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## **Report**

**Geotechnical Investigation  
Bankstown North Public School  
332 Hume Highway  
Bankstown NSW**

Prepared for  
**JHD Architects  
No 44 Little Oxford Street  
DARLINGHURST NSW 2010**

**Ref: JG18129A-r1  
November 2018**



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7<sup>th</sup> November 2018

Our Reference: JG18129A-r1

JDH Architects  
No 44 Little Oxford Street  
DARLINGHURST NSW 2010

Attention: Ms Kasia Podrygajlo

Dear Madam

**Re      Geotechnical, Salinity and Contamination Investigation Report  
Bankstown North Public School  
No 322 Hume Highway Bankstown**

We are pleased to submit our Geotechnical Investigation report for the proposed upgrades to be constructed at the above college located at No 322 Hume Highway Bankstown.

Should you have any queries, please contact the undersigned.

Yours faithfully  
**GeoEnviro Consultancy Pty Ltd**

Solern Liew CPEng (NPER)  
Director

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## 1. INTRODUCTION

This report presents the results of a geotechnical investigation for the proposed school upgrades to be constructed within the Bankstown North Public School at No 322 Hume Highway Bankstown as shown on Drawing No 1. The investigation was commissioned by Ms Kasia Podrygajlo of JDH Architect. The scope of this assessment was carried out in general accordance with our proposal referenced PG18489A dated 3<sup>rd</sup> August 2018.

This geotechnical investigation was undertaken in conjunction with our Preliminary Environmental Site Assessment report referenced in our report JG18129A-r1 dated October 2018 and this report should be read in conjunction it.

We understand that the proposed development will include refurbishment of the existing buildings and construction of some new buildings. At this stage, details of the proposed development are not available and we have assumed that the proposed new buildings will be of low to medium rise (ie not exceeding 3 storeys).

The purpose of this investigation was to assess the subsurface ground conditions including fill and groundwater conditions and based on the information provided, to provide the following information;

- Subsurface conditions and provide recommendations on geotechnical issues considered relevant to the proposed development as follows;
  - Site preparations, fill construction and earthworks specification to AS3798 -Guidelines on Earthworks for Commercial and Residential Sites.
  - Retaining wall design parameters including lateral earth pressure coefficients, Ka, Ko and Kp
  - Slope batter design; temporary and permanent
  - Foundation design parameters including suitable footings, allowable bearing capacities and estimated settlement
  - Assessment on Earthquake site soil class to AS170.4
  - Assessment on soil reactivity to AS2870
  - Recommendations on pavement subgrade preparation and pavement design
- Assessment on soil salinity and aggressiveness for durability design.

## **2. SCOPE OF WORK**

### **2.1 Geotechnical Investigation**

The scope of work for geotechnical investigation included;

- Drilling boreholes at 12 nominated locations (ie BH 1 to BH 12) to a maximum depth of about 5m below existing ground surface or refusal into bedrock.
- Standard penetration testing (SPT) and hand penetrometer testing to assess the insitu strength of the subsurface profiles.
- Visual soil classification and assessment of insitu material.
- Soil sampling and laboratory testing in our NATA accredited laboratory to assess soil properties and subgrade characteristics.

### **2.2 Salinity and Soil Aggressiveness Assessment**

The salinity assessment was performed in general conformance with our understanding of the guidelines prepared by the Department of Land and Water Conservation (Reference 7) and the Salinity Code of Practice prepared by Western Sydney Regional Organisation Council (Reference 8). The scope of work conducted consisted of:

- Soil sampling from the geotechnical boreholes at varying depths across the site.
- Laboratory analysis to aid assessment of chemical properties and this included pH, Electrical Conductivity, Chloride, Sulphate and Resistivity

## **3. SITE INFORMATION**

### **3.1 Site Locality and Description**

Bankstown North Public School is situated on the northern side of the Hume Highway with Stacey Street forming the northern boundary and Beresford Avenue forming the eastern boundary. The site is irregular in shape with a frontage of about 150m to the Hume Highway and extending north by an average of about 180m. Total site area is about 2.6 hectares.

School buildings and carparks occupy eastern portion of the school premises with the remaining portions of the site consisting of playing fields and open space.

The school is situated within a mixed residential and industrial area with residential properties predominantly to the west and south and industrial area to the north.

### 3.2 Site Topography, Geological and Hydrogeology

Bankstown North Public School is situated on gently undulating terrain. Ground surface within the school premises slopes down in a general direction to the north west at angles of between 3 and 6 degrees.

Based on Google Earth, the school building area is at about Reduced Level (RL) 64m to 68m above the Australian Height Datum (AHD) with the remainder of the site between RL 62m AHD and RP 64m AHD.

The 1:100,000 Soil Landscape Map of Sydney Series 9030 prepared by the Soil Conservation Services of NSW indicates the site to be underlain by residual soil belonging to the Blacktown landscape grouping. Typically, soil consists of low permeability, highly plastic and moderately reactive soil.

The 1:100,000 Geological Map of Sydney indicated the underlying bedrock consists of Bringelly Shale of the Wianamatta Group consisting of shale, carbonaceous claystone, claystone, laminite, fine to medium grained lithic sandstone, rare coal and tuff.

Surface water from the site is expected to flow west into Duck River and eventually further north into the Parramatta River. Groundwater is also expected to flow in a general direction towards the west into Duck River.

A study of groundwater conditions beneath the site and search of the NSW Department Infrastructure, Planning and Natural Resources groundwater database for the region was carried out. The search identified nine registered bores within 1km from the site. The following is a summary the two registered bore with relevant information;

Groundwater Number	Authorised uses	Northing	Easting	Standing Water Level (m)	Water Bearing Zones (m)	Final Depth (m)
GW109735	Monitoring Bore	6246624	318969	9.1	-	11.0
GW109734	Monitoring Bore	6246624	318933	1.8	-	4.0

Reference should be made to the Work Summary search in Appendix C for details. Based on the above information, groundwater is considered a resource in the immediate area of the site.

### 3.3 Site History, Records and Data

A desktop study of site history involving a review of Council's Section 10.7 certificates, NSW EPA search, groundwater search and aerial photographs was carried out in order to establish previous land use and to assess site contamination. Reference should be made to Appendix B for details of the searches.

The following is a summary of the historical and data searches;

#### Aerial Photographs

The following is a summary of the observations made from the review of historical aerial photos;

Year	Description
1961	The school premises was evident with school buildings constructed towards the eastern portion of the site. The remainder of the site was open space with grass cover. Hume Highway and Beresford Avenue were constructed. The adjoining northern and western properties consisted of residential properties with the current Bankstown Reservoir structure constructed to the south-east of the site.
1970	There was no significant change within the school site since the 1960s. The immediate surrounding properties also had little to no change and were used for residential purposes. The Chullora industrial area about 200m north of the site was built up.
1982	Some school buildings were removed within the site with the asphalt car park constructed. The remainder of the site had no change since the 1970s. The surrounding properties were still used for residential purposes with the Chullora industrial area established.
1991	Additional school buildings were constructed within the eastern portion of the site with the remainder of the site the same. The surrounding properties and region were in similar conditions since the 1980s. Stacey Street was yet to be formed.
2003	The school site appeared similar to its current form. Stacey Street was formed with the previous residential properties to the north removed as part of the Stacey Street construction. Residential properties remained to the west of the site with a commercial building constructed to the south-western property.

### NSW EPA Records

A search of NSW OEH contaminated land register and licensing register indicate the site to have no records kept under the Contaminated Land Management Act 1997 and Environmentally Hazardous Chemical Act 1985. Refer to Appendix B for details of the NSW EPA search.

### Council Section 10.7 (2) Certificate

A copy of the Section 10.7 (2) certificate was obtained from Canterbury Bankstown Council to determine conditions applicable to the site in relation to the Contaminated Land Management Act 1997 and Contaminated Land Management Amendment Act 2009. Reference may be made to the certificate attached in Appendix B.

The certificate indicates the following;

- The site is not within land declared to be an investigation area or remediation site under Part 3 of that Act.
- The site is not subject to an investigation order or a remediation order within the meaning of the Act
- The site is not the subject of a voluntary investigation proposal (or voluntary remediation proposal) the subject of the Environmental Protection Authority's agreement under Section 19 or 26 of that Act.
- The site is not the subject of a site audit statement within the meaning of Part 4 of that Act.



