BH11-2.3-2.5				✓
BH11-2.7-3.0	✓	✓		
BH11-3.7-4.0				✓
BH11-4.3-4.5				✓
BH12-0.0-0.1	✓	✓	✓	
BH12-0.4-0.5				✓
BH12-0.8-1.0	✓	✓	✓	
BH12-1.4-1.5				✓
BH12-1.8-2.0	✓	✓		
BH12-2.3-2.5				✓
BH13-0.0-0.1	✓	✓	✓	
BH13-0.4-0.5	✓	✓	✓	
BH13-0.8-1.0				✓
BH13-1.4-1.5	✓	✓		
BH13-1.8-2.0				✓
BH13-2.4-2.5				✓
BH13-2.8-3.0	✓	✓		
BH13-3.8-4.0				✓
BH13-4.3-4.5	✓	✓		
BH14-0.0-0.1	✓	✓	✓	



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Sample ID	Misc Inorg - Soil	Texture and Salinity*	CEC	On Hold
BH14-0.4-0.5				✓
BH14-0.8-1.0	✓	✓		
BH14-1.4-1.5				✓
BH14-1.8-2.0	✓	✓		
BH14-2.4-2.5				✓
BH14-2.8-3.0	✓	✓		
BH14-3.8-4.0				✓
BH14-4.3-4.5	✓	✓		
BH15-0.0-0.1	✓	✓	✓	
BH15-0.4-0.5				✓
BH15-0.7-1.0	✓	✓	✓	
BH15-1.4-1.5				✓
BH15-1.7-2.0				✓
BH15-2.4-2.5	✓	✓		
BH15-2.7-3.0				✓
BH15-3.7-3.0	✓	✓		
BH15-4.7-5.0				✓
BH15-5.7-6.0	✓	✓		
BH15-7.1-7.5				✓
BH15-8.7-9.0	✓	✓		
BH15-9.3-9.5	✓	✓		
BH16-0.0-0.1	✓	✓	✓	
BH16-0.4-0.5	✓	✓	✓	
BH16-0.8-1.0	✓	✓		
BH16-1.4-1.5				✓
BH16-1.8-2.0	✓	✓		
BH17-0.0-0.1				✓
BH17-0.4-0.5	✓	✓	✓	
BH17-0.8-1.0				✓
BH17-1.4-1.5	✓	✓		
BH17-1.8-2.0				✓
BH17-2.3-2.5	✓	✓	✓	



**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	Misc Inorg - Soil	Texture and Salinity*	CEC	On Hold
BH17-2.8-3.0				✓
BH17-3.8-4.0	✓	✓	✓	
BH17-4.8-5.0				✓
BH17-5.8-6.0	✓	✓		
BH17-6.8-7.0				✓
BH17-7.3-7.5	✓	✓		
BH18-0.0-0.1	✓	✓	✓	
BH18-0.4-0.5	✓	✓	✓	
BH18-0.8-1.0				✓
BH18-1.4-1.5	✓	✓		
BH18-1.7-2.0				✓
BH18-2.3-2.5	✓	✓		
BH18-2.7-3.0				✓
BH18-3.7-4.0	✓	✓		
BH18-4.3-4.5				✓
BH19-0.0-0.1	✓	✓	✓	
BH19-0.4-0.5				✓
BH19-0.7-1.0	✓	✓		
BH19-1.3-1.5				✓
BH19-1.8-2.0	✓	✓		
BH19-2.3-2.5				✓
BH19-2.8-3.0	✓	✓		
BH20-0.0-0.1				✓
BH20-0.4-0.5	✓	✓	✓	
BH20-0.8-1.0				✓
BH20-1.4-1.5	✓	✓	✓	
BH20-1.8-2.0	✓	✓	✓	
BH20-2.4-2.5	✓	✓		
BH20-2.8-3.0	✓	✓		
BH20-3.8-4.0	✓	✓		
BH20-4.3-4.5				✓
BH7-0.4-0.5	✓	✓		

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



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## 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**

<b>TO:</b> ENVIROLAB SERVICES PTY LTD 12 ASHLEY STREET CHATSWOOD NSW 2067 P: (02) 99106200 F: (02) 99106201  Attention: Aileen	<b>JKE Job Number:</b> <span style="border: 1px solid black; padding: 2px;">E36628BR</span>  <b>Date Results Required:</b> <span style="border: 1px solid black; padding: 2px;">STANDARD</span>  <b>Page:</b> <span style="border: 1px solid black; padding: 2px;">1 of 8</span>	<b>FROM:</b>  <b>JK Environments</b> REAR OF 115 WICKS ROAD MACQUARIE PARK, NSW 2113 P: 02-9888 5000      F: 02-9888 5001 Attention: Craig Ridley CRidley@jkenvironments.com.au
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<b>Location:</b> Horsley Park	<b>Sample Preserved in Esky on Ice</b>
<b>Sampler:</b> JTL / OB	<b>Tests Required</b>

Date Sampled	Lab Ref:	Sample Number	Depth (m)	Sample Container	Sample Description	Soil Aggressivity & Resistivity	ECe (Texture)	CEC											
18/03/2024	1	BH1	0.0-0.1	G	F: sandy clay	X	X	X											
18/03/2024	2	BH1	0.5-0.6	G	F: sandy clay														
18/03/2024	3	BH1	0.8-1.0	G	F: silty clay	X	X	X											
18/03/2024	4	BH1	1.6-2.0	G	F: silty clay														
18/03/2024	5	BH1	2.3-2.5	G	F: silty clay	X	X												
18/03/2024	6	BH1	3.0-3.3	G	F: silty clay														
18/03/2024	7	BH1	3.8-4.0	G	F: silty clay	X	X												
18/03/2024	8	BH1	4.8-5.0	G	F: silty clay	X	X												
18/03/2024	9	BH1	5.8-6.0	G	F: silty clay														
18/03/2024	10	BH1	7.3-7.5	G	XW SILTSTONE: silty clay	X	X												
18/03/2024	11	BH1	8.7-9.0	G	SILTSTONE: silty clay														
18/03/2024	12	BH1	10.2-10.5	G	SILTSTONE: silty clay	X	X												
18/03/2024	13	BH1	11.7-12.0	G	SILTSTONE: silty clay														
18/03/2024	14	BH2	0.0-0.1	G	F: gravelly sand	X	X	X											
18/03/2024	15	BH2	0.4-0.5	G	F: gravelly sand														
18/03/2024	16	BH2	0.8-1.0	G	F: sandy clay	X	X												
18/03/2024	17	BH2	1.4-1.5	G	F: sandy clay	X	X	X											
18/03/2024	18	BH2	1.6-2.0	G	F: silty clay														
18/03/2024	19	BH2	2.4-2.5	G	F: silty clay														
18/03/2024	NR	BH2	3.0-3.2	G	F: silty clay	X	X												
18/03/2024	20	BH2	3.3-3.45	G	F: silty clay														
18/03/2024	21	BH2	3.8-4.0	G	F: silty clay	X	X												
18/03/2024	22	BH2	4.8-5.0	G	F: silty clay	X	X												
18/03/2024	23	BH2	5.8-6.0	G	F: silty clay	X	X												
18/03/2024	24	BH2	7.3-7.5	G	F: silty clay	X	X												

**Envirolab Services**  
 12 Ashley St  
 Chatswood NSW 2067  
 P: (02) 9910 6200  
 Job No: 347259  
 Date Received: 22/3/24  
 Time Received: 1450  
 Received By: KW  
 Temp (Cool) Ambient  
 Cooling: Ice pack 7°C  
 Security: (initials) / None

<b>Remarks (comments/detection limits required):</b>	<b>Sample Containers:</b> G - 250mg Glass Jar A - Ziplock Asbestos Bag P - Plastic Bag
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<b>Relinquished By:</b> CR	<b>Date:</b> 22/03/2024	<b>Time:</b> 1450	<b>Received By:</b> Kathy Wayne	<b>Date:</b> 22/3/24
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**SAMPLE AND CHAIN OF CUSTODY FORM**

<b>TO:</b> ENVIROLAB SERVICES PTY LTD 12 ASHLEY STREET CHATSWOOD NSW 2067 P: (02) 99106200 F: (02) 99106201  Attention: Aileen	<b>JKE Job Number:</b> E366288R  <b>Date Results Required:</b> STANDARD  <b>Page:</b> 2 of 8	<b>FROM:</b> <b>JK Environments</b> REAR OF 115 WICKS ROAD MACQUARIE PARK, NSW 2113 P: 02-9888 5000 F: 02-9888 5001 Attention: Craig Ridley CRidley@jkenvironments.com.au
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<b>Location:</b> Horsley Park	<b>Sample Preserved in Esky on Ice</b>
<b>Sampler:</b> JTL / OB	<b>Tests Required</b>

Date Sampled	Lab Ref:	Sample Number	Depth (m)	Sample Container	Sample Description	Soil Aggressivity & Resistivity		CEC	Tests Required												
						ECe (Texture)															
18/03/2024	25	BH2	8.8-9.0	G	XW SILTSTONE: silty clay	X	X														
18/03/2024	26	BH2	10.3-10.5	G	XW SILTSTONE: silty clay																
18/03/2024	27	BH2	11.8-12.0	G	XW SILTSTONE: silty clay	X	X														
19/03/2024	28	BH3	0.0-0.1	G	F: gravelly sand																
19/03/2024	29	BH3	0.3-0.5	G	F: gravelly sand	X	X	X													
19/03/2024	30	BH3	0.8-1.0	G	F: silty clay	X	X	X													
19/03/2024	31	BH3	1.3-1.5	G	F: silty clay																
19/03/2024	32	BH3	1.8-2.0	G	F: silty clay	X	X														
19/03/2024	33	BH3	2.4-2.5	G	F: silty clay																
19/03/2024	34	BH3	2.8-3.0	G	F: silty clay	X	X														
19/03/2024	35	BH3	3.7-4.0	G	F: silty clay	X	X														
19/03/2024	36	BH3	4.8-5.0	G	F: silty clay	X	X														
19/03/2024	37	BH3	5.7-6.0	G	F: silty clay	X	X														
19/03/2024	38	BH3	6.7-7.0	G	XW SILTSTONE: silty clay	X	X														
20/03/2024	39	BH4	0.0-0.1	G	F: silty clay	X	X	X													
20/03/2024	40	BH4	0.4-0.5	G	F: silty clay																
20/03/2024	41	BH4	0.8-1.0	G	F: silty clay	X	X														
20/03/2024	42	BH4	1.4-1.5	G	CLAY	X	X	X													
20/03/2024	43	BH4	1.8-2.0	G	CLAY	X	X														
20/03/2024	44	BH4	2.4-2.5	G	XW SILTSTONE: silty clay	X	X														
20/03/2024	45	BH4	2.8-3.0	G	XW SILTSTONE: silty clay	X	X														
20/03/2024	46	BH4	3.8-4.0	G	XW SILTSTONE: silty clay	X	X														
20/03/2024	47	BH4	4.3-4.5	G	XW SILTSTONE: silty clay																
20/02/2024	48	BH5	0.0-0.1	G	F: silty clay	X	X	X													
20/03/2024	49	BH5	0.4-0.5	G	F: silty clay																

<b>Remarks (comments/detection limits required):</b>	Sample Containers: G - 250mg Glass Jar A - Ziplock Asbestos Bag P - Plastic Bag
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<b>Relinquished By:</b> CR	<b>Date:</b> 22/03/2024	<b>Time:</b>	<b>Received By:</b>	<b>Date:</b>
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**SAMPLE AND CHAIN OF CUSTODY FORM**

<b>TO:</b> ENVIROLAB SERVICES PTY LTD 12 ASHLEY STREET CHATSWOOD NSW 2067 P: (02) 99106200 F: (02) 99106201  Attention: Aileen	<b>JKE Job Number:</b> <span style="border: 1px solid black; padding: 2px;">E36628BR</span>  <b>Date Results Required:</b> <span style="border: 1px solid black; padding: 2px;">STANDARD</span>  <b>Page:</b> <span style="border: 1px solid black; padding: 2px;">3 of 8</span>	<b>FROM:</b> <b>JK Environments</b>  REAR OF 115 WICKS ROAD MACQUARIE PARK, NSW 2113 P: 02-9888 5000      F: 02-9888 5001 Attention: <span style="border: 1px solid black; padding: 2px;">Craig Ridley</span> CRidley@jkenvironments.com.au
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<b>Location:</b> Horsley Park	<b>Sample Preserved in Esky on Ice</b>
<b>Sampler:</b> JTL / OB	<b>Tests Required</b>

Date Sampled	Lab Ref:	Sample Number	Depth (m)	Sample Container	Sample Description	Soil Aggressivity & Resistivity	ECe (Texture)	CEC										
20/03/2024	50	BH5	0.8-1.0	G	F: silty clay	X	X	X										
20/03/2024	51	BH5	1.3-1.5	G	F: silty clay	X	X											
20/03/2024	52	BH5	1.8-2.0	G	F: silty clay	X	X											
20/03/2024	53	BH5	2.4-2.5	G	F: silty clay													
20/03/2024	54	BH5	2.7-3.0	G	F: silty clay	X	X											#347259
20/03/2024	55	BH5	3.7-4.0	G	F: silty clay	X	X											22/3 kw
20/03/2024	56	BH5	4.8-5.0	G	F: silty clay	X	X											
20/03/2024	57	BH5	5.8-6.0	G	F: silty clay													
20/03/2024	58	BH5	6.8-7.0	G	XW SILTSTONE: silty clay	X	X											
19/03/2024	59	BH6	0.0-0.1	G	F: clayey sand	X	X	X										
19/03/2024	60	BH6	0.4-0.5	G	F: clayey sand	X	X											
19/03/2024	61	BH6	0.8-1.0	G	F: clayey sand	X	X	X										
19/03/2024	62	BH6	1.4-1.5	G	F: clayey sand													
19/03/2024	63	BH6	1.7-2.0	G	F: clayey sand	X	X											
19/03/2024	64	BH6	2.3-2.5	G	F: silty clay	X	X	X										
19/03/2024	65	BH6	2.7-3.0	G	F: silty clay													
19/03/2024	66	BH6	3.7-4.0	G	F: silty clay	X	X											
19/03/2024	67	BH6	4.8-5.0	G	F: silty clay	X	X											
19/03/2024	68	BH6	5.7-6.0	G	XW SILTSTONE: silty clay	X	X											
19/03/2024	69	BH6	6.7-7.0	G	XW SILTSTONE: silty clay													
19/03/2024	70	BH7	0.0-0.1	G	F: gravelly sand	X	X	X										
19/03/2024	71	BH7	0.4-0.5	G	F: gravelly sand	X	X											
19/03/2024	71	BH7	0.8-1.0	G	F: silty clay	X	X	X										
19/03/2024	72	BH7	1.3-1.5	G	F: silty clay													
19/03/2024	73	BH7	1.8-2.0	G	F: silty clay	X	X											

<b>Remarks (comments/detection limits required):</b>	<b>Sample Containers:</b> G - 250mg Glass Jar A - Ziplock Asbestos Bag P - Plastic Bag
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<b>Relinquished By:</b> CR	<b>Date:</b> 22/03/2024	<b>Time:</b>	<b>Received By:</b>	<b>Date:</b>
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**SAMPLE AND CHAIN OF CUSTODY FORM**

<b>TO:</b> ENVIROLAB SERVICES PTY LTD 12 ASHLEY STREET CHATSWOOD NSW 2067 P: (02) 99106200 F: (02) 99106201 Attention: Aileen	<b>JKE Job Number:</b> E36628BR  <b>Date Results Required:</b> STANDARD  <b>Page:</b> 4 of 8	<b>FROM:</b> <b>JK Environments</b>  REAR OF 115 WICKS ROAD MACQUARIE PARK, NSW 2113 P: 02-9888 5000 F: 02-9888 5001 Attention: Craig Ridley CRidley@jkenvironments.com.au
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<b>Location:</b> Horsley Park	<b>Sample Preserved in Esky on Ice</b>
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<b>Sampler:</b> JTL / OB	<b>Tests Required</b>
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Date Sampled	Lab Ref:	Sample Number	Depth (m)	Sample Container	Sample Description	Soil Aggressivity & Resistivity		CEC	Tests Required														
						Soil Aggressivity	Resistivity																
19/03/2024	74	BH7	2.4-2.5	G	F: silty clay	X	X																
19/03/2024	75	BH7	2.8-3.0	G	F: silty clay																		
19/03/2024	76	BH7	3.8-4.0	G	F: silty clay	X	X																
19/03/2024	77	BH7	4.8-5.0	G	F: silty clay																		
19/03/2024	78	BH7	5.8-6.0	G	F: silty clay	X	X																
19/03/2024	79	BH7	6.8-7.0	G	XW SILTSTONE: silty clay																		
20/03/2024	80	BH8	0.0-0.1	G	F: gravelly sand	X	X	X															
20/03/2024	81	BH8	0.4-0.5	G	F: gravelly sand																		
20/03/2024	82	BH8	0.5-0.6	G	XW SILTSTONE: silty clay	X	X	X															
20/03/2024	83	BH9	0.0-0.1	G	F: silty clay																		
20/03/2024	84	BH9	0.4-0.5	G	F: silty clay	X	X	X															
20/03/2024	85	BH9	0.8-1.0	G	F: silty clay																		
20/03/2024	86	BH9	1.4-1.5	G	F: silty clay	X	X	X															
20/03/2024	87	BH9	1.8-2.0	G	F: silty clay	X	X	X															
20/03/2024	88	BH9	2.4-2.5	G	F: silty clay																		
20/03/2024	89	BH9	2.8-3.0	G	F: silty clay	X	X																
20/03/2024	90	BH9	3.8-4.0	G	F: silty clay	X	X																
20/03/2024	91	BH9	4.8-5.0	G	F: silty clay	X	X																
20/03/2024	92	BH9	5.8-6.0	G	XW SILTSTONE: silty clay	X	X																
20/03/2024	93	BH9	6.3-6.5	G	XW SILTSTONE: silty clay																		
19/03/2024	94	BH10	0.0-0.1	G	F: gravelly sand	X	X	X															
19/03/2024	95	BH10	0.4-0.5	G	F: gravelly sand																		
19/03/2024	96	BH10	0.8-1.0	G	F: silty clay	X	X	X															
19/03/2024	97	BH10	1.3-1.5	G	F: silty clay																		
19/03/2024	98	BH10	1.8-2.0	G	F: silty clay	X	X																
19/03/2024	99	BH10	2.3-2.5	G	F: silty clay																		

<b>Remarks (comments/detection limits required):</b>	<b>Sample Containers:</b> G - 250mg Glass Jar A - Ziplock Asbestos Bag P - Plastic Bag
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<b>Relinquished By:</b> CR	<b>Date:</b> 22/03/2024	<b>Time:</b>	<b>Received By:</b>	<b>Date:</b>
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**SAMPLE AND CHAIN OF CUSTODY FORM**

<b>TO:</b> ENVIROLAB SERVICES PTY LTD 12 ASHLEY STREET CHATSWOOD NSW 2067 P: (02) 99106200 F: (02) 99106201  Attention: Aileen	<b>JKE Job Number:</b> <span style="border: 1px solid black; padding: 2px;">E36628BR</span>  <b>Date Results Required:</b> <span style="border: 1px solid black; padding: 2px;">STANDARD</span>  <b>Page:</b> <span style="border: 1px solid black; padding: 2px;">5 of 8</span>	<b>FROM:</b> <b>JK Environments</b>  REAR OF 115 WICKS ROAD MACQUARIE PARK, NSW 2113 P: 02-9888 5000      F: 02-9888 5001 Attention: <span style="border: 1px solid black; padding: 2px;">Craig Ridley</span> CRidley@jkenvironments.com.au
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<b>Location:</b> Horsley Park	<b>Sample Preserved in Esky on Ice</b>
<b>Sampler:</b> JTL / OB	<b>Tests Required</b>

Date Sampled	Lab Ref:	Sample Number	Depth (m)	Sample Container	Sample Description	Soil Aggressivity & Resistivity	ECe (Texture)	CEC										
19/03/2024	100	BH10	2.7-3.0	G	F: silty clay	X	X											
19/03/2024	101	BH10	3.8-4.0	G	F: silty clay													
19/03/2024	102	BH10	4.8-5.0	G	XW SILTSTONE: silty clay	X	X											
19/03/2024	103	BH10	5.5-6.0	G	XW SILTSTONE: silty clay													# 347259
19/03/2024	104	BH11	0.0-0.1	G	F: gravelly sand	X	X	X										22/3 kw
19/03/2024	105	BH11	0.4-0.5	G	XW SILTSTONE: silty clay	X	X	X										
19/03/2024	106	BH11	0.4-0.5	G	XW SILTSTONE: silty clay													
19/03/2024	107	BH11	0.8-1.0	G	XW SILTSTONE: silty clay													
19/03/2024	108	BH11	1.4-1.5	G	XW SILTSTONE: silty clay	X	X											
19/03/2024	109	BH11	1.7-2.0	G	XW SILTSTONE: silty clay													
19/03/2024	110	BH11	2.3-2.5	G	XW SILTSTONE: silty clay													
19/03/2024	111	BH11	2.7-3.0	G	XW SILTSTONE: silty clay	X	X											
19/03/2024	112	BH11	3.7-4.0	G	XW SILTSTONE: silty clay													
19/03/2024	113	BH11	4.3-4.5	G	XW SILTSTONE: silty clay													
20/03/2024	114	BH12	0.0-0.1	G	F: gravelly sand	X	X	X										
20/03/2024	115	BH12	0.4-0.5	G	F: gravelly sand													
20/03/2024	116	BH12	0.8-1.0	G	XW SILTSTONE: silty clay	X	X	X										
20/03/2024	117	BH12	1.4-1.5	G	XW SILTSTONE: silty clay													
20/03/2024	118	BH12	1.8-2.0	G	XW SILTSTONE: silty clay	X	X											
20/03/2024	119	BH12	2.3-2.5	G	XW SILTSTONE: silty clay													
20/03/2024	120	BH13	0.0-0.1	G	F: gravelly sand	X	X	X										
20/03/2024	121	BH13	0.4-0.5	G	XW SILTSTONE: silty clay	X	X	X										
20/03/2024	122	BH13	0.8-1.0	G	XW SILTSTONE: silty clay													
20/03/2024	123	BH13	1.4-1.5	G	XW SILTSTONE: silty clay	X	X											
20/03/2024	124	BH13	1.8-2.0	G	XW SILTSTONE: silty clay													

<b>Remarks (comments/detection limits required):</b>	<b>Sample Containers:</b> G - 250mg Glass Jar A - Ziplock Asbestos Bag P - Plastic Bag
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<b>Relinquished By:</b> CR	<b>Date:</b> 22/03/2024	<b>Time:</b>	<b>Received By:</b>	<b>Date:</b>
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**SAMPLE AND CHAIN OF CUSTODY FORM**

<b>TO:</b> ENVIROLAB SERVICES PTY LTD 12 ASHLEY STREET CHATSWOOD NSW 2067 P: (02) 99106200 F: (02) 99106201  Attention: Aileen	<b>JKE Job Number:</b> E36628BR  <b>Date Results Required:</b> STANDARD  <b>Page:</b> 6 of 8	<b>FROM:</b>  <b>JK Environments</b> REAR OF 115 WICKS ROAD MACQUARIE PARK, NSW 2113 P: 02-9888 5000 F: 02-9888 5001 Attention: Craig Ridley CRidley@jkenvironments.com.au
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<b>Location:</b> Horsley Park <b>Sampler:</b> JTL / OB	<b>Sample Preserved in Esky on Ice</b>
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Date Sampled	Lab Ref:	Sample Number	Depth (m)	Sample Container	Sample Description	Soil Aggressivity & Resistivity	ECe (Texture)	CEC	Tests Required												
20/03/2024	125	BH13 <sup>124</sup>	2.4-2.5	G	XW SILTSTONE: silty clay																
20/03/2024	126	BH13 <sup>126</sup>	2.8-3.0	G	XW SILTSTONE: silty clay	X	X														
20/03/2024	127	BH13 <sup>126</sup>	3.8-4.0	G	XW SILTSTONE: silty clay																
20/03/2024	128	BH13 <sup>127</sup>	4.3-4.5	G	XW SILTSTONE: silty clay	X	X														
19/03/2024	129	BH14 <sup>128</sup>	0.0-0.1	G	F: gravelly sand	X	X	X												#342 259	
19/03/2024	130	BH14 <sup>129</sup>	0.4-0.5	G	XW SILTSTONE: silty clay															27/3 kw	
19/03/2024	131	BH14 <sup>130</sup>	0.8-1.0	G	XW SILTSTONE: silty clay	X	X														
19/03/2024	132	BH14 <sup>131</sup>	1.4-1.5	G	XW SILTSTONE: silty clay																
19/03/2024	133	BH14 <sup>132</sup>	1.8-2.0	G	XW SILTSTONE: silty clay	X	X														
19/03/2024	134	BH14 <sup>133</sup>	2.4-2.5	G	XW SILTSTONE: silty clay																
19/03/2024	135	BH14 <sup>134</sup>	2.8-3.0	G	XW SILTSTONE: silty clay	X	X														
19/03/2024	136	BH14 <sup>135</sup>	3.8-4.0	G	XW SILTSTONE: silty clay																
19/03/2024	137	BH14 <sup>136</sup>	4.3-4.5	G	XW SILTSTONE: silty clay	X	X														
18/03/2024	138	BH15 <sup>137</sup>	0.0-0.1	G	F: silty clay	X	X	X													
18/03/2024	139	BH15 <sup>138</sup>	0.4-0.5	G	XW SILTSTONE: silty clay																
18/03/2024	140	BH15 <sup>139</sup>	0.7-1.0	G	XW SILTSTONE: silty clay	X	X	X													
18/03/2024	141	BH15 <sup>140</sup>	1.4-1.5	G	XW SILTSTONE: silty clay																
18/03/2024	142	BH15 <sup>141</sup>	1.7-2.0	G	XW SILTSTONE: silty clay																
18/03/2024	143	BH15 <sup>142</sup>	2.4-2.5	G	XW SILTSTONE: silty clay	X	X														
18/03/2024	144	BH15 <sup>143</sup>	2.7-3.0	G	XW SILTSTONE: silty clay																
18/03/2024	145	BH15 <sup>144</sup>	3.7-3.0	G	XW SILTSTONE: silty clay	X	X														
18/03/2024	146	BH15 <sup>145</sup>	4.7-5.0	G	XW SILTSTONE: silty clay																
18/03/2024	147	BH15 <sup>146</sup>	5.7-6.0	G	XW SILTSTONE: silty clay	X	X														
18/03/2024	148	BH15 <sup>147</sup>	7.1-7.5	G	XW SILTSTONE: silty clay																
18/03/2024	149	BH15 <sup>148</sup>	8.7-9.0	G	XW SILTSTONE: silty clay	X	X														

<b>Remarks (comments/detection limits required):</b>	<b>Sample Containers:</b> G - 250mg Glass Jar A - Ziplock Asbestos Bag P - Plastic Bag
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Relinquished By: CR	Date: 22/03/2024	Time:	Received By:	Date:
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**SAMPLE AND CHAIN OF CUSTODY FORM**

<b>TO:</b> ENVIROLAB SERVICES PTY LTD 12 ASHLEY STREET CHATSWOOD NSW 2067 P: (02) 99106200 F: (02) 99106201  Attention: Aileen	<b>JKE Job Number:</b> <span style="border: 1px solid black; padding: 2px;">E36628BR</span>  <b>Date Results Required:</b> <span style="border: 1px solid black; padding: 2px;">STANDARD</span>  <b>Page:</b> <span style="border: 1px solid black; padding: 2px;">7 of 8</span>	<b>FROM:</b> <b>JK Environments</b>  REAR OF 115 WICKS ROAD MACQUARIE PARK, NSW 2113 P: 02-9888 5000      F: 02-9888 5001 Attention: <span style="border: 1px solid black; padding: 2px;">Craig Ridley</span> CRidley@jkenvironments.com.au
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<b>Location:</b> Horsley Park	<b>Sample Preserved in Esky on Ice</b>
<b>Sampler:</b> JTL / OB	<b>Tests Required</b>

Date Sampled	Lab Ref:	Sample Number	Depth (m)	Sample Container	Sample Description	Soil Aggressivity & Resistivity	ECe (Texture)	CEC												
18/03/2024	150	BH15 <sup>149</sup>	9.3-9.5	G	XW SILTSTONE: silty clay	X	X													
20/03/2024	151	BH16 <sup>150</sup>	0.0-0.1	G	F: gravelly sand	X	X	X												
20/03/2024	152	BH16 <sup>151</sup>	0.4-0.5	G	F: silty clay	X	X	X												
20/03/2024	153	BH16 <sup>152</sup>	0.8-1.0	G	XW SILTSTONE: silty clay	X	X													
20/03/2024	154	BH16 <sup>153</sup>	1.4-1.5	G	XW SILTSTONE: silty clay															
20/03/2024	155	BH16 <sup>154</sup>	1.8-2.0	G	XW SILTSTONE: silty clay	X	X													
20/03/2024	156	BH17 <sup>155</sup>	0.0-0.1	G	F: silty clay															
20/03/2024	157	BH17 <sup>156</sup>	0.4-0.5	G	F: silty clay	X	X	X												
20/03/2024	158	BH17 <sup>157</sup>	0.8-1.0	G	F: silty clay															
20/03/2024	159	BH17 <sup>158</sup>	1.4-1.5	G	F: silty clay	X	X													
20/03/2024	160	BH17 <sup>159</sup>	1.8-2.0	G	F: silty clay															
20/03/2024	161	BH17 <sup>160</sup>	2.3-2.5	G	F: silty clay	X	X	X												
20/03/2024	162	BH17 <sup>161</sup>	2.8-3.0	G	F: silty clay															
20/03/2024	163	BH17 <sup>162</sup>	3.8-4.0	G	F: silty clay	X	X	X												
20/03/2024	164	BH17 <sup>163</sup>	4.8-5.0	G	F: silty clay															
20/03/2024	165	BH17 <sup>164</sup>	5.8-6.0	G	F: silty clay	X	X													
20/03/2024	166	BH17 <sup>165</sup>	6.8-7.0	G	XW SILTSTONE: silty clay															
20/03/2024	167	BH17 <sup>166</sup>	7.3-7.5	G	XW SILTSTONE: silty clay	X	X													
19/03/2024	168	BH18 <sup>167</sup>	0.0-0.1	G	F: gravelly sand	X	X	X												
19/03/2024	169	BH18 <sup>168</sup>	0.4-0.5	G	XW SILTSTONE: silty clay	X	X	X												
19/03/2024	170	BH18 <sup>169</sup>	0.8-1.0	G	XW SILTSTONE: silty clay															
19/03/2024	171	BH18 <sup>170</sup>	1.4-1.5	G	XW SILTSTONE: silty clay	X	X													
19/03/2024	172	BH18 <sup>171</sup>	1.7-2.0	G	XW SILTSTONE: silty clay															
19/03/2024	173	BH18 <sup>172</sup>	2.3-2.5	G	XW SILTSTONE: silty clay	X	X													
19/03/2024	174	BH18 <sup>173</sup>	2.7-3.0	G	XW SILTSTONE: silty clay															