## **4. INVESTIGATION METHODOLOGY**

### **4.1 Field Investigation**

The field work for the investigation was carried out on the 2<sup>nd</sup> and 3<sup>rd</sup> October 2018 and consisted of drilling boreholes at twelve nominated locations (BH 1 to BH 12) as shown on the attached Drawing No 1.

Prior to borehole drilling, underground services checks were carried out using available drawing provided by Dial-Before-You-Dig. An underground services locator equipped with an electromagnetic device was engaged as an extra precautionary measure to reduce risk of damage to underground services caused by boreholes drilling.

The boreholes were drilled using a track mounted TCH05 drill rig equipped for site investigation purposes. The boreholes were drilled using continuous flight augers attached to a V-bit through topsoil, fill and into natural soil and in some boreholes into bedrock using a Tungsten Carbide (TC) bit to depths varying from 1.8m to 4.6m below existing ground surface. BH 2 was terminated into crushed rock at a depth of about 2.0m below existing ground surface due to a possible service.

To assess the strength of the subsurface sandy soil, Standard Penetration Tests (SPT) were carried out in the boreholes. The SPT tests involved driving a split tube steel spoon into the ground using a standard weight (ie 63.5kg) hammer and measuring the penetration resistance in number of blow counts per 150mm penetration. Hand penetrometer tests were carried out the SPT split tube clayey samples in order to augment the SPT test results.

The strength of the bedrock was subjectively assessed by visual examination of the disturbed shale samples recovered from the borehole and observation of the TC bit resistance during drilling.

The boreholes were observed for groundwater during and upon completion of the borehole drilling. Upon completion of the investigation, the boreholes were backfilled with drilling spoil. Details of the subsurface profiles are summarised on the Borehole Reports in Appendix A of this report.

## **4.2 Laboratory Analysis**

### Geotechnical

Four subgrade samples were taken from the Subject Site and were tested for 4-days soaked California Bearing Ratio (CBR) in our NATA accredited laboratory to assess the pavement subgrade characteristics.

Four “Undisturbed” U<sub>50</sub> soil samples and four “Disturbed” soil samples were taken from the site to our NATA accredited laboratory for Shrink-Swell Index and Atterberg Limit testing to aid assessment of soil reactivity to moisture variation and soil characteristics.

The laboratory test results are presented in Appendix C of this report.

### Salinity and Soil Aggressiveness

To assess the likely impact of soil salinity to the proposed development, the following laboratory analysis was carried out;

- pH
- Electrical Conductivity (EC)
- Chloride (Cl)
- Sulphate (SO<sub>4</sub>)
- Resistivity

The soil analysis was performed by Envirolab Services Pty Ltd, a laboratory accredited by the National Association of Testing Authorities (NATA). The analytical results and methods employed are presented in the Laboratory Test Report in Appendix D.

## 5. SUBSURFACE CONDITIONS

Reference should be made to the attached Borehole Reports in Appendix A for subsurface profiles encountered in the boreholes. The following is a summary of the subsurface profiles encountered in the boreholes during the investigation;

### Pavement

Asphalt, Crushed Rock and Road Base was encountered on the surface of BH 2, 4 to 7, 9 and 10 within the car park area of the school. The pavement was found to have thickness ranging from 70mm to 250mm.

### Topsoil/Fill

Topsoil/fill was encountered in BH 1, 3, 11 and 12 consisting of Clayey Silt of low liquid limit. The topsoil/fill was found to have thickness ranging from 300mm to 700mm.

### Fill

Fill was encountered on beneath the pavement in BH 4, 5 and the surface of BH 8 comprising of Clayey Silt of low liquid limit. Thickness of the fill was found to range from 100mm to 500mm.

### Natural Soil

Underlying the pavement, topsoil/fill and fill, natural soil was found in all boreholes except BH 2. The natural soil was found to consist predominantly of medium to high plasticity Silty Clay with the inclusions of ironstone and shale bands at lower depths in some test pits. Some Shaley Clay was encountered in BH 9 at a depth of about 2.2m below existing ground surface. Based on the SPT and hand penetrometer test results, the natural clayey soil was generally found to be very stiff to hard and dry to moist.

Some relatively weak (ie moist to wet and stiff) clay was encountered in BH 10 between 0.8m to 2.0m below existing ground surface.

### Bedrock

Bedrock consisting of Shale and Siltstone was encountered in all boreholes except BH 2 at depths ranging from 1.2m to 3.0m below existing ground surface. The Shale and Siltstone bedrock was generally assessed to have low strength with some medium strength bands and be extremely weathered to distinctly weathered.

The quality of shale and siltstone appear to improve to medium strength at or below TC bit refusal depths.

### Groundwater

Groundwater was not encountered in any of the boreholes during or shortly after completion of the site investigation.

## **6. RESULTS OF THE INVESTIGATION**

### **6.1 Salinity**

#### **6.1.1 Guidelines**

Salinity refers to the presence of excess salt in the environment and is able to occur if salts which are naturally found in soil or groundwater mobilise, allowing capillary rise and evaporation to concentrate the salt at the upper subsurface soil profile. Such movements are caused by changes in the natural water cycle. In urban areas, the processes which cause salinity are intensified by the increased volumes of water added to the natural system from irrigation of gardens, lawn and parks and from leaking infrastructures (eg pipes, sewer, stormwater, etc) and pool.

Saline soil may have adverse impact on development such as;

- Damage to buildings and houses caused by deterioration of bricks, mortar and concrete when salt drawn up into capillaries of bricks and mortar expands resulting in spalling.
- Deterioration of concrete kerbs and gutters as a result of chemical reaction between concrete and sulphates.
- High chloride content in the soil may result in corrosion of steel reinforcement and buried metal structures.
- Damage to underground pipes and infrastructures.
- Water logging of ground surface due to sealing effect of sodic and dispersive soil.
- Loss of vegetation cover and plants due to high salt content resulting in retardation of plants.

In recognition of the potential adverse impact of salinity to development, the Western Sydney Regional Organisation of Councils Ltd has drafted a Salinity Code of Practice (Reference 9) to address the issue of salinity. It was acknowledged in the Code that salinity problems can change substantially over time and it is difficult to predict exactly where salinity will occur and how it will respond to the changing environment conditions.

The fundamental criterion for assessing soil salinity is based on Electrical Conductivity (Reference 8).

Class	EC <sub>e</sub> (ds/m)
Non-Saline	<2
Slightly Saline	2-4
Moderately Saline	4-8
Very Saline	8-16
Highly Saline	>16

In addition to the above, the presence of Sulphate and Chloride in the soil has the potential to cause high soil aggressivity to concrete and steel structures, in particular if the structures are in direct contact with the soil. The following is a measure of soil aggressivity to concrete based on the Australian Standard (Reference10).

Sulfate expressed as SO <sub>3</sub>		PH	Chloride in water (ppm)	Soil conditions A*	Soil conditions B#
In Soil (ppm)	In Groundwater (ppm)				
<5000	<1000	>5.5	<6000	Mild	Non-aggressive
5000-10000	1000-3000	4.5-5.5	6000-12000	Moderate	Mild
10000-20000	3000-10000	4-4.5	12000-30000	Severe	Moderate
>20000	>10000	<4	>30000	Very Severe	Severe

Approximate 100ppm of SO<sub>4</sub>=80ppm of SO<sub>3</sub>

\* Soil condition A = High permeability soils (eg sands and gravels) which is below groundwater

# Soil conditions B = Low permeability soils (eg silts and clays) and all soils above groundwater

The following is a measure of soil aggressivity to steel piles based on the Australian Standard (Reference 10).

pH	Chlorides (Cl)		Resistivity Ohm.cm	Soil conditions A*	Soil conditions B#
	In Soil Ppm	In water ppm			
>5	<5000	<1000	>5000	Non-aggressive	Non-aggressive
4-5	5000-20000	1000-10000	2000-5000	Mild	Non-aggressive
3-4	20000-50000	10000-20000	1000-2000	Moderate	Mild
<3	>50000	>20000	<1000	Severe	Moderate

\* Soil condition A = High permeability soils (eg sands and gravels) which is below groundwater

# Soil conditions B = Low permeability soils (eg silts and clays) and all soils above groundwater

## 6.1.2 Laboratory Test Results

The following is a summary of the laboratory test results. For details refer to the laboratory test reports in Appendix D ;

BH	Depth	pH	EC	Factor	ECe	Cl <sup>-</sup>	SO <sub>4</sub>	Resistivity
BH 1	0.4-0.5	6.8	0.08	10	0.79			
	2.4-2.5	7.8	0.27	8	2.16	38	180	15000
BH 3	0.2-0.3	7.9	0.07	10	0.68			
	1.0-1.45	5.3	0.80	7.5	6.00		690	42000
BH 4	0.4-0.5	5.6	0.11	7	0.77			
	1.9-2.0	6.3	0.16	8	1.28	64	100	5000
BH 5	0.1-0.2	8.5	0.24	10	2.40			
	0.9-1.0	5.3	0.19	8	1.52			
BH 6	0.2-0.3	5.3	0.33	7	2.31			
	0.9-1.0	5.4	0.35	7.5	2.63	28	140	31000
BH 7	0.9-1.0	5.6	0.09	8	0.68			
	2.9-3.0	9.8	0.39	10	3.90		46	7800
BH 9	0.1-0.2	9.5	0.09	10	0.90			
	0.5-0.6	5.7	0.21	7.5	1.58	47	130	14000
BH 10	0.1-0.2	8.7	0.22	10	2.20			
	1.0-1.45	5.5	0.43	8	3.44	23	380	25000
BH 11	0.9-1.0	5.3	0.31	8	2.48			
	2.5-2.95	7.0	0.39	8	3.12	26	420	15000
BH 12	0.2-0.3	5.8	0.07	10	0.66			
	1.0-1.45	5.3	0.51	8	4.08			

Note: EC – Electrical Conductivity (dS/m)  
EC<sub>c</sub> – Electrical Conductivity (dS/m)  
CEC – Cation Exchange Capacity (cmol+/kg)  
ESP – Exchangeable Sodium Percentage (%)

Resistivity – ohm/cm  
CL – Chloride (mg/kg)  
SO<sub>4</sub> – Sulphate (mg/kg)

## 6.2 Geotechnical

For details of the laboratory test results, refer to the laboratory test reports in Appendix E of this report. The following is a summary of the laboratory test results;

### California Bearing Ratio

Sample	Maximum Dry Density (t/m <sup>3</sup> )	Optimum Moisture Content (%)	Field Moisture Content (%)	CBR %
BH 1 (0.6-1.0m)	1.62	21.0	19.0	2.0
BH 3 (0.7-1.0m)	1.61	23.0	19.5	2.0
BH 6 (0.3-0.5m)	1.56	24.0	21.0	2.0
BH 12 (0.5-1.0m)	1.55	25.0	26.5	2.5

### Shrink-Swell Index

Sample	Shrinkage (%)	Swell (%)	Shrink-Swell Index (%/pF)
BH 3 (1.0-1.4m)	4.3	5.7	3.9
BH 4 (0.8-1.1m)	1.7	4.8	2.3
BH 6 (0.5-0.9m)	4.0	4.1	3.3
BH 12 (0.5-1.0m)	3.0	2.2	2.3

### Atterberg Limits

Sample	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Linear Shrinkage (%)	Moisture Content (%)
BH 6 (0.3-0.5m)	70	30	41	15.5	21.0
BH 9 (1.3-1.5m)	40	20	23	11.0	9.5
BH 10 (0.4-0.8m)	57	25	32	12.0	21.5
BH 12 (2.3-2.5m)	53	22	31	12.0	16.5



## **7. ASSESSMENT AND RECOMMENDATIONS**

### **7.1 Geotechnical Issues**

#### **7.1.1 Site Preparation and Earthworks**

The site investigation revealed the site to be predominantly underlain by pavement and topsoil/fill overlying natural clay overlying shale and siltstone at depths varying from 1.2m to 3.0m.

Based on drawings provided, we understand that the exact locations of the proposed buildings are not determined at this stage although it is expected that the buildings will be constructed in the south-eastern portion of the school site between the existing buildings and car park area. The proposed development is likely to require some site regrading by cut and fill to achieve level building platforms.

Typical earthworks and building platform preparation should include the following;

- Clearing of site vegetation and stripping of topsoil/organic and any “uncontrolled” fill layers to expose the natural clayey soil. The topsoil and organic layer may be reused on site in landscaping and any surplus topsoil would need to be disposed off site.
- The excavated areas should be proof rolled using a minimum 10 tonne vibrating roller to delineate soft and heaving areas. Any soft or heaving areas observed during proof rolling should be excavated and recompacted to a minimum 98% Standard Maximum Dry Density at  $\pm 2\%$  Optimum Moisture.
- All fill beneath pavements should be controlled and compacted in layers not exceeding 250mm thickness compacted to the above specified compaction level. Any imported fill should be of good quality material such as ripped shale or sandstone with a maximum particle size of 75mm.
- Earthworks should be closely monitored by a geotechnical consultant and should include field density testing of fill at an appropriate frequency and level of supervision as detailed in AS3798 -2007 (Referenced 13). Fill placed and compacted in accordance with AS3798 may be classified as “Controlled” fill.

Our general comments on suitable bearing material and reusability of onsite soil are as follows;

- The topsoil and topsoil/fill encountered on the surface in the boreholes are not considered suitable to support permanent structures such as pavements, slabs and buildings and therefore should be excavated and removed. The topsoil and topsoil/fill may be reused in future landscaping areas (eg earth mounds and footpaths).
- Any fill encounter during construction would be classified as “Uncontrolled” fill in accordance with the definition outlined in AS 3798 and is therefore not suitable to support permanent structures such as pavements, slabs and buildings with shallow footings.
- Fill containing foreign inclusion (eg rubbish and building waste) or chemical contaminants (if encountered) are not considered suitable for reuse without treatment or remedial works.
- The underlying natural clayey soil, siltstone and sandstone are generally considered suitable for reuse as structural fill provided the fill is well graded with maximum particle size of not greater than 75mm.

#### **7.1.2 Shoring/Retaining Walls and Batter Slopes**

Site excavation will not require shoring if;

- The excavation is situated at least 1.5 times the depth of excavation away from building structures or services present at time of construction.
- The excavation is adequately battered to the recommended batter slopes outlined as below.

If shoring is required, a soldier pier wall system may be adopted and this system will involve drilling of bored or CFA piles at regular spaced intervals to form a line of soldier piles and shotcreting of the area between the soldier piles after each excavation stage. For soldier pile system, shotcrete infill should be reinforced and designed to span laterally between the soldiers. It should cover the full height of the exposed excavation face to minimise the risk of potential problems associated with degradation and weathering of the face.

For excavation situated within the zone of influence of buildings or structures, a rigid wall system such as a contiguous pile wall arrangement should be adopted in order to prevent potential undermining of existing footings causing damage. Construction of the contiguous pile wall would involve drilling a continuous line of bored or continuous flight auger (CFA) piles along the length of the excavation to form a concrete wall.

Soldier piles and contiguous piles should be taken down to the full height of the excavation and should be socketed a minimum of 0.5m below proposed excavation level (including footing excavations) and into Siltstone/sandstone or to adequate depths of embedment into hard clay to provide toe restraint.

Shoring wall may be temporarily restrained by internal bracing or designed as a cantilever system for the short term before building floor slabs are constructed to provide permanent restraints.

For retaining wall which will be propped by floor slabs or fixed at the top, thus limiting deflection, an “at-rest” lateral earth pressure coefficient ( $K_o$ ) should be adopted. For other retaining walls designed as “cantilevered” or gravity walls, an “active” lateral earth pressure coefficient ( $K_a$ ) may be adopted. For toe resistance, an active lateral pressure coefficient ( $K_p$ ) may be adopted. We recommend the following design parameters be adopted in preliminary design;

<b>Material</b>	<b>Bulk Density (kN/m<sup>3</sup>)</b>	<b><math>K_a</math></b>	<b><math>K_o</math></b>	<b><math>K_p</math></b>	<b>Effective Cohesion, C' (kPa)</b>	<b>Effective Friction Angle (deg)</b>
Compacted Fill	17.5	0.35	0.65	-	2	20
Natural clay	20.0	0.30	0.50	2.0	5	20
Shale/Siltstone	22.0	0.20	0.30	2.5	10	25

Permanent subsurface drains should be provided at the back of the retaining wall, or half hydrostatic ground water pressures should be taken into account in the design. Surcharge due to adjacent structures, construction loads and sloping backfill should be taken into account in the design

### 7.1.3 Batter Slopes

For all unretained cut and fill, the following batter slopes may be adopted for preliminary design;

Material	Temporary	Permanent
Fill and topsoil (Landscape)	1V : 1.5H	1V : 3H
Natural Clay	1V: 1H	1V : 2H
Weathered Shale/Siltstone	1V : 0.5 to 1H	1V : 1H

Steeper batter slopes may be adopted for shale batters subject to inspection and further by geotechnical engineer during excavation works.