<b>Remarks (comments/detection limits required):</b>	Sample Containers: G - 250mg Glass Jar A - Ziplock Asbestos Bag P - Plastic Bag
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Relinquished By: CR	Date: 22/03/2024	Time:	Received By:	Date:
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**SAMPLE AND CHAIN OF CUSTODY FORM**

<b>TO:</b> ENVIROLAB SERVICES PTY LTD 12 ASHLEY STREET CHATSWOOD NSW 2067 P: (02) 99106200 F: (02) 99106201 Attention: Aileen	<b>JKE Job Number:</b> <span style="border: 1px solid black; padding: 2px;">E36628BR</span>  <b>Date Results Required:</b> <span style="border: 1px solid black; padding: 2px;">STANDARD</span>  <b>Page:</b> <span style="border: 1px solid black; padding: 2px;">8 of 8</span>	<b>FROM:</b> <b>JK Environments</b> REAR OF 115 WICKS ROAD MACQUARIE PARK, NSW 2113 P: 02-9888 5000      F: 02-9888 5001 Attention: <span style="border: 1px solid black; padding: 2px;">Craig Ridley</span> CRidley@jkenvironments.com.au
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Location:		Horsley Park				Sample Preserved in Esky on Ice													
Sampler:		JTL / OB				Tests Required													
Date Sampled	Lab Ref:	Sample Number	Depth (m)	Sample Container	Sample Description	Soil Aggressivity & Resistivity	ECe (Texture)	CEC											
19/03/2024	175	BH18 <sup>174</sup>	3.7-4.0	G	XW SILTSTONE: silty clay	X	X												
19/03/2024	176	BH18 <sup>175</sup>	4.3-4.5	G	XW SILTSTONE: silty clay														
20/03/2024	177	BH19 <sup>176</sup>	0.0-0.1	G	F: gravelly sand	X	X	X											
20/03/2024	178	BH19 <sup>177</sup>	0.4-0.5	G	XW SILTSTONE: silty clay														
20/03/2024	179	BH19 <sup>178</sup>	0.7-1.0	G	XW SILTSTONE: silty clay	X	X												# 34725A
20/03/2024	180	BH19 <sup>179</sup>	1.3-1.5	G	XW SILTSTONE: silty clay														22/3 KW
20/03/2024	181	BH19 <sup>180</sup>	1.8-2.0	G	XW SILTSTONE: silty clay	X	X												
20/03/2024	182	BH19 <sup>181</sup>	2.3-2.5	G	XW SILTSTONE: silty clay														
20/03/2024	183	BH19 <sup>182</sup>	2.8-3.0	G	XW SILTSTONE: silty clay	X	X												
20/03/2024	184	BH20 <sup>183</sup>	0.0-0.1	G	F: silty clay														
20/03/2024	185	BH20 <sup>184</sup>	0.4-0.5	G	F: silty clay	X	X	X											
20/03/2024	186	BH20 <sup>185</sup>	0.8-1.0	G	F: silty clay														
20/03/2024	187	BH20 <sup>186</sup>	1.4-1.5	G	F: silty clay	X	X	X											
20/03/2024	188	BH20 <sup>187</sup>	1.8-2.0	G	F: silty clay	X	X	X											
20/03/2024	189	BH20 <sup>188</sup>	2.4-2.5	G	F: silty clay	X	X												
20/03/2024	190	BH20 <sup>189</sup>	2.8-3.0	G	XW SILTSTONE: silty clay	X	X												
20/03/2024	191	BH20 <sup>190</sup>	3.8-4.0	G	XW SILTSTONE: silty clay	X	X												
20/03/2024	192	BH20 <sup>191</sup>	4.3-4.5	G	XW SILTSTONE: silty clay														
	192	BH7	0.8-1.0		eston sample														

Remarks (comments/detection limits required):

Sample Containers:  
 G - 250mg Glass Jar  
 A - Ziplock Asbestos Bag  
 P - Plastic Bag

Relinquished By: CR	Date: 22/03/2024	Time:	Received By:	Date:
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## **CERTIFICATE OF ANALYSIS 347659**

### **Client Details**

<b>Client</b>	JK Environments
<b>Attention</b>	C Ridley
<b>Address</b>	PO Box 976, North Ryde BC, NSW, 1670

### **Sample Details**

<b>Your Reference</b>	<b><u>E366288R Horsley Park</u></b>
<b>Number of Samples</b>	11 Water
<b>Date samples received</b>	28/03/2024
<b>Date completed instructions received</b>	28/03/2024

### **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** 08/04/2024

**Date of Issue** 08/04/2024

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

#### **Results Approved By**

Diego Bigolin, Inorganics Supervisor  
Dragana Tomas, Senior Chemist  
Giovanni Agosti, Group Technical Manager  
Greta Petzold, Operation Manager  
Loren Bardwell, Development Chemist  
Timothy Toll, Senior Chemist

#### **Authorised By**

Nancy Zhang, Laboratory Manager

Client Reference: E366288R Horsley Park

vTRH(C6-C10)/BTEXN in Water						
Our Reference		347659-1	347659-2	347659-3	347659-4	347659-5
Your Reference	UNITS	MW1	MW2	MW15	S3-06	S3-07
Date Sampled		27/03/2024	27/03/2024	27/03/2024	27/03/2024	27/03/2024
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	01/04/2024	01/04/2024	01/04/2024	01/04/2024	01/04/2024
Date analysed	-	02/04/2024	02/04/2024	02/04/2024	02/04/2024	02/04/2024
TRH C <sub>6</sub> - C <sub>9</sub>	µg/L	<10	<10	<10	<10	<10
TRH C <sub>6</sub> - C <sub>10</sub>	µg/L	<10	<10	<10	<10	<10
TRH C <sub>6</sub> - C <sub>10</sub> less BTEX (F1)	µg/L	<10	<10	<10	<10	<10
Benzene	µg/L	<1	<1	<1	<1	<1
Toluene	µg/L	<1	<1	<1	<1	<1
Ethylbenzene	µg/L	<1	<1	<1	<1	<1
m+p-xylene	µg/L	<2	<2	<2	<2	<2
o-xylene	µg/L	<1	<1	<1	<1	<1
Naphthalene	µg/L	<1	<1	<1	<1	<1
Surrogate Dibromofluoromethane	%	103	103	106	105	104
Surrogate Toluene-d8	%	100	99	101	101	101
Surrogate 4-Bromofluorobenzene	%	104	105	105	105	103

vTRH(C6-C10)/BTEXN in Water						
Our Reference		347659-6	347659-7	347659-8	347659-9	347659-10
Your Reference	UNITS	S3-08	Dam1	GWDUP1	GWDUP2	TB-W1
Date Sampled		27/03/2024	27/03/2024	27/03/2024	27/03/2024	27/03/2024
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	30/03/2024	30/03/2024	30/03/2024	30/03/2024	30/03/2024
Date analysed	-	02/04/2024	02/04/2024	02/04/2024	02/04/2024	02/04/2024
TRH C <sub>6</sub> - C <sub>9</sub>	µg/L	<10	<10	<10	<10	<10
TRH C <sub>6</sub> - C <sub>10</sub>	µg/L	<10	<10	<10	<10	<10
TRH C <sub>6</sub> - C <sub>10</sub> less BTEX (F1)	µg/L	<10	<10	<10	<10	<10
Benzene	µg/L	<1	<1	<1	<1	<1
Toluene	µg/L	<1	<1	<1	<1	<1
Ethylbenzene	µg/L	<1	<1	<1	<1	<1
m+p-xylene	µg/L	<2	<2	<2	<2	<2
o-xylene	µg/L	<1	<1	<1	<1	<1
Naphthalene	µg/L	<1	<1	<1	<1	<1
Surrogate Dibromofluoromethane	%	100	102	102	102	96
Surrogate Toluene-d8	%	98	97	100	97	96
Surrogate 4-Bromofluorobenzene	%	106	99	100	100	97

vTRH(C6-C10)/BTEXN in Water		
Our Reference		347659-11
Your Reference	UNITS	TS-W1
Date Sampled		27/03/2024
Type of sample		Water
Date extracted	-	30/03/2024
Date analysed	-	02/04/2024
Benzene	µg/L	106%
Toluene	µg/L	111%
Ethylbenzene	µg/L	118%
m+p-xylene	µg/L	115%
o-xylene	µg/L	115%
Surrogate Dibromofluoromethane	%	101
Surrogate Toluene-d8	%	102
Surrogate 4-Bromofluorobenzene	%	102

svTRH (C10-C40) in Water						
Our Reference		347659-1	347659-2	347659-3	347659-4	347659-5
Your Reference	UNITS	MW1	MW2	MW15	S3-06	S3-07
Date Sampled		27/03/2024	27/03/2024	27/03/2024	27/03/2024	27/03/2024
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	02/04/2024	02/04/2024	02/04/2024	02/04/2024	02/04/2024
Date analysed	-	02/04/2024	02/04/2024	02/04/2024	02/04/2024	02/04/2024
TRH C <sub>10</sub> - C <sub>14</sub>	µg/L	<50	<50	<50	<50	<50
TRH C <sub>15</sub> - C <sub>28</sub>	µg/L	<100	<100	<100	<100	<100
TRH C <sub>29</sub> - C <sub>36</sub>	µg/L	<100	<100	<100	<100	<100
Total +ve TRH (C10-C36)	µg/L	<50	<50	<50	<50	<50
TRH >C <sub>10</sub> - C <sub>16</sub>	µg/L	<50	<50	<50	<50	<50
TRH >C <sub>10</sub> - C <sub>16</sub> less Naphthalene (F2)	µg/L	<50	<50	<50	<50	<50
TRH >C <sub>16</sub> - C <sub>34</sub>	µg/L	<100	<100	<100	<100	<100
TRH >C <sub>34</sub> - C <sub>40</sub>	µg/L	<100	<100	<100	<100	<100
Total +ve TRH (>C10-C40)	µg/L	<50	<50	<50	<50	<50
Surrogate o-Terphenyl	%	78	79	71	84	87

svTRH (C10-C40) in Water						
Our Reference		347659-6	347659-7	347659-8	347659-9	347659-10
Your Reference	UNITS	S3-08	Dam1	GWDUP1	GWDUP2	TB-W1
Date Sampled		27/03/2024	27/03/2024	27/03/2024	27/03/2024	27/03/2024
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	02/04/2024	02/04/2024	02/04/2024	02/04/2024	02/04/2024
Date analysed	-	02/04/2024	03/04/2024	03/04/2024	03/04/2024	03/04/2024
TRH C <sub>10</sub> - C <sub>14</sub>	µg/L	<50	<50	<50	<50	<50
TRH C <sub>15</sub> - C <sub>28</sub>	µg/L	<100	<100	<100	<100	<100
TRH C <sub>29</sub> - C <sub>36</sub>	µg/L	<100	<100	<100	<100	<100
Total +ve TRH (C10-C36)	µg/L	<50	<50	<50	<50	<50
TRH >C <sub>10</sub> - C <sub>16</sub>	µg/L	<50	<50	<50	<50	54
TRH >C <sub>10</sub> - C <sub>16</sub> less Naphthalene (F2)	µg/L	<50	<50	<50	<50	54
TRH >C <sub>16</sub> - C <sub>34</sub>	µg/L	<100	<100	<100	<100	<100
TRH >C <sub>34</sub> - C <sub>40</sub>	µg/L	<100	<100	<100	<100	<100
Total +ve TRH (>C10-C40)	µg/L	<50	<50	<50	<50	50
Surrogate o-Terphenyl	%	86	79	84	88	88

PAHs in Water						
Our Reference		347659-1	347659-2	347659-3	347659-4	347659-5
Your Reference	UNITS	MW1	MW2	MW15	S3-06	S3-07
Date Sampled		27/03/2024	27/03/2024	27/03/2024	27/03/2024	27/03/2024
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	02/04/2024	02/04/2024	02/04/2024	02/04/2024	02/04/2024
Date analysed	-	03/04/2024	03/04/2024	03/04/2024	03/04/2024	03/04/2024
Naphthalene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Anthracene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Pyrene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)anthracene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Chrysene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(b,j+k)fluoranthene	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Benzo(a)pyrene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Indeno(1,2,3-c,d)pyrene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)pyrene TEQ	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Total +ve PAH's	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate p-Terphenyl-d14	%	85	80	74	91	89

PAHs in Water						
Our Reference		347659-6	347659-7	347659-8	347659-9	347659-10
Your Reference	UNITS	S3-08	Dam1	GWDUP1	GWDUP2	TB-W1
Date Sampled		27/03/2024	27/03/2024	27/03/2024	27/03/2024	27/03/2024
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	02/04/2024	02/04/2024	02/04/2024	02/04/2024	02/04/2024
Date analysed	-	03/04/2024	03/04/2024	03/04/2024	03/04/2024	03/04/2024
Naphthalene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Anthracene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Pyrene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)anthracene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Chrysene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(b,j+k)fluoranthene	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Benzo(a)pyrene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Indeno(1,2,3-c,d)pyrene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)pyrene TEQ	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Total +ve PAH's	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate <i>p</i> -Terphenyl-d14	%	90	85	87	90	87

Miscellaneous Inorganics						
Our Reference		347659-1	347659-2	347659-3	347659-4	347659-5
Your Reference	UNITS	MW1	MW2	MW15	S3-06	S3-07
Date Sampled		27/03/2024	27/03/2024	27/03/2024	27/03/2024	27/03/2024
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	28/03/2024	28/03/2024	28/03/2024	28/03/2024	28/03/2024
Date analysed	-	28/03/2024	28/03/2024	28/03/2024	28/03/2024	28/03/2024
pH	pH Units	6.7	7.2	7.5	7.3	7.4
Electrical Conductivity	µS/cm	14,000	8,200	8,100	15,000	6,600
Total Suspended Solids	mg/L	1,800	190	1,400	<5	8
Total Dissolved Solids (grav)	mg/L	9,100	5,000	5,000	9,000	3,900
Turbidity	NTU	NT	120	710	0.8	6.3
Sodium Adsorption Ratio	-	26	27	38	38	21
Total Organic Carbon	mg/L	3	2	3	1	3
Phosphate as P in water	mg/L	<0.005	<0.005	<0.005	<0.005	0.007
Dissolved Oxygen*	mg/L	7.9	8.3	8.1	7.9	7.7
Redox Potential*	mV	234	197	186	197	195
Ammonia as N in water	mg/L	0.098	0.027	2.7	3.1	0.32
Nitrate as N in water	mg/L	0.51	<0.005	<0.005	0.007	<0.005
Nitrite as N in water	mg/L	0.006	<0.005	<0.005	0.29	<0.005
NOx as N in water	mg/L	0.51	<0.005	0.006	0.3	<0.005
Total Nitrogen in water	mg/L	0.6	<0.1	3.2	3.6	0.4
TKN in water	mg/L	0.1	<0.1	3.2	3.3	0.4
Organic Nitrogen as N	mg/L	<0.2	<0.2	0.5	<0.2	<0.2
Silica (Reactive - SiO <sub>2</sub> )	mg/L	14	11	13	10	8.8