### 7.1.4 Footings

Our borehole investigation revealed the site to be predominantly underlain by pavement and topsoil/fill overlying natural clay overlying shale and siltstone at depths varying from 1.2m to 3.0m. All boreholes were found to be dry during and shortly after completion of our site investigation.

Based on the results of the investigation, our recommendations on allowable bearing capacity and founding depths of footings are as follows;

Minimum Footing Depth	Foundation Material	Allowable Bearing Capacity	Allowable Shaft Adhesion* <sup>1</sup>
1.0m from surface	Natural very stiff clay	150 kPa	10 kPa
2.0 to 3.5m from surface	Low Strength shale/siltstone	600kPa	20 kPa
0.5m embedded into shale	Low Strength shale/siltstone	800kPa	50 kPa
TC refusal depth	Medium Strength Shale	1000 kPa	80 kPa

Note: 1) Shaft adhesion applicable for pier footings only and should ignore the upper 1m.

All footings should be taken through topsoil and fill and founded on natural clay, siltstone or sandstone. For deep pier footings, bored piles, grout injected piles or Continuous Flight Auger (CFA) piles may be considered suitable.

If bored piles are adopted some trial piles should be carried out to further assess the groundwater conditions particularly if the piles are taken to significant depths. Adoption of bored pile system should allow for additional costs associated with concreting by “Tremie” methods and use of temporary liners,

Care should be taken to ensure the footings are cleaned of loose or remoulded debris prior to concreting. Footing construction should be supervised and monitored by a suitably qualified geotechnical engineer in order to confirm the above design parameters.

The proposed footings should be designed to accommodate reactive soil proportioned to a Class ‘H1’ (Highly Reactive) site in accordance to AS2870 “Residential Slabs and Footings”.

#### **7.1.5 Pavement Design**

Pavement subgrade preparation for access roads and car parks should include the following;

- Stripping of the topsoil and any “uncontrolled” fill to expose natural clay.
- Boxing of pavement subgrade to proposed design level.
- Proof rolling of the base of the excavation with a heavy vibrating roller (minimum 10 tonne).
- Any soft areas identified during rolling should be further excavated and replaced with ripped sandstone fill.
- The excavated clay material may be reused as filling beneath pavements subject to moisture reconditioning. Alternatively, imported good quality fill such as ripped sandstone having a maximum particle size of 75mm may be used.
- The fill material should be compacted in layers not exceeding 250mm loose thickness compacted to a minimum 98% Standard Maximum Dry Density (SMDD) at close to Optimum Moisture Content.
- The upper 300mm of the fill material forming the pavement subgrade should be compacted to a minimum 100% SMDD.

The subgrade preparation and pavement construction should be closely monitored by a geotechnical consultant and should include field density testing of the pavement material at an appropriate frequency and level of supervision as detailed in AS 3798 -2007.

Our laboratory test results indicate the pavement subgrade to have CBR values of 2% to 2.5%. The subgrade may be modified and improved by lime stabilisation (ie minimum 3 % by weight) or replacement of subgrade with good quality subgrade material such as ripped sandstone or shale having a minimum CBR value of 15%.

Pavement constructed on stabilised subgrade or reworked subgrade may adopt the following Effective CBR values;

Thickness of modified subgrade	Effective CBR
0mm	2.0%
300mm	3.0%
500mm	4.0%

In the absence of design traffic loading for the proposed roads, the following pavement design options may be adopted based on assumed design traffic loadings (ie Equivalent Standard Axle (ESA))

Material	ESA = 1 x 10 <sup>5</sup>			ESA = 5 x 10 <sup>5</sup>		
	CBR 2%	CBR 3%	CBR 4%	CBR 2%	CBR 3%	CBR 4%
Asphaltic Concrete (AC10)	50mm	50mm	50mm	50mm	50mm	50mm
Primer Seal	-	-	-	-	-	-
DGB20 Base	150mm	150mm	150mm	150mm	150mm	150mm
Sandstone Subbase	260mm	180mm	150mm	360mm	280mm	210mm
<b>Total</b>	<b>460mm</b>	<b>380mm</b>	<b>350mm</b>	<b>560mm</b>	<b>480mm</b>	<b>410mm</b>

The pavement design assumes the subgrade and pavement materials to be compacted to the following Minimum Dry Density Ratios (AS1289 5.1.1, 5.2.1);

Material	Relative Densities	Compactive Effort
Base Course	98%	Modified
Sub-Base Course	98%	Modified
Subgrade	100%	Standard

## **7.2 Salinity Issues**

We understand that the proposed development may include minor cut and fill for the proposed building platform to design levels. At this stage, details of the bulk earthworks levels are not known. The laboratory test results indicate the insite soil to be Non to Moderately Saline with EC values ranging from 0.66 dS/m to 6.00 dS/m.

The subsurface soil was found to have low concentrations of Sulphate however in an environment with the lowest pH being 5.3, the soil is considered to be Mildly-aggressive to buried concrete structures and therefore the site may be classified as “Class A2” in accordance to Table 5.2 of AS2870-2011 “Residential Slabs and Footings”. The subsurface soil was found to have low concentrations of Chloride and with the resistivity value of 5000 Ohm/cm, the site was assessed to be Non-aggressive to buried steel structures.

We recommend the following salinity management be adopted as a minimum:

- A high impact waterproof membrane, not just a vapour proof membrane, should be lain under house slabs (refer to NSW Building Code of Australia). The waterproof membrane must be extended to the outside face of the external edge beam up to the finishing ground level, as detailed in the Building Code of Australia (BCA).
- For masonry building construction, the damp proof course must consist of poly-ethylene or poly-ethylene coated metal and correctly placed in accordance with BCA. Ground levels immediately adjacent to masonry walls must be kept below the damp proof course.
- Concrete piers and footings should be constructed using a minimum Class 32MPa concrete, or sulphur resisting concrete with a water cement ratio of 0.5.
- Concrete footings should have a minimum cover to reinforcement of 50mm from unprotected ground and 40mm from a membrane in contact with the ground.
- Use Copper or non-metallic pipes instead of galvanised iron.
- Slabs must be vibrated and cured for a minimum 3 days.
- Admixtures for waterproofing and /or corrosion prevention may be used.

Reference should be made to the following for detail durability design for concrete and steel structures;

- Australian Standard, AS 3600 -2009 “Concrete Structures”
- Australian Standard, AS 2159-2009 “Piling – Design and Installation”
- Australian Standard, AS 2870-2011 “Residential Slabs and Footings

## 8. LIMITATIONS

The interpretation and recommendations submitted in this report are based in part upon data obtained from a limited number of boreholes. There is no investigation which is thorough enough to determine all site conditions and anomalies, no matter how comprehensive the investigation program is as site data is derived from extrapolation of limited test locations. The nature and extent of variations between test locations may not become evident until construction.

Groundwater conditions are only briefly examined in this investigation. The groundwater conditions may vary seasonally or as a consequence of construction activities on or adjacent to the site.

In view of the above, the subsurface soil and rock conditions between the test locations may be found to be different or interpreted to be different from those expected. If such differences appear to exist, we recommend that this office be contacted without delay.

The statements presented in this document are intended to advise you of what should be your realistic expectations of this report and to present you with recommendations on how to minimise the risk associated with groundworks for this project. The document is not intended to reduce the level of responsibility accepted by GeoEnviro Consultancy Pty Ltd, but rather to ensure that all parties who may rely on this report are aware of the responsibilities each assumes in to doing.