Miscellaneous Inorganics			
Our Reference		347659-6	347659-7
Your Reference	UNITS	S3-08	Dam1
Date Sampled		27/03/2024	27/03/2024
Type of sample		Water	Water
Date prepared	-	28/03/2024	28/03/2024
Date analysed	-	28/03/2024	28/03/2024
pH	pH Units	6.9	7.7
Electrical Conductivity	µS/cm	17,000	270
Total Suspended Solids	mg/L	27	310
Total Dissolved Solids (grav)	mg/L	12,000	380
Turbidity	NTU	11	710
Sodium Adsorption Ratio	-	25	2.2
Total Organic Carbon	mg/L	2	2
Phosphate as P in water	mg/L	0.03	<0.005
Dissolved Oxygen*	mg/L	6.6	7.3
Redox Potential*	mV	236	196
Ammonia as N in water	mg/L	0.13	0.017
Nitrate as N in water	mg/L	0.17	0.71
Nitrite as N in water	mg/L	<0.005	<0.005
NOx as N in water	mg/L	0.2	0.71
Total Nitrogen in water	mg/L	0.3	1.0
TKN in water	mg/L	0.1	0.3
Organic Nitrogen as N	mg/L	<0.2	0.3
Silica (Reactive - SiO <sub>2</sub> )	mg/L	10	2.8

All metals in water - total			
Our Reference		347659-7	347659-10
Your Reference	UNITS	Dam1	TB-W1
Date Sampled		27/03/2024	27/03/2024
Type of sample		Water	Water
Date prepared	-	02/04/2024	02/04/2024
Date analysed	-	02/04/2024	02/04/2024
Silver-Total	µg/L	<1	[NA]
Aluminium-Total	µg/L	8,400	[NA]
Arsenic-Total	µg/L	5	<1
Boron-Total	µg/L	<20	[NA]
Barium-Total	µg/L	160	[NA]
Beryllium-Total	µg/L	1	[NA]
Cadmium-Total	µg/L	0.4	<0.1
Cobalt-Total	µg/L	22	[NA]
Chromium-Total	µg/L	10	<1
Copper-Total	µg/L	34	<1
Iron-Total	µg/L	10,000	[NA]
Mercury-Total	µg/L	<0.05	<0.05
Manganese-Total	µg/L	260	[NA]
Molybdenum-Total	µg/L	2	[NA]
Nickel-Total	µg/L	28	<1
Lead-Total	µg/L	17	<1
Antimony-Total	µg/L	<1	[NA]
Selenium-Total	µg/L	3	[NA]
Uranium-Total	µg/L	0.8	[NA]
Vanadium-Total	µg/L	20	[NA]
Zinc-Total	µg/L	110	<1
Lithium-Total	µg/L	6	[NA]
Strontium-Total	µg/L	89	[NA]

All metals in water-dissolved						
Our Reference		347659-1	347659-2	347659-3	347659-4	347659-5
Your Reference	UNITS	MW1	MW2	MW15	S3-06	S3-07
Date Sampled		27/03/2024	27/03/2024	27/03/2024	27/03/2024	27/03/2024
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	02/04/2024	02/04/2024	02/04/2024	02/04/2024	02/04/2024
Date analysed	-	02/04/2024	02/04/2024	02/04/2024	02/04/2024	02/04/2024
Silver-Dissolved	µg/L	<1	<1	<1	<1	<1
Aluminium-Dissolved	µg/L	<10	<10	80	<10	<10
Arsenic-Dissolved	µg/L	<1	<1	3	1	<1
Boron-Dissolved	µg/L	50	<20	30	<20	70
Barium-Dissolved	µg/L	140	41	100	18,000	84
Beryllium-Dissolved	µg/L	<0.5	<0.5	<0.5	<0.5	1
Cadmium-Dissolved	µg/L	0.4	<0.1	<0.1	<0.1	<0.1
Cobalt-Dissolved	µg/L	5	2	<1	2	1
Chromium-Dissolved	µg/L	<1	<1	<1	<1	<1
Copper-Dissolved	µg/L	7	3	3	5	76
Iron-Dissolved	µg/L	<10	<10	20	40	<10
Mercury-Dissolved	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Manganese-Dissolved	µg/L	1,000	490	83	680	510
Molybdenum-Dissolved	µg/L	2	<1	3	3	2
Nickel-Dissolved	µg/L	19	2	2	3	2
Lead-Dissolved	µg/L	<1	<1	<1	<1	<1
Antimony-Dissolved	µg/L	<1	<1	<1	<1	<1
Selenium-Dissolved	µg/L	<1	<1	<1	<1	<1
Uranium-Dissolved	µg/L	7.8	3.9	0.8	<0.5	1.2
Vanadium-Dissolved	µg/L	1	<1	1	<1	<1
Zinc-Dissolved	µg/L	61	8	14	20	32
Lithium-Dissolved	µg/L	140	66	99	180	72
Strontium-Dissolved	µg/L	8,900	1,900	4,700	13,000	3,900

All metals in water-dissolved				
Our Reference		347659-6	347659-8	347659-9
Your Reference	UNITS	S3-08	GWDUP1	GWDUP2
Date Sampled		27/03/2024	27/03/2024	27/03/2024
Type of sample		Water	Water	Water
Date prepared	-	02/04/2024	02/04/2024	02/04/2024
Date analysed	-	02/04/2024	02/04/2024	02/04/2024
Silver-Dissolved	µg/L	<1	[NA]	[NA]
Aluminium-Dissolved	µg/L	<10	[NA]	[NA]
Arsenic-Dissolved	µg/L	4	<1	4
Boron-Dissolved	µg/L	<20	[NA]	[NA]
Barium-Dissolved	µg/L	46	[NA]	[NA]
Beryllium-Dissolved	µg/L	<0.5	[NA]	[NA]
Cadmium-Dissolved	µg/L	<0.1	<0.1	<0.1
Cobalt-Dissolved	µg/L	6	[NA]	[NA]
Chromium-Dissolved	µg/L	<1	<1	<1
Copper-Dissolved	µg/L	48	79	46
Iron-Dissolved	µg/L	20	[NA]	[NA]
Mercury-Dissolved	µg/L	<0.05	<0.05	<0.05
Manganese-Dissolved	µg/L	650	[NA]	[NA]
Molybdenum-Dissolved	µg/L	1	[NA]	[NA]
Nickel-Dissolved	µg/L	11	2	10
Lead-Dissolved	µg/L	<1	<1	<1
Antimony-Dissolved	µg/L	<1	[NA]	[NA]
Selenium-Dissolved	µg/L	<1	[NA]	[NA]
Uranium-Dissolved	µg/L	2.3	[NA]	[NA]
Vanadium-Dissolved	µg/L	1	[NA]	[NA]
Zinc-Dissolved	µg/L	24	32	21
Lithium-Dissolved	µg/L	82	[NA]	[NA]
Strontium-Dissolved	µg/L	5,300	[NA]	[NA]

Ion Balance						
Our Reference		347659-1	347659-2	347659-3	347659-4	347659-5
Your Reference	UNITS	MW1	MW2	MW15	S3-06	S3-07
Date Sampled		27/03/2024	27/03/2024	27/03/2024	27/03/2024	27/03/2024
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	28/03/2024	28/03/2024	28/03/2024	28/03/2024	28/03/2024
Date analysed	-	28/03/2024	28/03/2024	28/03/2024	28/03/2024	28/03/2024
Calcium - Dissolved	mg/L	140	43	47	150	52
Potassium - Dissolved	mg/L	31	13	26	34	18
Sodium - Dissolved	mg/L	2,500	1,600	1,700	3,000	1,200
Magnesium - Dissolved	mg/L	360	140	60	190	110
Hardness	mgCaCO <sub>3</sub> /L	1,800	700	360	1,200	570
Hydroxide Alkalinity (OH <sup>-</sup> ) as CaCO <sub>3</sub>	mg/L	<5	<5	<5	<5	<5
Bicarbonate Alkalinity as CaCO <sub>3</sub>	mg/L	930	1,000	35	450	760
Carbonate Alkalinity as CaCO <sub>3</sub>	mg/L	150	260	<5	37	150
Total Alkalinity as CaCO <sub>3</sub>	mg/L	1,100	1,300	35	480	910
Sulphate, SO <sub>4</sub>	mg/L	470	590	210	2	130
Chloride, Cl	mg/L	3,700	1,700	1,900	4,700	1,500
Ionic Balance	%	4.0	-1.0	15	4.0	0

Ion Balance			
Our Reference		347659-6	347659-7
Your Reference	UNITS	S3-08	Dam1
Date Sampled		27/03/2024	27/03/2024
Type of sample		Water	Water
Date prepared	-	28/03/2024	28/03/2024
Date analysed	-	28/03/2024	28/03/2024
Calcium - Dissolved	mg/L	210	7.8
Potassium - Dissolved	mg/L	25	2
Sodium - Dissolved	mg/L	3,000	33
Magnesium - Dissolved	mg/L	520	5
Hardness	mgCaCO <sub>3</sub> /L	2,700	39
Hydroxide Alkalinity (OH <sup>-</sup> ) as CaCO <sub>3</sub>	mg/L	<5	<5
Bicarbonate Alkalinity as CaCO <sub>3</sub>	mg/L	520	33
Carbonate Alkalinity as CaCO <sub>3</sub>	mg/L	21	<5
Total Alkalinity as CaCO <sub>3</sub>	mg/L	540	33
Sulphate, SO <sub>4</sub>	mg/L	500	47
Chloride, Cl	mg/L	5,100	28
Ionic Balance	%	5.0	-3.0

Client Reference: E366288R Horsley Park

Metals in Waters - Total						
Our Reference		347659-1	347659-2	347659-3	347659-4	347659-5
Your Reference	UNITS	MW1	MW2	MW15	S3-06	S3-07
Date Sampled		27/03/2024	27/03/2024	27/03/2024	27/03/2024	27/03/2024
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	02/04/2024	02/04/2024	02/04/2024	02/04/2024	02/04/2024
Date analysed	-	02/04/2024	02/04/2024	02/04/2024	02/04/2024	02/04/2024
Phosphorus - Total	mg/L	0.2	<0.05	0.2	<0.05	<0.05

Metals in Waters - Total			
Our Reference		347659-6	347659-7
Your Reference	UNITS	S3-08	Dam1
Date Sampled		27/03/2024	27/03/2024
Type of sample		Water	Water
Date prepared	-	02/04/2024	02/04/2024
Date analysed	-	02/04/2024	02/04/2024
Phosphorus - Total	mg/L	<0.05	0.2

Microbiological Testing						
Our Reference		347659-1	347659-2	347659-3	347659-4	347659-5
Your Reference	UNITS	MW1	MW2	MW15	S3-06	S3-07
Date Sampled		27/03/2024	27/03/2024	27/03/2024	27/03/2024	27/03/2024
Type of sample		Water	Water	Water	Water	Water
Date of testing	-	29/03/2024	29/03/2024	29/03/2024	29/03/2024	29/03/2024
E. coli	cfu/100mL	**	<1000 NBO	20 mpn/100mL	<10	<1000
Faecal Coliforms	cfu/100mL	**	<1000 NBO	20 mpn/100mL	<10	<1000

Microbiological Testing			
Our Reference		347659-6	347659-7
Your Reference	UNITS	S3-08	Dam1
Date Sampled		27/03/2024	27/03/2024
Type of sample		Water	Water
Date of testing	-	29/03/2024	29/03/2024
E. coli	cfu/100mL	<10	2,400 mpn/100mL
Faecal Coliforms	cfu/100mL	<10	2,400 mpn/100mL

Method ID	Methodology Summary
<b>Ext-008</b>	Subcontracted to Sonic Food & Water Testing. NATA Accreditation No. 4034.
<b>Inorg-001</b>	pH - Measured using pH meter and electrode. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times.
<b>Inorg-002</b>	Conductivity and Salinity - measured using a conductivity cell.
<b>Inorg-006</b>	Alkalinity - determined titrimetrically in accordance with APHA latest edition, 2320-B.
<b>Inorg-018</b>	Total Dissolved Solids - determined gravimetrically. The solids are dried at 180+/-10°C.  NOTE: Where the EC of the sample is <100µS/cm, the TDS will typically be below 70mg/L (as the sample is very likely to be at least drinking water quality). Therefore to ensure data quality for TDS, the TDS is typically calculated as per the equation below:-  TDS = EC * 0.6
<b>Inorg-019</b>	Suspended Solids - determined gravimetrically by filtration of the sample. The samples are dried at 104+/-5°C.
<b>Inorg-022</b>	Turbidity - measured nephelometrically using a turbidimeter, in accordance with APHA latest edition, 2130-B.
<b>Inorg-035</b>	Analysed using an electrode. Please note that the results for water analyses are indicative only, samples are ideally analysed on collection.
<b>Inorg-040</b>	The concentrations of the major ions (mg/L) are converted to milliequivalents and summed. The ionic balance should be within +/- 15% ie total anions = total cations +/-15%.
<b>Inorg-055</b>	Nitrate - determined colourimetrically. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a water extraction.
<b>Inorg-055</b>	Nitrite - determined colourimetrically based on APHA latest edition NO2- B. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a water extraction.
<b>Inorg-055/062/127</b>	Total Nitrogen - Calculation sum of TKN and oxidised Nitrogen. Alternatively analysed by combustion and chemiluminescence.
<b>Inorg-057</b>	Ammonia - determined colourimetrically, based on APHA latest edition 4500-NH3 F. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a KCl extraction.
<b>Inorg-060</b>	Phosphate determined colourimetrically based on EPA365.1 and APHA latest edition 4500 P E. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a water extraction.
<b>Inorg-062</b>	TKN - determined colourimetrically based on APHA latest edition 4500 Norg. Alternatively, TKN can be derived from calculation (Total N - NOx).
<b>Inorg-079</b>	TOC determined using a TOC analyser using the combustion method. Dissolved requires filtering prior to determination. Analysis using APHA latest edition 5310B.
<b>Inorg-081</b>	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.
<b>Inorg-112</b>	Dissolved Oxygen using membrane electrode. Note this analysis should ideally be carried out immediately after sampling.
<b>INORG-120</b>	Reactive Silica (SiO2) determined colorimetrically. Waters samples are filtered on receipt prior to analysis.
<b>Metals-020</b>	Determination of various metals by ICP-AES.

Method ID	Methodology Summary
<b>Metals-020</b>	Calcium and Magnesium analysed by ICP-AES and SAR calculated.
<b>Metals-021</b>	Determination of Mercury by Cold Vapour AAS.
<b>Metals-022</b>	Determination of various metals by ICP-MS.  Please note for Bromine and Iodine, any forms of these elements that are present are included together in the one result reported for each of these two elements.  Salt forms (e.g. FeO, PbO, ZnO) are determined stoichiometrically from the base metal concentration.
<b>Org-020</b>	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.
<b>Org-022/025</b>	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.
<b>Org-023</b>	Water samples are analysed directly by purge and trap GC-MS.
<b>Org-023</b>	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.

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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	-			01/04/2024	1	01/04/2024	04/04/2024		01/04/2024	[NT]
Date analysed	-			02/04/2024	1	02/04/2024	05/04/2024		02/04/2024	[NT]
TRH C <sub>6</sub> - C <sub>9</sub>	µg/L	10	Org-023	<10	1	<10	<10	0	106	[NT]
TRH C <sub>6</sub> - C <sub>10</sub>	µg/L	10	Org-023	<10	1	<10	<10	0	106	[NT]
Benzene	µg/L	1	Org-023	<1	1	<1	<1	0	102	[NT]
Toluene	µg/L	1	Org-023	<1	1	<1	<1	0	106	[NT]
Ethylbenzene	µg/L	1	Org-023	<1	1	<1	<1	0	107	[NT]
m+p-xylene	µg/L	2	Org-023	<2	1	<2	<2	0	107	[NT]
o-xylene	µg/L	1	Org-023	<1	1	<1	<1	0	108	[NT]
Naphthalene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Surrogate Dibromofluoromethane	%		Org-023	104	1	103	104	1	99	[NT]
Surrogate Toluene-d8	%		Org-023	100	1	100	100	0	99	[NT]
Surrogate 4-Bromofluorobenzene	%		Org-023	103	1	104	99	5	103	[NT]

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Water				Duplicate				Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	10	30/03/2024	04/04/2024		[NT]	[NT]
Date analysed	-			[NT]	10	02/04/2024	05/04/2024		[NT]	[NT]
TRH C <sub>6</sub> - C <sub>9</sub>	µg/L	10	Org-023	[NT]	10	<10	<10	0	[NT]	[NT]
TRH C <sub>6</sub> - C <sub>10</sub>	µg/L	10	Org-023	[NT]	10	<10	<10	0	[NT]	[NT]
Benzene	µg/L	1	Org-023	[NT]	10	<1	<1	0	[NT]	[NT]
Toluene	µg/L	1	Org-023	[NT]	10	<1	<1	0	[NT]	[NT]
Ethylbenzene	µg/L	1	Org-023	[NT]	10	<1	<1	0	[NT]	[NT]
m+p-xylene	µg/L	2	Org-023	[NT]	10	<2	<2	0	[NT]	[NT]
o-xylene	µg/L	1	Org-023	[NT]	10	<1	<1	0	[NT]	[NT]
Naphthalene	µg/L	1	Org-023	[NT]	10	<1	<1	0	[NT]	[NT]
Surrogate Dibromofluoromethane	%		Org-023	[NT]	10	96	105	9	[NT]	[NT]
Surrogate Toluene-d8	%		Org-023	[NT]	10	96	102	6	[NT]	[NT]
Surrogate 4-Bromofluorobenzene	%		Org-023	[NT]	10	97	101	4	[NT]	[NT]

Client Reference: E366288R Horsley Park

QUALITY CONTROL: svTRH (C10-C40) in Water					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	347659-2
Date extracted	-			02/04/2024	1	02/04/2024	02/04/2024		02/04/2024	02/04/2024
Date analysed	-			02/04/2024	1	02/04/2024	02/04/2024		02/04/2024	02/04/2024
TRH C <sub>10</sub> - C <sub>14</sub>	µg/L	50	Org-020	<50	1	<50	<50	0	100	131
TRH C <sub>15</sub> - C <sub>28</sub>	µg/L	100	Org-020	<100	1	<100	<100	0	106	136
TRH C <sub>29</sub> - C <sub>36</sub>	µg/L	100	Org-020	<100	1	<100	<100	0	100	111
TRH >C <sub>10</sub> - C <sub>16</sub>	µg/L	50	Org-020	<50	1	<50	<50	0	100	131
TRH >C <sub>16</sub> - C <sub>34</sub>	µg/L	100	Org-020	<100	1	<100	<100	0	106	136
TRH >C <sub>34</sub> - C <sub>40</sub>	µg/L	100	Org-020	<100	1	<100	<100	0	100	111
Surrogate o-Terphenyl	%		Org-020	70	1	78	85	9	129	79

Client Reference: E366288R Horsley Park

QUALITY CONTROL: PAHs in Water						Duplicate		Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	[NT]
Date extracted	-			02/04/2024	1	02/04/2024	02/04/2024		02/04/2024	[NT]
Date analysed	-			03/04/2024	1	03/04/2024	03/04/2024		03/04/2024	[NT]
Naphthalene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	88	[NT]
Acenaphthylene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Acenaphthene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	86	[NT]
Fluorene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	84	[NT]
Phenanthrene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	92	[NT]
Anthracene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Fluoranthene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	89	[NT]
Pyrene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	88	[NT]
Benzo(a)anthracene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Chrysene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	76	[NT]
Benzo(b,j+k)fluoranthene	µg/L	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Benzo(a)pyrene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	77	[NT]
Indeno(1,2,3-c,d)pyrene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Dibenzo(a,h)anthracene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Benzo(g,h,i)perylene	µg/L	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	82	1	85	90	6	95	[NT]

Client Reference: E366288R Horsley Park

QUALITY CONTROL: Miscellaneous Inorganics				Duplicate				Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	347659-2
Date prepared	-			28/03/2024	1	28/03/2024	28/03/2024		28/03/2024	28/03/2024
Date analysed	-			28/03/2024	1	28/03/2024	28/03/2024		28/03/2024	28/03/2024
pH	pH Units		Inorg-001	[NT]	1	6.7	[NT]		101	[NT]
Electrical Conductivity	µS/cm	1	Inorg-002	<1	1	14000	[NT]		101	[NT]
Total Suspended Solids	mg/L	5	Inorg-019	<5	1	1800	[NT]		100	[NT]
Total Dissolved Solids (grav)	mg/L	5	Inorg-018	<5	1	9100	9200	1	103	[NT]
Turbidity	NTU	0.1	Inorg-022	<0.1	1	NT	[NT]		98	[NT]
Sodium Adsorption Ratio	-	0.01	Metals-020	<0.01	1	26	27	4	100	[NT]
Total Organic Carbon	mg/L	1	Inorg-079	<1	1	3	[NT]		103	[NT]
Phosphate as P in water	mg/L	0.005	Inorg-060	<0.005	1	<0.005	[NT]		113	[NT]
Dissolved Oxygen*	mg/L	0.1	Inorg-112	<0.1	1	7.9	7.8	1	[NT]	[NT]
Redox Potential*	mV		Inorg-035	[NT]	1	234	221	6	81	[NT]
Ammonia as N in water	mg/L	0.005	Inorg-057	<0.005	1	0.098	[NT]		103	[NT]
Nitrate as N in water	mg/L	0.005	Inorg-055	<0.005	1	0.51	[NT]		101	[NT]
Nitrite as N in water	mg/L	0.005	Inorg-055	<0.005	1	0.006	[NT]		99	[NT]
NOx as N in water	mg/L	0.005	Inorg-055	<0.005	1	0.51	[NT]		101	[NT]
Total Nitrogen in water	mg/L	0.1	Inorg-055/062/127	<0.1	1	0.6	[NT]		104	80
TKN in water	mg/L	0.1	Inorg-062	<0.1	1	0.1	[NT]		[NT]	[NT]
Organic Nitrogen as N	mg/L	0.2	Inorg-055/062/127	<0.2	1	<0.2	[NT]		[NT]	[NT]
Silica (Reactive - SiO <sub>2</sub> )	mg/L	0.1	INORG-120	<0.1	1	14	14	0	88	90

Client Reference: E366288R Horsley Park

QUALITY CONTROL: Miscellaneous Inorganics				Duplicate				Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	347659-3
Date prepared	-			[NT]	2	28/03/2024	28/03/2024		[NT]	28/03/2024
Date analysed	-			[NT]	2	28/03/2024	28/03/2024		[NT]	28/03/2024
pH	pH Units		Inorg-001	[NT]	2	7.2	[NT]		[NT]	[NT]
Electrical Conductivity	µS/cm	1	Inorg-002	[NT]	2	8200	[NT]		[NT]	[NT]
Total Suspended Solids	mg/L	5	Inorg-019	[NT]	2	190	[NT]		[NT]	[NT]
Total Dissolved Solids (grav)	mg/L	5	Inorg-018	[NT]	2	5000	[NT]		[NT]	[NT]
Turbidity	NTU	0.1	Inorg-022	[NT]	2	120	120	0	[NT]	[NT]
Sodium Adsorption Ratio	-	0.01	Metals-020	[NT]	2	27	[NT]		[NT]	[NT]
Total Organic Carbon	mg/L	1	Inorg-079	[NT]	2	2	[NT]		[NT]	100
Phosphate as P in water	mg/L	0.005	Inorg-060	[NT]	2	<0.005	<0.005	0	[NT]	[NT]
Dissolved Oxygen*	mg/L	0.1	Inorg-112	[NT]	2	8.3	[NT]		[NT]	[NT]
Redox Potential*	mV		Inorg-035	[NT]	2	197	[NT]		[NT]	[NT]
Ammonia as N in water	mg/L	0.005	Inorg-057	[NT]	2	0.027	0.032	17	[NT]	[NT]
Nitrate as N in water	mg/L	0.005	Inorg-055	[NT]	2	<0.005	<0.005	0	[NT]	[NT]
Nitrite as N in water	mg/L	0.005	Inorg-055	[NT]	2	<0.005	<0.005	0	[NT]	[NT]
NOx as N in water	mg/L	0.005	Inorg-055	[NT]	2	<0.005	0.006	18	[NT]	[NT]
Total Nitrogen in water	mg/L	0.1	Inorg-055/062/127	[NT]	2	<0.1	[NT]		[NT]	[NT]
TKN in water	mg/L	0.1	Inorg-062	[NT]	2	<0.1	[NT]		[NT]	[NT]
Organic Nitrogen as N	mg/L	0.2	Inorg-055/062/127	[NT]	2	<0.2	[NT]		[NT]	[NT]
Silica (Reactive - SiO <sub>2</sub> )	mg/L	0.1	INORG-120	[NT]	2	11	[NT]		[NT]	[NT]

Client Reference: E366288R Horsley Park

QUALITY CONTROL: Miscellaneous Inorganics				Duplicate				Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	7	28/03/2024	28/03/2024		[NT]	[NT]
Date analysed	-			[NT]	7	28/03/2024	28/03/2024		[NT]	[NT]
pH	pH Units		Inorg-001	[NT]	7	7.7	[NT]		[NT]	[NT]
Electrical Conductivity	µS/cm	1	Inorg-002	[NT]	7	270	[NT]		[NT]	[NT]
Total Suspended Solids	mg/L	5	Inorg-019	[NT]	7	310	330	6	[NT]	[NT]
Total Dissolved Solids (grav)	mg/L	5	Inorg-018	[NT]	7	380	[NT]		[NT]	[NT]
Turbidity	NTU	0.1	Inorg-022	[NT]	7	710	[NT]		[NT]	[NT]
Sodium Adsorption Ratio	-	0.01	Metals-020	[NT]	7	2.2	[NT]		[NT]	[NT]
Total Organic Carbon	mg/L	1	Inorg-079	[NT]	7	2	[NT]		[NT]	[NT]
Phosphate as P in water	mg/L	0.005	Inorg-060	[NT]	7	<0.005	[NT]		[NT]	[NT]
Dissolved Oxygen*	mg/L	0.1	Inorg-112	[NT]	7	7.3	[NT]		[NT]	[NT]
Redox Potential*	mV		Inorg-035	[NT]	7	196	[NT]		[NT]	[NT]
Ammonia as N in water	mg/L	0.005	Inorg-057	[NT]	7	0.017	[NT]		[NT]	[NT]
Nitrate as N in water	mg/L	0.005	Inorg-055	[NT]	7	0.71	[NT]		[NT]	[NT]
Nitrite as N in water	mg/L	0.005	Inorg-055	[NT]	7	<0.005	[NT]		[NT]	[NT]
NOx as N in water	mg/L	0.005	Inorg-055	[NT]	7	0.71	[NT]		[NT]	[NT]
Total Nitrogen in water	mg/L	0.1	Inorg-055/062/127	[NT]	7	1.0	1.0	0	[NT]	[NT]
TKN in water	mg/L	0.1	Inorg-062	[NT]	7	0.3	[NT]		[NT]	[NT]
Organic Nitrogen as N	mg/L	0.2	Inorg-055/062/127	[NT]	7	0.3	[NT]		[NT]	[NT]
Silica (Reactive - SiO <sub>2</sub> )	mg/L	0.1	INORG-120	[NT]	7	2.8	[NT]		[NT]	[NT]

Client Reference: E366288R Horsley Park

QUALITY CONTROL: All metals in water - total				Duplicate				Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date prepared	-			02/04/2024	7	02/04/2024	02/04/2024		02/04/2024	[NT]
Date analysed	-			02/04/2024	7	02/04/2024	02/04/2024		02/04/2024	[NT]
Silver-Total	µg/L	1	Metals-022	<1	7	<1	<1	0	114	[NT]
Aluminium-Total	µg/L	10	Metals-022	<10	7	8400	8100	4	85	[NT]
Arsenic-Total	µg/L	1	Metals-022	<1	7	5	5	0	113	[NT]
Boron-Total	µg/L	20	Metals-022	<20	7	<20	<20	0	109	[NT]
Barium-Total	µg/L	1	Metals-022	<1	7	160	170	6	105	[NT]
Beryllium-Total	µg/L	0.5	Metals-022	<0.5	7	1	1	0	117	[NT]
Cadmium-Total	µg/L	0.1	Metals-022	<0.1	7	0.4	0.4	0	108	[NT]
Cobalt-Total	µg/L	1	Metals-022	<1	7	22	21	5	109	[NT]
Chromium-Total	µg/L	1	Metals-022	<1	7	10	10	0	106	[NT]
Copper-Total	µg/L	1	Metals-022	<1	7	34	34	0	109	[NT]
Iron-Total	µg/L	10	Metals-022	<10	7	10000	10000	0	108	[NT]
Mercury-Total	µg/L	0.05	Metals-021	<0.05	7	<0.05	[NT]		100	[NT]
Manganese-Total	µg/L	5	Metals-022	<5	7	260	250	4	102	[NT]
Molybdenum-Total	µg/L	1	Metals-022	<1	7	2	2	0	104	[NT]
Nickel-Total	µg/L	1	Metals-022	<1	7	28	27	4	107	[NT]
Lead-Total	µg/L	1	Metals-022	<1	7	17	18	6	106	[NT]
Antimony-Total	µg/L	1	Metals-022	<1	7	<1	<1	0	105	[NT]
Selenium-Total	µg/L	1	Metals-022	<1	7	3	3	0	105	[NT]
Uranium-Total	µg/L	0.5	Metals-022	<0.5	7	0.8	0.8	0	106	[NT]
Vanadium-Total	µg/L	1	Metals-022	<1	7	20	20	0	107	[NT]
Zinc-Total	µg/L	1	Metals-022	<1	7	110	110	0	108	[NT]
Lithium-Total	µg/L	1	Metals-022	<1	7	6	7	15	104	[NT]
Strontium-Total	µg/L	1	Metals-022	<1	7	89	87	2	103	[NT]

Client Reference: E366288R Horsley Park

QUALITY CONTROL: All metals in water-dissolved				Duplicate			Spike Recovery %			
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	347659-2
Date prepared	-			02/04/2024	1	02/04/2024	02/04/2024		[NT]	02/04/2024
Date analysed	-			02/04/2024	1	02/04/2024	02/04/2024		[NT]	02/04/2024
Silver-Dissolved	µg/L	1	Metals-022	<1	1	<1	<1	0	[NT]	[NT]
Aluminium-Dissolved	µg/L	10	Metals-022	<10	1	<10	<10	0	[NT]	[NT]
Arsenic-Dissolved	µg/L	1	Metals-022	<1	1	<1	<1	0	[NT]	[NT]
Boron-Dissolved	µg/L	20	Metals-022	<20	1	50	40	22	[NT]	[NT]
Barium-Dissolved	µg/L	1	Metals-022	<1	1	140	140	0	[NT]	[NT]
Beryllium-Dissolved	µg/L	0.5	Metals-022	<0.5	1	<0.5	<0.5	0	[NT]	[NT]
Cadmium-Dissolved	µg/L	0.1	Metals-022	<0.1	1	0.4	0.4	0	[NT]	[NT]
Cobalt-Dissolved	µg/L	1	Metals-022	<1	1	5	6	18	[NT]	[NT]
Chromium-Dissolved	µg/L	1	Metals-022	<1	1	<1	<1	0	[NT]	[NT]
Copper-Dissolved	µg/L	1	Metals-022	<1	1	7	8	13	[NT]	[NT]
Iron-Dissolved	µg/L	10	Metals-022	<10	1	<10	<10	0	[NT]	[NT]
Mercury-Dissolved	µg/L	0.05	Metals-021	<0.05	1	<0.05	<0.05	0	[NT]	88
Manganese-Dissolved	µg/L	5	Metals-022	<5	1	1000	1100	10	[NT]	[NT]
Molybdenum-Dissolved	µg/L	1	Metals-022	<1	1	2	2	0	[NT]	[NT]
Nickel-Dissolved	µg/L	1	Metals-022	<1	1	19	20	5	[NT]	[NT]
Lead-Dissolved	µg/L	1	Metals-022	<1	1	<1	<1	0	[NT]	[NT]
Antimony-Dissolved	µg/L	1	Metals-022	<1	1	<1	<1	0	[NT]	[NT]
Selenium-Dissolved	µg/L	1	Metals-022	<1	1	<1	<1	0	[NT]	[NT]
Uranium-Dissolved	µg/L	0.5	Metals-022	<0.5	1	7.8	7.8	0	[NT]	[NT]
Vanadium-Dissolved	µg/L	1	Metals-022	<1	1	1	1	0	[NT]	[NT]
Zinc-Dissolved	µg/L	1	Metals-022	<1	1	61	63	3	[NT]	[NT]
Lithium-Dissolved	µg/L	1	Metals-022	<1	1	140	140	0	[NT]	[NT]
Strontium-Dissolved	µg/L	1	Metals-022	<1	1	8900	8900	0	[NT]	[NT]