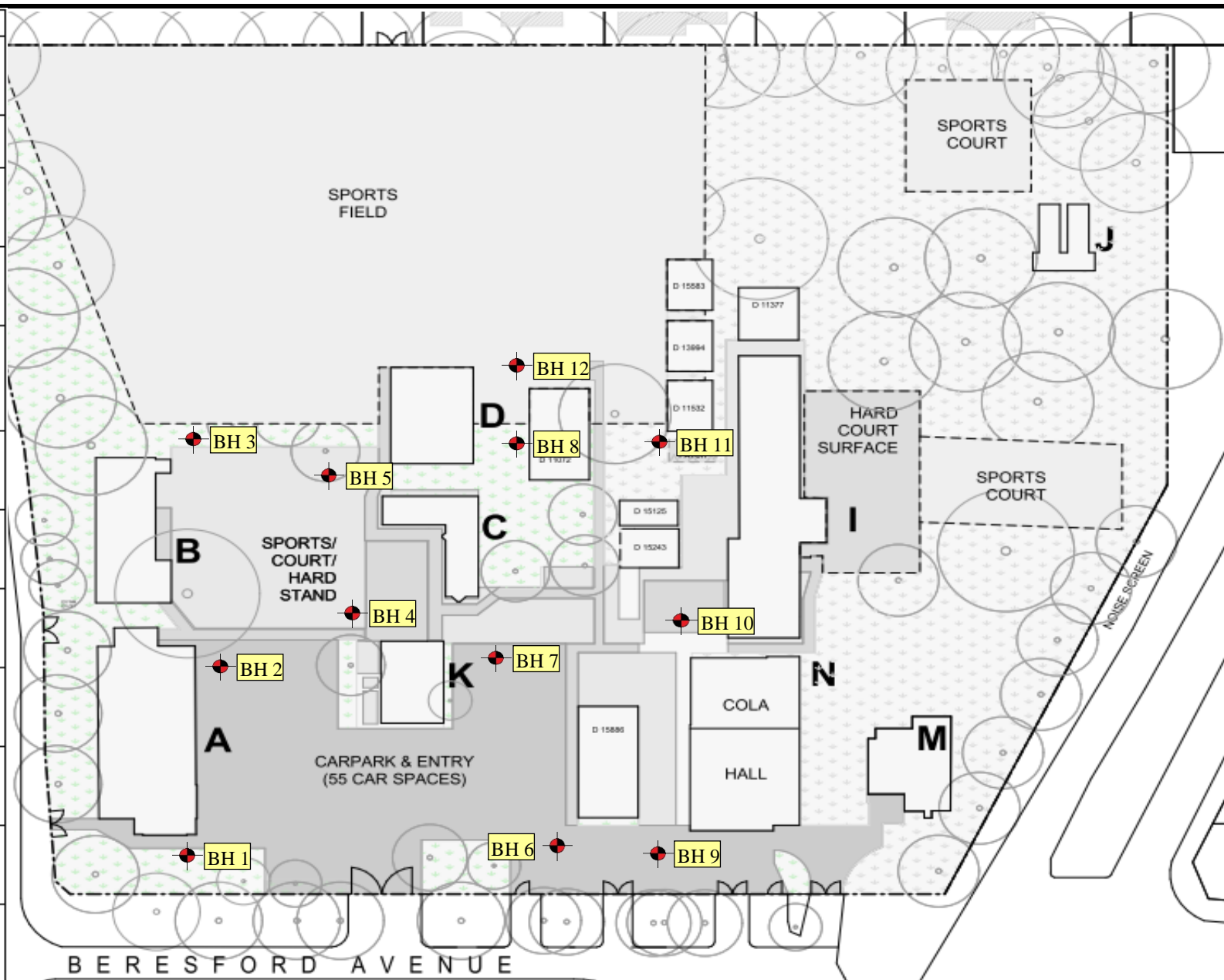
Your attention is drawn to the attached “Explanatory Notes” in Appendix F and this document should be read in conjunction with our report.



## REFERENCES

1. *1:100,000 Soil Landscape Map of Sydney – Soil Conservation Service of NSW; Sheet 9029-9129*
2. *Australian & New Zealand Guidelines for the Assessment and Management of Contaminated Sites, Australian and New Zealand Conservation Council and National Health and Medical Research Council, 1992.*
3. *Assessment of Orchard and Market Garden Contamination - Contaminated Sites Discussion Paper, NSW EPA 1999.*
4. *Health Based Soil Investigation Levels, National Environmental Health Forum Monographs Soil Series No. 1 – 1996*
5. *National Environment Protection (Assessment of Site Contamination) Measure 1999(including updated Schedule B1 – 2013*
6. *Guidelines for Assessment Service Station Sites – NSW EPA 1994*
7. *Guidelines for the NSW Auditor Scheme, NSW EPA*
8. *Department of Land and Water Conservation – “Site Investigation for Urban Salinity”.2002*
9. *Salinity Code of Practice – Western Sydney Regional Organisation of Councils Ltd – 2002*
10. *What do all the numbers mean? A guide for the interpretation of soil test results. – Department of Conservation and Land Management, 1992*
11. *Australian Standard, AS 2159-2009 “Piling – Design and Installation”*
12. *Australian Standard, AS 3600 -2009 “Concrete Structures”*
13. *Australian Standard, AS 3798 - 2007“Bulk Earthworks for Commercial and Residential Site”*
14. *Part 1 – Classifying Waste – 2014, NSW DEC*
15. *Australian and New Zealand Guidelines for Fresh and Marine Water Quality 2000 – ANZECC.*
16. *Australian Standard, AS 3798 - 2007“Bulk Earthworks for Commercial and Residential Site”*

Borehole	Depth (m)	Profile
1	0.00-0.50 0.50-2.00 2.00-2.80	Topsoil/Fill Natural Bedrock
2	0.00-0.07 0.07-2.00	Asphalt Crushed Rock
3	0.00-0.70 0.70-2.70 2.70-4.50	Topsoil/Fill Natural Bedrock
4	0.00-0.30 0.30-1.20 1.20-1.80	Fill Natural Bedrock
5	0.00-0.30 0.30-0.70 0.70-2.60 2.60-3.20	Asphalt Fill Natural Bedrock
6	0.00-0.21 0.20-2.00 2.00-3.00	Asphalt Natural Bedrock
7	0.00-0.19 0.19-2.10 2.10-3.00	Asphalt Natural Bedrock
8	0.00-0.50 0.50-2.80 2.80-4.60	Fill Natural Bedrock
9	0.00-0.25 0.25-2.40 2.40-3.50	Asphalt Natural Bedrock
10	0.00-0.25 0.25-2.60 2.60-4.00	Asphalt Natural Bedrock
11	0.00-0.40 0.40-3.00 3.00-4.30	Topsoil/Fill Natural Bedrock
12	0.00-0.40 0.40-2.80 2.80-4.10	Topsoil/Fill Natural Bedrock



#### Legend



Borehole



**GeoEnviro Consultancy**

Unit 5, 39-41 Fourth Avenue, Blacktown NSW 2148, Australia  
Tel: (02) 96798733 Fax: (02) 96798744

Drawn By: AT

Date: 8/10/18

Checked By: SL

Date: 8/10/18

Revision By:

Date:

Scale: Not to Scale

A3

**JDH Architects**  
**Bankstown North Public School**  
**Test Pit Location Plan**

Project No: JG18129A

Drawing No: 1

## **APPENDIX A**

### **Borehole Reports**



# GeoEnviro Consultancy Pty Ltd

Unit 5, 39-41 Fourth Avenue, Blacktown NSW 2148, Australia  
Tel: (02) 96798733 Fax: (02) 96798744

## Borehole Report

Borehole no: 1

Client: JDH Architects

Job no: JG18129A

Project: Proposed School Upgrade

Date: 2-3/10/18

Location: Bankstown North Public School

Logged by: SG

Drill Model and Mounting: TCH05

Slope: 90°

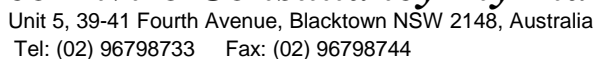
R.L. Surface: -

Hole Diameter: 100mm

Bearing: Vertical

Datum: AHD

Method	Support	Water	Notes: Samples, Tests, etc	Depth(m)	Classification Symbol	Unified Soil Classification	Material Description Soil Type, Plasticity or Particle Characteristic, colour, secondary and minor component	Moisture Content	Consistency/Density Index	Hand Penetrometer kPa	Structure and Additional Observations
V	N I L	D R Y					Topsoil/Fill: Clayey Silt: low liquid limit, brown with fine to medium grained gravel and fine grained sand	D			
				1.0		CI-CH	Silty Clay: medium to high plasticity, brown and grey	D			
			6,12/70mm N>12			CI	Silty Clay: medium plasticity, brown grey with ironstone bands	D-M	H	>600	SPT bouncing at 1.22m
T C				2.0			Shale/Siltstone: grey and brown, low strength extremely weathered to distinctly weathered				
							As above but medium strength				
				3.0			End of BH 1 at 2.8m				Near TC Refusal
				4.0							
				5.0							
				6.0							
				7.0							
				8.0							