Client Reference: E366288R Horsley Park

QUALITY CONTROL: All metals in water-dissolved				Duplicate				Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	[NT]
Date prepared	-			[NT]	[NT]	[NT]	[NT]	[NT]	02/04/2024	[NT]
Date analysed	-			[NT]	[NT]	[NT]	[NT]	[NT]	02/04/2024	[NT]
Silver-Dissolved	µg/L	1	Metals-022	[NT]	[NT]	[NT]	[NT]	[NT]	102	[NT]
Aluminium-Dissolved	µg/L	10	Metals-022	[NT]	[NT]	[NT]	[NT]	[NT]	101	[NT]
Arsenic-Dissolved	µg/L	1	Metals-022	[NT]	[NT]	[NT]	[NT]	[NT]	102	[NT]
Boron-Dissolved	µg/L	20	Metals-022	[NT]	[NT]	[NT]	[NT]	[NT]	117	[NT]
Barium-Dissolved	µg/L	1	Metals-022	[NT]	[NT]	[NT]	[NT]	[NT]	97	[NT]
Beryllium-Dissolved	µg/L	0.5	Metals-022	[NT]	[NT]	[NT]	[NT]	[NT]	111	[NT]
Cadmium-Dissolved	µg/L	0.1	Metals-022	[NT]	[NT]	[NT]	[NT]	[NT]	100	[NT]
Cobalt-Dissolved	µg/L	1	Metals-022	[NT]	[NT]	[NT]	[NT]	[NT]	102	[NT]
Chromium-Dissolved	µg/L	1	Metals-022	[NT]	[NT]	[NT]	[NT]	[NT]	100	[NT]
Copper-Dissolved	µg/L	1	Metals-022	[NT]	[NT]	[NT]	[NT]	[NT]	109	[NT]
Iron-Dissolved	µg/L	10	Metals-022	[NT]	[NT]	[NT]	[NT]	[NT]	98	[NT]
Mercury-Dissolved	µg/L	0.05	Metals-021	[NT]	[NT]	[NT]	[NT]	[NT]	99	[NT]
Manganese-Dissolved	µg/L	5	Metals-022	[NT]	[NT]	[NT]	[NT]	[NT]	95	[NT]
Molybdenum-Dissolved	µg/L	1	Metals-022	[NT]	[NT]	[NT]	[NT]	[NT]	97	[NT]
Nickel-Dissolved	µg/L	1	Metals-022	[NT]	[NT]	[NT]	[NT]	[NT]	102	[NT]
Lead-Dissolved	µg/L	1	Metals-022	[NT]	[NT]	[NT]	[NT]	[NT]	101	[NT]
Antimony-Dissolved	µg/L	1	Metals-022	[NT]	[NT]	[NT]	[NT]	[NT]	94	[NT]
Selenium-Dissolved	µg/L	1	Metals-022	[NT]	[NT]	[NT]	[NT]	[NT]	97	[NT]
Uranium-Dissolved	µg/L	0.5	Metals-022	[NT]	[NT]	[NT]	[NT]	[NT]	99	[NT]
Vanadium-Dissolved	µg/L	1	Metals-022	[NT]	[NT]	[NT]	[NT]	[NT]	100	[NT]
Zinc-Dissolved	µg/L	1	Metals-022	[NT]	[NT]	[NT]	[NT]	[NT]	101	[NT]
Lithium-Dissolved	µg/L	1	Metals-022	[NT]	[NT]	[NT]	[NT]	[NT]	95	[NT]
Strontium-Dissolved	µg/L	1	Metals-022	[NT]	[NT]	[NT]	[NT]	[NT]	95	[NT]

Client Reference: E366288R Horsley Park

QUALITY CONTROL: Ion Balance				Duplicate				Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	347659-2
Date prepared	-			28/03/2024	1	28/03/2024	28/03/2024		28/03/2024	28/03/2024
Date analysed	-			28/03/2024	1	28/03/2024	28/03/2024		28/03/2024	28/03/2024
Calcium - Dissolved	mg/L	0.5	Metals-020	<0.5	1	140	140	0	98	88
Potassium - Dissolved	mg/L	0.5	Metals-020	<0.5	1	31	31	0	96	97
Sodium - Dissolved	mg/L	0.5	Metals-020	<0.5	1	2500	2600	4	100	#
Magnesium - Dissolved	mg/L	0.5	Metals-020	<0.5	1	360	360	0	101	109
Hardness	mgCaCO <sub>3</sub> /L	3	Metals-020	<3	1	1800	1800	0	[NT]	[NT]
Hydroxide Alkalinity (OH <sup>-</sup> ) as CaCO <sub>3</sub>	mg/L	5	Inorg-006	<5	1	<5	[NT]		[NT]	[NT]
Bicarbonate Alkalinity as CaCO <sub>3</sub>	mg/L	5	Inorg-006	<5	1	930	[NT]		[NT]	[NT]
Carbonate Alkalinity as CaCO <sub>3</sub>	mg/L	5	Inorg-006	<5	1	150	[NT]		[NT]	[NT]
Total Alkalinity as CaCO <sub>3</sub>	mg/L	5	Inorg-006	<5	1	1100	[NT]		[NT]	[NT]
Sulphate, SO <sub>4</sub>	mg/L	1	Inorg-081	<1	1	470	[NT]		[NT]	[NT]
Chloride, Cl	mg/L	1	Inorg-081	<1	1	3700	[NT]		[NT]	[NT]
Ionic Balance	%		Inorg-040	[NT]	1	4.0	[NT]		[NT]	[NT]

QUALITY CONTROL: Ion Balance				Duplicate				Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	[NT]
Date prepared	-			[NT]	[NT]	[NT]	[NT]	[NT]	28/03/2024	[NT]
Date analysed	-			[NT]	[NT]	[NT]	[NT]	[NT]	28/03/2024	[NT]
Calcium - Dissolved	mg/L	0.5	Metals-020	[NT]	[NT]	[NT]	[NT]	[NT]	98	[NT]
Potassium - Dissolved	mg/L	0.5	Metals-020	[NT]	[NT]	[NT]	[NT]	[NT]	96	[NT]
Sodium - Dissolved	mg/L	0.5	Metals-020	[NT]	[NT]	[NT]	[NT]	[NT]	100	[NT]
Magnesium - Dissolved	mg/L	0.5	Metals-020	[NT]	[NT]	[NT]	[NT]	[NT]	101	[NT]
Total Alkalinity as CaCO <sub>3</sub>	mg/L	5	Inorg-006	[NT]	[NT]	[NT]	[NT]	[NT]	105	[NT]
Sulphate, SO <sub>4</sub>	mg/L	1	Inorg-081	[NT]	[NT]	[NT]	[NT]	[NT]	108	[NT]
Chloride, Cl	mg/L	1	Inorg-081	[NT]	[NT]	[NT]	[NT]	[NT]	102	[NT]

**Client Reference: E366288R Horsley Park**

QUALITY CONTROL: Metals in Waters - Total					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date prepared	-			02/04/2024	7	02/04/2024	02/04/2024		02/04/2024	[NT]
Date analysed	-			02/04/2024	7	02/04/2024	02/04/2024		02/04/2024	[NT]
Phosphorus - Total	mg/L	0.05	Metals-020	<0.05	7	0.2	0.2	0	110	[NT]

**Result Definitions**

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

## Quality Control Definitions

<b>Blank</b>	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.
<b>Duplicate</b>	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.
<b>Matrix Spike</b>	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.
<b>LCS (Laboratory Control Sample)</b>	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.
<b>Surrogate Spike</b>	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.

Where matrix spike recoveries fall below the lower limit of the acceptance criteria (e.g. for non-labile or standard Organics <60%), positive result(s) in the parent sample will subsequently have a higher than typical estimated uncertainty (MU estimates supplied on request) and in these circumstances the sample result is likely biased significantly low.

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

TRH Water(C10-C40) NEPM - The positive result in the blank/rinsate sample is due to a single peak with no hydrocarbon profile that is consistent with the use of plastic containers.

Microbiology analysed by Sonic Food & Water Testing. Report No. W2407841

NBO: The presence of competing background organisms in the sample may have reduced the count.

The time between collection and the commencement of testing should not exceed 24 hours. Samples tested outside this time may have their results compromised

\*\* A result cannot be reported as a most probable number has been obtained that is not included in the table, as per the standard.

Ion Balance - # Percent recovery is not applicable due to the high concentration of the element/s in the sample/s. However an acceptable recovery was obtained for the LCS.

## SAMPLE RECEIPT ADVICE

### Client Details

<b>Client</b>	JK Environments
<b>Attention</b>	C Ridley

### Sample Login Details

<b>Your reference</b>	E366288R Horsley Park
<b>Envirolab Reference</b>	347659
<b>Date Sample Received</b>	28/03/2024
<b>Date Instructions Received</b>	28/03/2024
<b>Date Results Expected to be Reported</b>	08/04/2024

### Sample Condition

<b>Samples received in appropriate condition for analysis</b>	Yes
<b>No. of Samples Provided</b>	11 Water
<b>Turnaround Time Requested</b>	Standard
<b>Temperature on Receipt (°C)</b>	11
<b>Cooling Method</b>	Ice Pack
<b>Sampling Date Provided</b>	YES

### Comments

Nil

Please direct any queries to:

#### Aileen Hie

**Phone:** 02 9910 6200  
**Fax:** 02 9910 6201  
**Email:** ahie@envirolab.com.au

#### Jacinta Hurst

**Phone:** 02 9910 6200  
**Fax:** 02 9910 6201  
**Email:** jhurst@envirolab.com.au

*Analysis Underway, details on the following page:*







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## Appendix J: 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. Soil Sampling:

- 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 appropriate sampling containers provided by the lab.
- 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).
- Record the lithology of the sample and sample depth on the borehole/test pit log generally in accordance with AS1726-1993<sup>20</sup>.
- 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. Groundwater Sampling

Groundwater samples are more sensitive than soil samples and therefore adherence 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 be 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.

<sup>20</sup> Standards Australia, (1993), *Geotechnical Site Investigations*. (AS1726-1993)



- 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.



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## **Appendix K: Groundwater Field Records**



## PID FIELD CALIBRATION FORM

Client:		TTW	
Project:		Proposed Development	
Location:		Stage 3B, 16 Johnston Crescent, HORSLEY PARK, NSW	
Job Number:		E36628BR	
<b>PID</b>			
Make: Honeywell	Model: MiniRAE Lite.	Unit: PID 3.	Date of last factory calibration: 13/02/24
Date of calibration: 19/03/24		Name of Calibrator: VR	
Calibration gas: Iso-butylene		Calibration Gas Concentration: 100.0 ppm	
Measured reading: 100.4 ppm		Error in measured reading: ± 0.4 ppm	
Measured reading Acceptable (Yes/No):			
<b>PID</b>			
Make:	Model:	Unit:	Date of last factory calibration:
Date of calibration:		Name of Calibrator:	
Calibration gas: Iso-butylene		Calibration Gas Concentration: 100.0 ppm	
Measured reading: ppm		Error in measured reading: ± ppm	
Measured reading Acceptable (Yes/No):			
<b>PID</b>			
Make:	Model:	Unit:	Date of last factory calibration:
Date of calibration:		Name of Calibrator:	
Calibration gas: Iso-butylene		Calibration Gas Concentration: 100.0 ppm	
Measured reading: ppm		Error in measured reading: ± ppm	
Measured reading Acceptable (Yes/No):			
<b>PID</b>			
Make:	Model:	Unit:	Date of last factory calibration:
Date of calibration:		Name of Calibrator:	
Calibration gas: Iso-butylene		Calibration Gas Concentration: 100.0 ppm	
Measured reading: ppm		Error in measured reading: ± ppm	
Measured reading Acceptable (Yes/No):			
<b>PID</b>			
Make:	Model:	Unit:	Date of last factory calibration:
Date of calibration:		Name of Calibrator:	
Calibration gas: Iso-butylene		Calibration Gas Concentration: 100.0 ppm	
Measured reading: ppm		Error in measured reading: ± ppm	
Measured reading Acceptable (Yes/No):			



## WATER QUALITY METER CALIBRATION FORM

Client:	TTW		
Project:	Proposed Development		
Location:	Stage 3B, 16 Johnston Crescent, HORSLEY PARK, NSW		
Job Number:	E36628BR		
<b>DISSOLVED OXYGEN</b>			
Make: YSI	Model: 4		
Date of calibration: 21/3/24	Name of Calibrator: OB		
Span value: 70% to 130%			
Measured value: 97%			
Measured reading Acceptable (Yes/No): Yes			
<b>pH</b>			
Make: YSI	Model: 4		
Date of calibration: 21/3/24	Name of Calibrator: OB		
Buffer 1: Theoretical pH = 7.01 ± 0.01	Expiry date: 03/24	Lot No: DK100123	
Buffer 2: Theoretical pH = 4.01 ± 0.01	Expiry date: 03/24	Lot No: CD030223	
Measured reading of Buffer 1: 7.05			
Measured reading of Buffer 2: 4.01			
Slope: Measured reading Acceptable (Yes/No): Yes			
<b>EC</b>			
Make: YSI	Model: 1		
Date: 21/3/24	Name of Calibrator: OB	Temperature: 12 °C	
Calibration solution: Rowe Scientific	Expiry date: 06/24	Lot No: DE091222	
Theoretical conductivity at temperature (see solution container): 1337 μS/cm			
Measured conductivity: 1276 μS/cm			
Measured reading Acceptable (Yes/No): Yes			
<b>REDOX</b>			
Make: YSI	Model: 4		
Date of calibration: 21/3/24	Name of Calibrator: OB		
Calibration solution: HANNA	Expiry date: 09/18	Lot No: 9289	
Theoretical redox value: 240mV			
Measured redox reading: 241.0 mV			
Measured reading Acceptable (Yes/No): Yes			

# JK Environments



Client:	TTW	Job No.:	E36628BR
Project:	Proposed Development	Well No.:	MW1
Location:	Stage 3B, 16 Johnston Crescent, HORSLEY PARK, NSW	Depth (m):	12

### WELL FINISH DETAILS

Gatic Cover <input checked="" type="checkbox"/>	Standpipe <input type="checkbox"/>	Other (describe) <input type="checkbox"/>
---	------------------------------------	---

### WELL DEVELOPMENT DETAILS

Method:	Dev Pump	SWL - Before (m):	10.31
Date:	21/3/24	Time - Before:	15:35
Undertaken By:	OB	SWL - After (m):	11.85
Total Vol. Removed:	8	Time - After:	15:47
PID Reading (ppm):	6.9		

Comments:

### DEVELOPMENT MEASUREMENTS

Volume Removed (L)	Temp (°C)	DO (mg/L)	EC (µS/cm)	pH	Eh (mV)
1	20.4	7.7	930.4	7.13	78.0
5	20.6	9.9	940.7	7.07	79.2
8	20.5	4.5	934.9	7.11	83.2
well pumped effectively dry					

data  
logger  
out  
15:34  
15:57

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

YSI Used: 4 m-H silt load v turbidity, brown, low recharge

Tested By:	OB	<b>Remarks:</b> - Steady state conditions - Difference in the pH less than 0.2 units, difference in the conductivity less than 10% and SWL stable/not in drawdown - Minimum 3 monitoring well volumes purged, unless well purged until it is effectively dry
Date Tested:	21/3/24	
Checked By:	CL	
Date:	19/4/24	

# JK Environments



<b>Client:</b>	TTW	<b>Job No.:</b>	E36628BR
<b>Project:</b>	Proposed Development	<b>Well No.:</b>	MW2
<b>Location:</b>	Stage 3B, 16 Johnston Crescent, HORSLEY PARK, NSW	<b>Depth (m):</b>	12

### WELL FINISH DETAILS

<b>Gatic Cover</b> <input checked="" type="checkbox"/>	<b>Standpipe</b> <input type="checkbox"/>	<b>Other (describe)</b> <input type="checkbox"/>
--	---	--

### WELL DEVELOPMENT DETAILS

<b>Method:</b>	Per Pump	<b>SWL - Before (m):</b>	6.10
<b>Date:</b>	21/3/24	<b>Time - Before:</b>	12:26
<b>Undertaken By:</b>	OB	<b>SWL - After (m):</b>	11.60
<b>Total Vol. Removed:</b>	60	<b>Time - After:</b>	13:09
<b>PID Reading (ppm):</b>	0.2		

### Comments:

### DEVELOPMENT MEASUREMENTS

Volume Removed (L)	Temp (°C)	DO (mg/L)	EC (µS/cm)	pH	Eh (mV)
1	20.5	2.8	5523	7.12	63.7
5	20.7	0.2	5522	6.97	65.8
10	20.9	1.8	5397	6.94	67.7
15	20.7	0.5	5277	6.98	67.9
20	21.0	2.3	5477	6.96	69.7
25	21.1	1.0	5717	6.94	71.3
30	21.1	3.0	5664	6.94	76.7
35	21.2	3.4	6001	6.93	79.1
40	21.7	3.9	6657	6.91	82.0
45	20.9	0.7	5570	6.97	91.0
50	20.8	2.5	5565	6.93	91.2
55	20.8	1.6	5585	6.92	90.9
60	20.6	3.1	5684	7.07	87.8
well pumped effectively dry					
very High silt load @ very bottom - had to barrel					
> 3 well volumes pumped					

Data logger  
out  
12:26  
in  
13:16

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

YSI Used: 4 u silt load & turbidity, brown, 1-m recharge

<b>Tested By:</b>	OB	<b>Remarks:</b> - Steady state conditions - Difference in the pH less than 0.2 units, difference in the conductivity less than 10% and SWL stable/not in drawdown - Minimum 3 monitoring well volumes purged, unless well purged until it is effectively dry
<b>Date Tested:</b>	21/3/24	
<b>Checked By:</b>	CR	
<b>Date:</b>	19/4/24	

$$12 - 6.10 = 5.90 \times 3 = 17.70 \times 3 = 53.1$$

# JK Environments



Client:	TTW	Job No.:	E36628BR
Project:	Proposed Development	Well No.:	MW15
Location:	Stage 3B, 16 Johnston Crescent, HORSLEY PARK, NSW	Depth (m):	9.5

### WELL FINISH DETAILS

Gatic Cover <input checked="" type="checkbox"/>	Standpipe <input type="checkbox"/>	Other (describe) <input type="checkbox"/>
---	------------------------------------	---

### WELL DEVELOPMENT DETAILS

Method:	Per Pump	SWL - Before (m):	5.60
Date:	21/3/24	Time - Before:	14:56
Undertaken By:	OB	SWL - After (m):	9.10
Total Vol. Removed:	20L	Time - After:	15:20
PID Reading (ppm):	1.5		

Palma logger  
out 14:55

### Comments:

### DEVELOPMENT MEASUREMENTS

Volume Removed (L)	Temp (°C)	DO (mg/L)	EC (µS/cm)	pH	Eh (mV)
1	21.1	7.3	6636	7.48	86.3
5	21.0	7.3	6565	7.31	7.4
10	21.6	3.7	6618	7.36	17.1
15	22.2	3.9	6237	7.45	0.0
20	21.1	2.6	6320	7.25	-10.9
well purged effectively dry					
very heavy silt load last 0.5m					

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

YSI Used: 4 H silt load v turbidity, dark brown, low recharge

Tested By:	OB	<b>Remarks:</b> - Steady state conditions - Difference in the pH less than 0.2 units, difference in the conductivity less than 10% and SWL stable/not in drawdown - Minimum 3 monitoring well volumes purged, unless well purged until it is effectively dry
Date Tested:	21/3/24	
Checked By:	ZL	
Date:	19/4/24	

$$42.56 = 6.4 \times 3 = 19.2 \times 3 = 57.6$$

$$9.5 - 5.6 = 3.9 \times 3 = 35.1$$

# JK Environments



<b>Client:</b>	TTW	<b>Job No.:</b>	E36628BR
<b>Project:</b>	Proposed Development	<b>Well No.:</b>	53-06
<b>Location:</b>	Stage 3B, 16 Johnston Crescent, HORSLEY PARK, NSW	<b>Depth (m):</b>	20

stand pipe

**WELL FINISH DETAILS**

Gatic Cover  Standpipe  Other (describe)

0.81m

**WELL DEVELOPMENT DETAILS**

<b>Method:</b>	Pos Pump	<b>SWL - Before (m):</b>	5.82
<b>Date:</b>	21/3/24	<b>Time - Before:</b>	11:30
<b>Undertaken By:</b>	OB	<b>SWL - After (m):</b>	19.22
<b>Total Vol. Removed:</b>	60L	<b>Time - After:</b>	12:11
<b>PID Reading (ppm):</b>	0.0		

data  
logger  
unit

11:30

**Comments:**

in

**DEVELOPMENT MEASUREMENTS**

Volume Removed (L)	Temp (°C)	DO (mg/L)	EC (µS/cm)	pH	Eh (mV)
1	21.4	4.0	8849	7.10	231.6
5	20.7	5.8	8750	6.92	213.0
10	21.3	5.4	9046	6.91	96.6
15	21.1	5.7	8897	6.91	61.5
20	21.1	2.7	9007	6.95	59.4
25	20.5	4.0	9169	6.97	36.5
30	20.6	4.0	9180	6.97	18.2
35	20.6	3.7	9291	7.08	-1.3
40	20.6	3.5	9281	7.06	-8.3
45	20.6	2.4	9357	7.11	-7.0
50	20.5	1.5	9260	7.09	-3.7
55	20.2	2.0	9174	7.14	-1.0
60	20.1	2.7	9110	7.13	0.1

12:16

much siltier from 30L

SWL = 18.00 m

SWL = 18.98 m

well pumped effectively dry

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

YSI Used: 4 1 silt load & turbidity to 25L 1-m recharge  
4 silt load & turbidity from 30L grey brown

<b>Tested By:</b>	21/3/24	<b>Remarks:</b>
<b>Date Tested:</b>	OB	- Steady state conditions - Difference in the pH less than 0.2 units, difference in the conductivity less than 10% and SWL stable/not in drawdown
<b>Checked By:</b>	CR	- Minimum 3 monitoring well volumes purged, unless well purged until it is effectively dry
<b>Date:</b>	18/4/24	

$$20 - \frac{5.82}{18.18} \times 3 = 42.54 \times 3 = 127$$

# JK Environments



Client:	TTW	Job No.:	E36628BR
Project:	Proposed Development	Well No.:	53-07
Location:	Stage 3B, 16 Johnston Crescent, HORSLEY PARK, NSW	Depth (m):	14

standpipe

**WELL FINISH DETAILS**

Gatic Cover  Standpipe  Other (describe)

0.73m

**WELL DEVELOPMENT DETAILS**

Method:	Dev Pump	SWL - Before (m):	7.67
Date:	21/3/24	Time - Before:	13:24
Undertaken By:	OB	SWL - After (m):	5.49
Total Vol. Removed:	100 L	Time - After:	13:58
PID Reading (ppm):	0.0		

data  
logger out

13:23  
in

**DEVELOPMENT MEASUREMENTS**

14:00

Volume Removed (L)	Temp (°C)	DO (mg/L)	EC (µS/cm)	pH	Eh (mV)
1	19.7	2.8	3926	7.31	88.8
5	19.2	0.5	3826	7.15	89.0
10	18.9	0.2	5129	7.03	43.7
15	18.9	0.1	5415	7.01	4.6
20	18.9	0.1	5486	7.01	-2.7
25	18.8	0.2	5172	7.04	-0.4
30	18.8	0.1	5374	7.03	-13.4
35	18.5	0.2	3366	7.10	-19.2
40	18.8	0.2	5370	7.03	-19.4
45	19.1	0.6	4731	7.12	12.1
50	19.0	0.7	4663	7.10	9.0
55	18.9	0.2	4991	7.06	0.8
60	19.0	0.1	5122	7.06	0.8
65	19.4	5.2	4231	7.15	45.7
70	19.0	2.3	4874	7.07	52.7
75	18.9	1.6	5076	7.05	58.3
80	18.9	1.4	5103	7.05	49.0
85	18.8	0.9	5235	7.04	21.0
90	18.9	0.5	5111	7.04	11.3
95	18.8	0.2	5185	7.04	2.3
100	18.8	0.1	5200	7.02	-4.7
>	3 well volume		pumped		

SWL 5.59

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

YSI Used: 4  
1-m silt load & turbidity, 4 recharge, grey brown

Tested By:	OB	<b>Remarks:</b> - Steady state conditions - Difference in the pH less than 0.2 units, difference in the conductivity less than 10% and SWL stable/not in drawdown - Minimum 3 monitoring well volumes purged, unless well purged until it is effectively dry
Date Tested:	21/3/24	
Checked By:	VB	
Date:	24.06.24	

$$14 - 1.64 = 9.37 \times 3 = 28.11 \times 3 = 84.33$$

# JK Environments



<b>Client:</b>	TTW	<b>Job No.:</b>	E36628BR
<b>Project:</b>	Proposed Development	<b>Well No.:</b>	53-08
<b>Location:</b>	Stage 3B, 16 Johnston Crescent, HORSLEY PARK, NSW	<b>Depth (m):</b>	11

### WELL FINISH DETAILS

<b>Gatic Cover</b> <input type="checkbox"/>	<b>Standpipe</b> <input checked="" type="checkbox"/>	<b>Other (describe)</b> <input type="checkbox"/>
---	--	--

### WELL DEVELOPMENT DETAILS

<b>Method:</b>	Per Pump	<b>SWL - Before (m):</b>	5.18
<b>Date:</b>	21/3/24	<b>Time - Before:</b>	14:17
<b>Undertaken By:</b>	OB	<b>SWL - After (m):</b>	5.18
<b>Total Vol. Removed:</b>	60L	<b>Time - After:</b>	14:40
<b>PID Reading (ppm):</b>	0.0		

standpipe  
0.82  
data

### Comments:

### DEVELOPMENT MEASUREMENTS

Volume Removed (L)	Temp (°C)	DO (mg/L)	EC (µS/cm)	pH	Eh (mV)
1	19.7	3.2	10847	6.71	103.0
5	19.7	2.2	11035	6.61	104.8
10	19.7	1.5	11091	6.61	104.8
15	19.6	1.0	11094	6.61	104.6
20	19.6	0.9	11111	6.61	104.5
25	19.6	0.8	11217	6.62	86.8
30	19.6	1.0	11233	6.62	89.2
35	19.6	0.9	11275	6.62	90.7
40	19.6	1.2	11209	6.63	92.5
45	19.5	0.7	11304	6.62	89.4
50	19.5	0.8	11302	6.62	90.1
55	19.6	0.8	11279	6.62	91.2
60	19.6	1.2	11222	6.63	92.2
steady state achieved					
> 3 well volumes pumped					

logger  
inf  
11.16  
in  
14:40

swl 6.18  
swl 5.30  
swl 5.19

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

YSI Used: 4

1-m silt load + turbidity, grey. H recharge

<b>Tested By:</b>	OB	<b>Remarks:</b> - Steady state conditions - Difference in the pH less than 0.2 units, difference in the conductivity less than 10% and SWL stable/not in drawdown - Minimum 3 monitoring well volumes purged, unless well purged until it is effectively dry
<b>Date Tested:</b>	21/3/24	
<b>Checked By:</b>	CR	
<b>Date:</b>	18/4/24	

$$11 - 5.18 = 5.82 \times 3 = 52.38$$



## WATER QUALITY METER CALIBRATION FORM

Client:	TTW		
Project:	Proposed Development		
Location:	<del>Stage 3B</del> , 16 Johnston Crescent, HORSLEY PARK, NSW		
Job Number:	E36628BR		
<b>DISSOLVED OXYGEN</b>			
Make: YSI	Model: 4		
Date of calibration: 25/3/24	Name of Calibrator: OB		
Span value: 70% to 130%			
Measured value: 97%			
Measured reading Acceptable (Yes/No): Yes			
<b>pH</b>			
Make: YSI	Model: 4		
Date of calibration: 25/3/24	Name of Calibrator: OB		
Buffer 1: Theoretical pH = 7.01 ± 0.01	Expiry date: 03/24	Lot No: 71100173	
Buffer 2: Theoretical pH = 4.01 ± 0.01	Expiry date: 03/24	Lot No: C7030223	
Measured reading of Buffer 1: 7.05			
Measured reading of Buffer 2: 4.03			
Slope:	Measured reading Acceptable (Yes/No): Yes		
<b>EC</b>			
Make: YSI	Model: 4		
Date: 25/3/24	Name of Calibrator: OB	Temperature: 23 °C	
Calibration solution: Roro Seawater	Expiry date: 06/24	Lot No: 72091227	
Theoretical conductivity at temperature (see solution container): 1359 µS/cm			
Measured conductivity: 1382 µS/cm	Measured reading Acceptable (Yes/No): Yes		
<b>REDOX</b>			
Make: YSI	Model: 4		
Date of calibration: 25/3/24	Name of Calibrator: OB		
Calibration solution: HANNA	Expiry date: 09/28	Lot No: 9289	
Theoretical redox value: 240mV			
Measured redox reading: 235 - 7 mV	Measured reading Acceptable (Yes/No): Yes		



<b>Client:</b>	TTW	<b>Job No.:</b>	E36628BR
<b>Project:</b>	Proposed Development	<b>Well No.:</b>	MW1
<b>Location:</b>	Stage 3B, 16 Johnston Crescent, HORSLEY PARK, NSW	<b>Depth (m):</b>	12

**WELL FINISH DETAILS**

<b>Gatic Cover</b> <input checked="" type="checkbox"/>	<b>Standpipe</b> <input type="checkbox"/>	<b>Other (describe)</b> <input type="checkbox"/>
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**WELL DEVELOPMENT DETAILS**

<b>Method:</b>	Per DMM	<b>SWL - Before (m):</b>	8.87
<b>Date:</b>	25/3/24	<b>Time - Before:</b>	12:28
<b>Undertaken By:</b>	OB	<b>SWL - After (m):</b>	11.75
<b>Total Vol. Removed:</b>	15L	<b>Time - After:</b>	13:47
<b>PID Reading (ppm):</b>	0.6		