## Borehole no: 2

Job no: JG18129A

Date: 2-3/10/18

Logged by: SG

Slope:  $90^\circ$

R.L. Surface: -

Bearing: Vertical

Datum: AHD

[illegible]



# GeoEnviro Consultancy Pty Ltd

Unit 5, 39-41 Fourth Avenue, Blacktown NSW 2148, Australia  
Tel: (02) 96798733 Fax: (02) 96798744

## Borehole Report

Borehole no: 3

Client: JDH Architects

Job no: JG18129A

Project: Proposed School Upgrade

Date: 2-3/10/18

Location: Bankstown North Public School

Logged by: SG

Drill Model and Mounting: TCH05

Slope: 90°

R.L. Surface: -

Hole Diameter: 100mm

Bearing: Vertical

Datum: AHD

Method	Support	Water	Notes: Samples, Tests, etc	Depth(m)	Classification Symbol	Unified Soil Classification	Material Description Soil Type, Plasticity or Particle Characteristic, colour, secondary and minor component	Moisture Content	Consistency/Density Index	Hand Penetrometer kPa	Structure and Additional Observations
V	N	D					Topsoil/Fill: Clayey Silt: low liquid limit, brown with fine to medium grained gravel	D			
	I		3,5,7 N=12	1.0		CI-CH	Silty Clay: medium to high plasticity, brown red grey	D-M	H	480 490	
	L			2.0		CI	Silty Clay: medium plasticity, grey				
	R		9,12/70mm N>12	3.0			As above but with shale bands	D			V bit refusal at 2.8m
	Y			4.0			Shale: grey-dark grey with siltstone bands, low strength with some medium strength bands, extremely to distinctly weathered				SPT bouncing at 2.72m
				5.0			As above medium strength				TC bit refusal at 4.5m
				6.0							
				7.0							
				8.0							
							End of BH 3 at 4.5m				



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Unit 5, 39-41 Fourth Avenue, Blacktown NSW 2148, Australia  
Tel: (02) 96798733 Fax: (02) 96798744

## Borehole Report

Borehole no: 4

Client: JDH Architects

Job no: JG18129A

Project: Proposed School Upgrade

Date: 2-3/10/18

Location: Bankstown North Public School

Logged by: SG

Drill Model and Mounting: TCH05

Slope: 90°

R.L. Surface: -

Hole Diameter: 100mm

Bearing: Vertical

Datum: AHD

Method	Support	Water	Notes: Samples, Tests, etc	Depth(m)	Classification Symbol	Unified Soil Classification	Material Description Soil Type, Plasticity or Particle Characteristic, colour, secondary and minor component	Moisture Content	Consistency/Density Index	Hand Penetrometer kPa	Structure and Additional Observations
V	N	D					Asphalt & Roadbase				
	I	R				CH	Fill: Clayey Silt: low liquid limit, brown	D			
	L	Y					Silty Clay: high plasticity, red brown	D	(H)		
			13, 12/30mm	1.0		CI	Silty Clay: medium plasticity, grey brown with trace of siltstone bands	D	H		SPT bouncing at 1.18m
T			N>12				Shale/Siltstone: grey brown, low to medium strength, extremely weathered to distinctly weathered				V bit refusal at 1.2m
							End of BH 4 at 1.8m				TC bit refusal at 1.8m
				2.0							
				3.0							
				4.0							
				5.0							
				6.0							
				7.0							
				8.0							



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Tel: (02) 96798733 Fax: (02) 96798744

## Borehole Report

Borehole no: 5

Client: JDH Architects

Job no: JG18129A

Project: Proposed School Upgrade

Date: 2-3/10/18

Location: Bankstown North Public School

Logged by: SG

Drill Model and Mounting: TCH05

Slope: 90°

R.L. Surface: -

Hole Diameter: 100mm

Bearing: Vertical

Datum: AHD

Method	Support	Water	Notes: Samples, Tests, etc	Depth(m)	Classification Symbol	Unified Soil Classification	Material Description Soil Type, Plasticity or Particle Characteristic, colour, secondary and minor component	Moisture Content	Consistency/Density Index	Hand Penetrometer kPa	Structure and Additional Observations
V	N I L	D R Y					Asphalt & Crushed Rock				
							Fill: Clayey Silt: low liquid limit, brown	D			
			6,10,11 N=21	1.0		CI-CH	Silty Clay: medium to high plasticity, red brown	D-M	H	>600	
				2.0		CI	Silty Clay: medium plasticity, brown red with ironstone bands				
							As above but grey	D			V bit refusal at 2.2m
							As above but with shale bands				SPT bouncing at 2.58m
			12/80mm N>12	3.0			Shale: grey brown, low to medium strength, extremely weathered to distinctly weathered				
							As above but medium strength				TC bit refusal at 3.2m
							End of BH 5 at 3.2m				
				4.0							
				5.0							
				6.0							
				7.0							
				8.0							





# GeoEnviro Consultancy Pty Ltd

Unit 5, 39-41 Fourth Avenue, Blacktown NSW 2148, Australia  
Tel: (02) 96798733 Fax: (02) 96798744

## Borehole Report

Borehole no: 6

Client: JDH Architects

Job no: JG18129A

Project: Proposed School Upgrade

Date: 2-3/10/18

Location: Bankstown North Public School

Logged by: SG

Drill Model and Mounting: TCH05

Slope: 90°

R.L. Surface: -

Hole Diameter: 100mm

Bearing: Vertical

Datum: AHD

Method	Support	Water	Notes: Samples, Tests, etc	Depth(m)	Classification Symbol	Unified Soil Classification	Material Description Soil Type, Plasticity or Particle Characteristic, colour, secondary and minor component	Moisture Content	Consistency/Density Index	Hand Penetrometer kPa	Structure and Additional Observations
V	N	D				CH	Asphalt: 60mm.t, Crushed Rock: 150mm.t				
	I	R				CH	Silty Clay: high plasticity, red brown	D-M			
	L					CI-CH	Silty Clay: medium to high plasticity, red and grey		H	>600	
			5,12,19 N=31	1.0		CI	Silty Clay: medium plasticity, grey brown with ironstone gravel bands	D			V bit refusal at 1.6m
T				2.0			Shale/Siltstone: grey and brown, low strength with some medium strength bands, extremely to distinctly weathered				
				3.0			As above but medium strength				TC bit refusal at 3.0m
				4.0			End of BH 6 at 3.0m				
				5.0							
				6.0							
				7.0							
				8.0							



# GeoEnviro Consultancy Pty Ltd

Unit 5, 39-41 Fourth Avenue, Blacktown NSW 2148, Australia  
Tel: (02) 96798733 Fax: (02) 96798744

## Borehole Report

Borehole no: 7

Client: JDH Architects

Job no: JG18129A

Project: Proposed School Upgrade

Date: 2-3/10/18

Location: Bankstown North Public School

Logged by: SG

Drill Model and Mounting: TCH05

Slope: 90°

R.L. Surface: -

Hole Diameter: 100mm

Bearing: Vertical

Datum: AHD

Method	Support	Water	Notes: Samples, Tests, etc	Depth(m)	Classification Symbol	Unified Soil Classification	Material Description Soil Type, Plasticity or Particle Characteristic, colour, secondary and minor component	Moisture Content	Consistency/Density Index	Hand Penetrometer kPa	Structure and Additional Observations
V	N	D				CH	Asphalt: 40mm.t, Crushed Rock: 150mm.t				
	I	R				CI	Silty Clay: high plasticity, red brown	D			
	L	Y		1.0			Silty Clay: medium plasticity, grey brown		(H)		
			6,18/100mm				Siltstone: brown, low strength, extremely weathered with clay bands				SPT bouncing at 1.25m
			N>18								V bit refusal at 1.6m
T	C			2.0			Shale/Siltstone: grey and brown, low strength extremely weathered to distinctly weathered				
				3.0			As above but medium strength				TC bit refusal at 3.0m
				4.0			End of BH 7 at 3.0m				
				5.0							
				6.0							
				7.0							
				8.0							