**Comments:**

**DEVELOPMENT MEASUREMENTS**

Volume Removed (L)	Temp (°C)	DO (mg/L)	EC (µS/cm)	pH	Eh (mV)
0.5	21.6	5.1	11486	7.14	83.0
5	20.6	3.5	12255	6.91	80.5
10	20.5	3.3	12585	6.90	84.6
15	20.5	3.6	12685	6.96	92.0
well pumped effectively dry					

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

YSI Used: 4 m-11 silt load, brown, low recharge

<b>Tested By:</b>	OB	<b>Remarks:</b> - Steady state conditions - Difference in the pH less than 0.2 units, difference in the conductivity less than 10% and SWL stable/not in drawdown - Minimum 3 monitoring well volumes purged, unless well purged until it is effectively dry
<b>Date Tested:</b>	25/3/24	
<b>Checked By:</b>	CR	
<b>Date:</b>	18/4/24	

data  
logger  
out  
13:27  
  
in  
13:51



# JK Environments



Client:	TTW	Job No.:	E36628BR
Project:	Proposed Development	Well No.:	MW15
Location:	Stage 3B, 16 Johnston Crescent, HORSLEY PARK, NSW	Depth (m):	9.5

**WELL FINISH DETAILS**

Gatic Cover <input checked="" type="checkbox"/>	Standpipe <input type="checkbox"/>	Other (describe) <input type="checkbox"/>
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**WELL DEVELOPMENT DETAILS**

Method:	Per Pump	SWL - Before (m):	5.99
Date:	25/3/24	Time - Before:	12:43
Undertaken By:	OB	SWL - After (m):	9.12
Total Vol. Removed:	15L	Time - After:	14:09
PID Reading (ppm):	2.6		

Comments:

**DEVELOPMENT MEASUREMENTS**

Volume Removed (L)	Temp (°C)	DO (mg/L)	EC (µS/cm)	pH	Eh (mV)
0.5	22.8	2.2	8494	7.38	87.4
5	21.7	2.2	8021	7.37	79.6
10	21.3	0.4	7718	7.24	40.3
15	21.6	1.7	7773	7.31	14.9
20					
WAITED 45 minutes FOR RECHARGE					
25	21.1	6.9	7900	7.16	57.4
30	21.5	6.6	7896	7.18	49.1
35	21.1	6.4	7632	7.25	16.4
well pumped effectively dry					
well pumped effectively dry					

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

YSI Used: 4 m-H silk food, brown & dark brown, low recharge

Tested By:	OB	<b>Remarks:</b> - Steady state conditions - Difference in the pH less than 0.2 units, difference in the conductivity less than 10% and SWL stable/not in drawdown - Minimum 3 monitoring well volumes purged, unless well purged until it is effectively dry
Date Tested:	25/3/24	
Checked By:	CR	
Date:	19/4/24	

data  
logger  
out  
12:42  
in  
13:13  
out  
13:58  
in  
14:14

4.51 x 3 = 13.53 x 3 =

# JK Environments



standpipe  
078m

Client:	TTW	Job No.:	E36628BR
Project:	Proposed Development	Well No.:	53-06
Location:	Stage 3B, 16 Johnston Crescent, HORSLEY PARK, NSW	Depth (m):	20

**WELL FINISH DETAILS**

Gatic Cover	<input type="checkbox"/>	Standpipe	<input checked="" type="checkbox"/>	Other (describe)	<input type="checkbox"/>
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data logge  
out

**WELL DEVELOPMENT DETAILS**

Method:	7EV Pump	SWL - Before (m):	6.75
Date:	25/3/24	Time - Before:	08:18
Undertaken By:	OB	SWL - After (m):	19.23
Total Vol. Removed:	65L	Time - After:	09:10
PID Reading (ppm):	0-0		

08:18

In

09:15

Comments:

**DEVELOPMENT MEASUREMENTS**

Volume Removed (L)	Temp (°C)	DO (mg/L)	EC (µS/cm)	pH	Eh (mV)
0-75	20.5	1.3	10399	6.98	218.6
5	20.6	0.3	10570	6.87	89.9
10	20.2	1.8	10950	6.93	29.5
15	20.1	0.6	10940	6.94	23.7
20	20.3	0.8	10999	6.91	23.4
25	20.4	1.7	11173	6.95	17.2
30	20.4	1.1	11227	6.97	10.3
35	20.3	1.0	11198	7.04	5.1
40	20.3	0.8	11273	7.09	11.2
45	20.4	2.5	11415	7.07	32.7
50	20.3	1.7	11460	7.15	87.1
55	20.4	0.8	11562	7.29	37.6
60	20.4	1.3	11623	7.28	40.4
65	20.3	0.9	11670	7.28	39.9
well pumped effectively dry					

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

YSI Used: 4 m-H silt load, brown, 1-m recharge

Tested By:	OB	<b>Remarks:</b> - Steady state conditions - Difference in the pH less than 0.2 units, difference in the conductivity less than 10% and SWL stable/not in drawdown - Minimum 3 monitoring well volumes purged, unless well purged until it is effectively dry
Date Tested:	25/3/24	
Checked By:	OB	
Date:	18/4/24	

# JK Environments



<b>Client:</b>	TTW	<b>Job No.:</b>	E36628BR
<b>Project:</b>	Proposed Development	<b>Well No.:</b>	53-07
<b>Location:</b>	Stage 3B, 16 Johnston Crescent, HORSLEY PARK, NSW	<b>Depth (m):</b>	14

5.33  
0.72m  
1.61

**WELL FINISH DETAILS**

Gatic Cover  Standpipe  Other (describe)

**WELL DEVELOPMENT DETAILS**

<b>Method:</b>	Per Pump	<b>SWL - Before (m):</b>	4.61
<b>Date:</b>	25/3/24	<b>Time - Before:</b>	10:49
<b>Undertaken By:</b>	OB	<b>SWL - After (m):</b>	5.01
<b>Total Vol. Removed:</b>	100L	<b>Time - After:</b>	11:28
<b>PID Reading (ppm):</b>	0.2		

data logger cut  
10:46

**Comments:**

**DEVELOPMENT MEASUREMENTS**

Volume Removed (L)	Temp (°C)	DO (mg/L)	EC (µS/cm)	pH	Eh (mV)
5	20.7	8.3	5157	7.17	98.8
10	19.2	7.7	5157	7.10	78.1
15	19.0	6.9	7815	6.92	11.1
20	19.0	6.6	7909	6.92	2.7
25	19.9	0.2	8500	6.92	-4.1
30	18.9	0.1	8976	6.92	-8.2
35	18.8	0.1	8949	6.92	-12.9
40	18.9	0.5	8270	6.93	-14.4
45	19.2	0.3	6716	7.03	6.4
50	19.0	0.1	6771	7.01	0.1
55	18.9	0.1	7313	6.98	-12.6
60	18.9	0.1	7310	6.98	-13.2
65	19.1	0.1	5949	7.07	3.1
70	19.0	0.1	6949	6.99	-5.2
75	19.0	0.1	7053	6.99	-11.2
80	19.0	0.1	7087	6.99	-14.11
85	19.2	0.2	5812	7.05	4.4
90	19.1	0.1	6515	7.01	-1.9
95	19.0	0.1	6789	7.00	-7.4
100	19.0	0.1	6857	6.99	-11.9

> 3 well volumes pumped

in  
11.30

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

YSI Used: A 1-m silt load, grey m-H recharge

<b>Tested By:</b>	OB	<b>Remarks:</b> - Steady state conditions - Difference in the pH less than 0.2 units, difference in the conductivity less than 10% and SWL stable/not in drawdown - Minimum 3 monitoring well volumes purged, unless well purged until it is effectively dry
<b>Date Tested:</b>	25/3/24	
<b>Checked By:</b>	OB	
<b>Date:</b>	28/4/24	

$9.39 \times 3 = 28.17 \times 3 = 84.51$





## PID FIELD CALIBRATION FORM

Client:		TTW	
Project:		Proposed Development	
Location:		Stage 3B, 16 Johnston Crescent, HORSLEY PARK, NSW	
Job Number:		E36628BR	
<b>PID</b>			
Make: <i>MIRAE</i>	Model: <i>MIRAE</i>	Unit: <i>2</i>	Date of last factory calibration:
Date of calibration: <i>25.3.24</i>		Name of Calibrator: <i>OB</i>	
Calibration gas: Iso-butylene		Calibration Gas Concentration: 100.0 ppm	
Measured reading: <i>100.3</i> ppm		Error in measured reading: $\pm 0.3$ ppm	
Measured reading Acceptable (Yes/No): <i>Yes</i>			
<b>PID</b>			
Make:	Model:	Unit: <i>2</i>	Date of last factory calibration:
Date of calibration: <i>26/3/24</i>		Name of Calibrator: <i>OB</i>	
Calibration gas: Iso-butylene		Calibration Gas Concentration: 100.0 ppm	
Measured reading: <i>100.6</i> ppm		Error in measured reading: $\pm 0.6$ ppm	
Measured reading Acceptable (Yes/No): <i>Yes</i>			
<b>PID</b>			
Make:	Model:	Unit:	Date of last factory calibration:
Date of calibration:		Name of Calibrator:	
Calibration gas: Iso-butylene		Calibration Gas Concentration: 100.0 ppm	
Measured reading: ppm		Error in measured reading: $\pm$ ppm	
Measured reading Acceptable (Yes/No):			
<b>PID</b>			
Make:	Model:	Unit:	Date of last factory calibration:
Date of calibration:		Name of Calibrator:	
Calibration gas: Iso-butylene		Calibration Gas Concentration: 100.0 ppm	
Measured reading: ppm		Error in measured reading: $\pm$ ppm	
Measured reading Acceptable (Yes/No):			
<b>PID</b>			
Make:	Model:	Unit:	Date of last factory calibration:
Date of calibration:		Name of Calibrator:	
Calibration gas: Iso-butylene		Calibration Gas Concentration: 100.0 ppm	
Measured reading: ppm		Error in measured reading: $\pm$ ppm	
Measured reading Acceptable (Yes/No):			



## WATER QUALITY METER CALIBRATION FORM

Client:	TTW		
Project:	Proposed Development		
Location:	Stage 3B, 16 Johnston Crescent, HORSLEY PARK, NSW		
Job Number:	E36628BR		
<b>DISSOLVED OXYGEN</b>			
Make: YSI	Model: 1		
Date of calibration: 27/3/24	Name of Calibrator: OB		
Span value: 70% to 130%			
Measured value: 96.7%			
Measured reading Acceptable (Yes/No): YES			
<b>pH</b>			
Make: YSI	Model: 1		
Date of calibration: 27/3/24	Name of Calibrator: OB		
Buffer 1: Theoretical pH = 7.01 ± 0.01	Expiry date: 03/24	Lot No: DK100123	
Buffer 2: Theoretical pH = 4.01 ± 0.01	Expiry date: 03/24	Lot No: CD030223	
Measured reading of Buffer 1: 7.19			
Measured reading of Buffer 2: 4.21			
Slope:	Measured reading Acceptable (Yes/No): YES		
<b>EC</b>			
Make: YSI	Model: 1		
Date: 27/3/24	Name of Calibrator: OB	Temperature: 24 °C	
Calibration solution: Rowle Synthetic	Expiry date: 06/29	Lot No: PE091227	
Theoretical conductivity at temperature (see solution container): 1386 μS/cm			
Measured conductivity: 1771 μS/cm	Measured reading Acceptable (Yes/No): YES		
<b>REDOX</b>			
Make: YSI	Model: 1		
Date of calibration: 27/3/24	Name of Calibrator: OB		
Calibration solution: HANNA	Expiry date: 09/28	Lot No: 9289	
Theoretical redox value: 240mV			
Measured redox reading: 221.4 mV	Measured reading Acceptable (Yes/No): YES		







# JK Environments



**Client:** TTW **Job No.:** E36628BR  
**Project:** Proposed Development **Well No.:** 53-06  
**Location:** Stage 3B, 16 Johnston Crescent, HORSLEY PARK, NSW **Depth (m):** 20

SAPE  
 0-78m

**WELL FINISH**

Gatic Cover     Standpipe     Other (describe)

PL  
 047  
 07:36

**WELL PURGE DETAILS:**

**Method:** Peristaltic Pump    **SWL - Before:** 5.82  
**Date:** 27/3/24    **Time - Before:** 07:58  
**Undertaken By:** OB    **Total Vol Removed:** ~ 2.9L  
**Pump Program No:** Low    **PID (ppm):** 0.0

m  
 09-06

**PURGING / SAMPLING MEASUREMENTS**

Time (min)	SWL (m)	Vol (L)	Notes	Temp (°C)	DO (mg/L)	EC (µS/cm)	pH	Eh (mV)
08:16 (0)	5.83	0.50		21.1	2.12	15199	7.00	133.6
08:19 (3)	5.85	0.70		21.1	2.43	15184	7.02	130.6
08:22 (6)	5.86	0.90		21.2	2.35	15173	7.02	125.7
08:25 (9)	5.86	1.1		21.5	1.95	15260	7.02	118.9
08:28 (12)	5.86	1.3		21.8	1.60	15304	7.01	114.4
			steady state achieved - 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, 2 x BTEX vials, 2 x HNO3 plastic, 1 x H2SO4 plastic, 1 x unpreserved plastic

**YSI used:** 1 (Hise YSI) low silt load, 1-m recharge

**Tested By:** Oisin Butler

**Date Tested:** 27/3/24

**Checked By:** CR

**Date:** 18/4/24

**Remarks:**

- 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

x 1 micro



# JK Environments



<b>Client:</b>	TTW	<b>Job No.:</b>	E36628BR
<b>Project:</b>	Proposed Development	<b>Well No.:</b>	53-08
<b>Location:</b>	Stage 3B, 16 Johnston Crescent, HORSLEY PARK, NSW	<b>Depth (m):</b>	14

<b>WELL FINISH</b>			
<input type="checkbox"/> Gatic Cover	<input checked="" type="checkbox"/> Standpipe	<input type="checkbox"/> Other (describe)	

<b>WELL PURGE DETAILS:</b>			
<b>Method:</b>	Peristaltic Pump	<b>SWL - Before:</b>	5.17
<b>Date:</b>	27/3/24	<b>Time - Before:</b>	11:50
<b>Undertaken By:</b>	OB	<b>Total Vol Removed:</b>	~ 2.6L
<b>Pump Program No:</b>	low	<b>PID (ppm):</b>	0.3

**PURGING / SAMPLING MEASUREMENTS**

Time (min)	SWL (m)	Vol (L)	Notes	Temp (°C)	DO (mg/L)	EC (µS/cm)	pH	Eh (mV)
12:00 (0)	5.17	0.5		22.4	2.56	16656	6.78	120.9
12:03 (3)	5.21	0.9	(pump slowed)	23.1	2.65	16759	6.81	121.8
12:06 (6)	5.21	1.2		23.5	2.16	16800	6.78	122.1
12:09 (9)	5.21	1.5		23.9	1.85	16894	6.74	121.9
			steady state achieved - start sampling					

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

GW DUP2 x 1 microbial

**Sampling Containers Used:** 4 x glass amber, 4 x BTEX vials, 3 x HNO3 plastic, 1 x H2SO4 plastic, 1 x unpreserved plastic

**YSI used:** 1 (Have YSI) low silt load, H recharge

<b>Tested By:</b> Oisin Butler	<b>Remarks:</b> - 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
<b>Date Tested:</b> 27/3/24	
<b>Checked By:</b> OB	
<b>Date:</b> 14/4/24	

SPIRE  
0.83 m  
PL  
OUT  
11:48  
IN  
12.40