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Tel: (02) 96798733 Fax: (02) 96798744

## Borehole Report

Borehole no: 8

Client: JDH Architects

Job no: JG18129A

Project: Proposed School Upgrade

Date: 2-3/10/18

Location: Bankstown North Public School

Logged by: SG

Drill Model and Mounting: TCH05

Slope: 90°

R.L. Surface: -

Hole Diameter: 100mm

Bearing: Vertical

Datum: AHD

Method	Support	Water	Notes: Samples, Tests, etc	Depth(m)	Classification Symbol	Unified Soil Classification	Material Description Soil Type, Plasticity or Particle Characteristic, colour, secondary and minor component	Moisture Content	Consistency/Density Index	Hand Penetrometer kPa	Structure and Additional Observations
V	N	D					Fill: Clayey Silt: low liquid limit, brown	D			
	I			1.0		CI	Silty Clay: medium plasticity, grey brown	D-M			
	L		2,3,6 N=9						H	>600	
				2.0			As above but with trace of ironstone bands				
							As above but with shale bands		H	>600	V bit refusal at 2.4m SPT bouncing at 2.65m
T	C		11/150mm N>11	3.0			Siltstone: grey, low to medium strength, extremely weathered to distinctly weathered				
				4.0			Shale: grey, low strength with some bands of medium strength shale, extremely to distinctly weathered				
							As above but medium strength				
				5.0			End of BH 8 at 4.6m				TC bit refusal at 4.6m
				6.0							
				7.0							
				8.0							



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Unit 5, 39-41 Fourth Avenue, Blacktown NSW 2148, Australia  
Tel: (02) 96798733 Fax: (02) 96798744

## Borehole Report

Borehole no: 9

Client: JDH Architects

Job no: JG18129A

Project: Proposed School Upgrade

Date: 2-3/10/18

Location: Bankstown North Public School

Logged by: SG

Drill Model and Mounting: TCH05

Slope: 90°

R.L. Surface: -

Hole Diameter: 100mm

Bearing: Vertical

Datum: AHD

Method	Support	Water	Notes: Samples, Tests, etc	Depth(m)	Classification Symbol	Unified Soil Classification	Material Description Soil Type, Plasticity or Particle Characteristic, colour, secondary and minor component	Moisture Content	Consistency/Density Index	Hand Penetrometer kPa	Structure and Additional Observations
V	N I L	D R Y					Asphalt: 50mm.t, Crushed Rock 200mm.t				
				1.0	CI-CH		Silty Clay: medium to high plasticity, red brown	D-M			
			7,19,12 /30mm N>31	2.0	CI		Silty Clay: medium plasticity, grey brown with ironstone gravel	D	H	>600	SPT bouncing at 1.33m
											V bit refusal at 2.2m
TC				3.0	CI		Shaley Clay: medium plasticity, grey brown with shale bands				
			11,20/130mm N>20				Shale: grey brown, low strength, extremely weathered to distinctly weathered with siltstone bands				SPT bouncing at 2.78m
							As above but medium strength				TC bit refusal at 3.5m
				4.0			End of BH 9 at 3.5m				
				5.0							
				6.0							
				7.0							
				8.0							



# GeoEnviro Consultancy Pty Ltd

Unit 5, 39-41 Fourth Avenue, Blacktown NSW 2148, Australia  
Tel: (02) 96798733 Fax: (02) 96798744

## Borehole Report

Borehole no: 10

Client: JDH Architects

Job no: JG18129A

Project: Proposed School Upgrade

Date: 2-3/10/18

Location: Bankstown North Public School

Logged by: SG

Drill Model and Mounting: TCH05

Slope: 90°

R.L. Surface: -

Hole Diameter: 100mm

Bearing: Vertical

Datum: AHD

Method	Support	Water	Notes: Samples, Tests, etc	Depth(m)	Classification Symbol	Unified Soil Classification	Material Description Soil Type, Plasticity or Particle Characteristic, colour, secondary and minor component	Moisture Content	Consistency/Density Index	Hand Penetrometer kPa	Structure and Additional Observations
V	N	D	1,2,3 N=5	1.0	CI-CH	CI	Asphalt & Roadbase Silty Clay: medium to high plasticity, grey brown Silty Clay: medium plasticity, grey brown	M	St	150	
				2.0			As above but with ironstaining	M			
TC			10,8/40mm N>8	3.0			Shale: grey brown, low strength, extremely weathered to distinctly weathered As above but with some medium strength bands As above but medium strength	D			SPT bouncing at 2.69m V bit refusal at 2.6m TC bit refusal at 4.0m
				4.0			End of BH 10 at 4.0m				
				5.0							
				6.0							
				7.0							
				8.0							



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Unit 5, 39-41 Fourth Avenue, Blacktown NSW 2148, Australia  
Tel: (02) 96798733 Fax: (02) 96798744

## Borehole Report

Borehole no: 11

Client: JDH Architects

Job no: JG18129A

Project: Proposed School Upgrade

Date: 2-3/10/18

Location: Bankstown North Public School

Logged by: SG

Drill Model and Mounting: TCH05

Slope: 90°

R.L. Surface: -

Hole Diameter: 100mm

Bearing: Vertical

Datum: AHD

Method	Support	Water	Notes: Samples, Tests, etc	Depth(m)	Classification Symbol	Unified Soil Classification	Material Description Soil Type, Plasticity or Particle Characteristic, colour, secondary and minor component	Moisture Content	Consistency/Density Index	Hand Penetrometer kPa	Structure and Additional Observations
V	N	D					Topsoil/Fill: Clayey Silt: low liquid limit, brown with trace of gravel	D			
	I	R				CH	Silty Clay: high plasticity, red brown	D			
	L	Y				CI	Silty Clay: medium plasticity, grey brown		H	>600	
			7,10,12 N=22	1.0							
				2.0			As above but grey				
			13/140mm N>13	3.0			As above but with shale bands	H	>600		SPT bouncing at 2.64m V bit refusal at 3.0m
T	C			4.0			Shale: grey brown, low strength, extremely weathered to distinctly weathered				
							As above but with some medium strength bands				
							As above but medium strength				
				5.0			End of BH 11 at 4.6m				
				6.0							
				7.0							
				8.0							



# GeoEnviro Consultancy Pty Ltd

Unit 5, 39-41 Fourth Avenue, Blacktown NSW 2148, Australia  
Tel: (02) 96798733 Fax: (02) 96798744

## Borehole Report

Borehole no: 12

Client: JDH Architects

Job no: JG18129A

Project: Proposed School Upgrade

Date: 2-3/10/18

Location: Bankstown North Public School

Logged by: SG

Drill Model and Mounting: TCH05

Slope: 90°

R.L. Surface: -

Hole Diameter: 100mm

Bearing: Vertical

Datum: AHD

Method	Support	Water	Notes: Samples, Tests, etc	Depth(m)	Classification Symbol	Unified Soil Classification	Material Description Soil Type, Plasticity or Particle Characteristic, colour, secondary and minor component	Moisture Content	Consistency/Density Index	Hand Penetrometer kPa	Structure and Additional Observations
V	N I L	D R Y					Topsoil/Fill: Clayey Silt: low liquid limit, brown				
				1.0		CH	Silty Clay: high plasticity, red brown	D-M			
			5,13,13 N=26			CI	Silty Clay: medium plasticity, grey brown with ironstone bands		VSt	350	
				2.0			As above but with shale gravel				
			3,16/150mm N>16	3.0			Shale: dark grey, low strength, extremely weathered		H	>600	SPT bouncing at 2.8m V bit refusal at 3.0m
TC				4.0			As above but low to medium strength, extremely weathered to distinctly weathered				
							As above but distinctly weathered				TC bit refusal at 4.1m
				5.0			End of BH 12 at 4.1m				
				6.0							
				7.0							
				8.0							

## **APPENDIX B**

EPA Searches, Groundwater Bores & Section 10.7(2)



[Home](#) [Contaminated land](#) [Record of notices](#)

Search results

Your search for:LGA: Bankstown City Council

Matched 31 notices  
relating to 9 sites.

[Search Again](#)

[Refine Search](#)

Suburb	Address	Site Name	Notices related to this site
CHESTER HILL	127 Orchard ROAD	<a href="#">Former Orica, Chester Hill</a>	4 former
PADSTOW	55 Bryant STREET	<a href="#">Exide</a>	2 current and 1 former
REVESBY	33-35 Violet STREET	<a href="#">Bituminous Products</a>	2 current and 1 former
REVESBY	21 Marigold STREET	<a href="#">Mirotone Pty Ltd</a>	2 current
VILLAWOOD	66 Christina ROAD	<a href="#">Former Electrical Component Manufacturer</a>	1 current and 4 former
VILLAWOOD	2 Christina ROAD	<a href="#">Former Orica Crop Care</a>	2 current and 1 former
VILLAWOOD	49 Miowera ROAD	<a href="#">Former Siemens/Westinghouse</a>	9 former
VILLAWOOD	110A Christina ROAD	<a href="#">Nepotian (Former Toll) Site</a>	1 current
YAGOONA	117-153 Rookwood ROAD	<a href="#">Galserv Galvanising Services</a>	1 current

Page 1 of 1

19 October 2018

For business and industry ☐

For local government ☐

Contact us

- ☐ 131 555 (tel:131555)
- ☐ [info@epa.nsw.gov.au](mailto:info@epa.nsw.gov.au) (mailto:info@epa.nsw.gov.au)
- ☐ EPA Office Locations (<https://www.epa.nsw.gov.au/about-us/contact-us/locations>)

Accessibility (<https://www.epa.nsw.gov.au/about-us/contact-us/website-service-standards/help-index>)  
Disclaimer (<https://www.epa.nsw.gov.au/about-us/contact-us/website-service-standards/disclaimer>)  
Privacy (<https://www.epa.nsw.gov.au/about-us/contact-us/website-service-standards/privacy>)  
Copyright (<https://www.epa.nsw.gov.au/about-us/contact-us/website-service-standards/copyright>)

☐ <https://au.linkedin.com/company/epa-nsw>  
☐ [https://twitter.com/epa\\_nsw](https://twitter.com/epa_nsw)  
☐ <https://www.facebook.com/epa.nsw>

Find us on

# NSW Office of Water

## Work Summary

GW112136

Licence: 10BL161854

Licence Status: ACTIVE

Authorised Purpose(s): MONITORING BORE  
Intended Purpose(s): MONITORING BORE

Work Type: Bore

Work Status: Equipped

Construct.Method:

Owner Type: Private

Commenced Date:

Completion Date: 30/01/2003

Final Depth:

Drilled Depth:

Contractor Name:

Driller: Unknown Unknown

Assistant Driller:

Property: 7-ELEVEN 301 HUME HWY  
BANKSTOWN 2200 NSW

GWMA:  
GW Zone:

Standing Water Level:

Salinity:  
Yield:

### Site Details

Site Chosen By:

County  
Form A: CUMBE  
Licensed:

Parish  
CUMBE.3

Cadastre  
1/575922

Region: 10 - Sydney South Coast

River Basin: - Unknown  
Area/District:

CMA Map:

Grid Zone:

Scale:

Elevation: 0.00 m (A.H.D.)  
Elevation Source: Unknown

Northing: 6246651.0  
Easting: 318953.0

Latitude: 33°54'18.0"S  
Longitude: 151°02'30.6"E

GS Map: -

MGA Zone: 0

Coordinate Source: Unknown

### Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel  
Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details

### Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)

### Geologists Log

#### Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments

### Remarks

17/07/2014: Nat Carling, 17-July-2014; Updated work type, status, drill method & drilled depth.

# NSW Office of Water

## Work Summary

GW112135

Licence: 10BL161854

Licence Status: ACTIVE

Authorised Purpose(s): MONITORING BORE  
Intended Purpose(s): MONITORING BORE

Work Type: Bore

Work Status: Equipped

Construct.Method:

Owner Type: Private

Commenced Date:

Completion Date: 28/11/2001

Final Depth:

Drilled Depth:

Contractor Name:

Driller: Unknown Unknown

Assistant Driller:

Property: 7-ELEVEN 301 HUME HWY  
BANKSTOWN 2200 NSW

GWMA:  
GW Zone:

Standing Water Level:

Salinity:  
Yield:

### Site Details

Site Chosen By:

County  
Form A: CUMBE  
Licensed:

Parish  
CUMBE.3

Cadastre  
1/575922

Region: 10 - Sydney South Coast

River Basin: - Unknown  
Area/District:

CMA Map:

Grid Zone:

Scale:

Elevation: 0.00 m (A.H.D.)  
Elevation Source: Unknown

Northing: 6246635.0  
Easting: 318961.0

Latitude: 33°54'18.5"S  
Longitude: 151°02'30.9"E

GS Map: -

MGA Zone: 0

Coordinate Source: Unknown

### Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel  
Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details

### Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)

### Geologists Log

#### Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments

### Remarks

17/07/2014: Nat Carling, 17-July-2014; Updated work type, status, drill method & drilled depth.

# NSW Office of Water

## Work Summary

GW112134

Licence: 10BL161854

Licence Status: ACTIVE

Authorised Purpose(s): MONITORING BORE  
Intended Purpose(s): MONITORING BORE

Work Type: Bore

Work Status: Equipped

Construct.Method:

Owner Type: Private

Commenced Date:

Completion Date: 29/01/2003

Final Depth:

Drilled Depth:

Contractor Name:

Driller: Unkown Unknown

Assistant Driller:

Property: 7-ELEVEN 301 HUME HWY  
BANKSTOWN 2200 NSW

Standing Water Level:

GWMA:  
GW Zone:

Salinity:  
Yield:

## Site Details

Site Chosen By:

County  
Form A: CUMBE  
Licensed:

Parish  
CUMBE.3

Cadastre  
1/575922

Region: 10 - Sydney South Coast

CMA Map:

River Basin: - Unknown  
Area/District:

Grid Zone:

Scale:

Elevation: 0.00 m (A.H.D.)  
Elevation Source: Unknown

Northing: 6246619.0  
Easting: 318958.0

Latitude: 33°54'19.0"S  
Longitude: 151°02'30.8"E

GS Map: -

MGA Zone: 0

Coordinate Source: Unknown

## Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel  
Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details

## Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)

## Geologists Log

### Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments

## Remarks

17/07/2014: Nat Carling, 17-July-2014; Updated work type, status, drill method & drilled depth.

# NSW Office of Water

## Work Summary

GW112133

Licence: 10BL161854

Licence Status: ACTIVE

Authorised Purpose(s): MONITORING BORE  
Intended Purpose(s): MONITORING BORE

Work Type: Bore

Work Status: Equipped

Construct.Method:

Owner Type: Private

Commenced Date:

Completion Date: 29/01/2003

Final Depth:

Drilled Depth:

Contractor Name:

Driller: Unkown Unknown

Assistant Driller:

Property: 7-ELEVEN 301 HUME HWY  
BANKSTOWN 2200 NSW

GWMA:  
GW Zone:

Standing Water Level:

Salinity:  
Yield:

### Site Details

Site Chosen By:

County  
Form A: CUMBE  
Licensed:

Parish  
CUMBE.3

Cadastre  
1/575922

Region: 10 - Sydney South Coast

River Basin: - Unknown  
Area/District:

CMA Map:

Grid Zone:

Scale:

Elevation: 0.00 m (A.H.D.)  
Elevation Source: Unknown

Northing: 6246625.0  
Easting: 318963.0

Latitude: 33°54'18.8"S  
Longitude: 151°02'31.0"E

GS Map: -

MGA Zone: 0

Coordinate Source: Unknown

### Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel  
Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details

### Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)

### Geologists Log

#### Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments

### Remarks

17/07/2014: Nat Carling, 17-July-2014; Updated work type, status, drill method & drilled depth.

# NSW Office of Water

## Work Summary

GW112132

Licence: 10BL161854

Licence Status: ACTIVE

Authorised Purpose(s): MONITORING BORE  
Intended Purpose(s): MONITORING BORE

Work Type: Bore

Work Status: Equipped

Construct.Method:

Owner Type: Private

Commenced Date:

Completion Date: 02/04/2013

Final Depth:

Drilled Depth:

Contractor Name:

Driller: Unknown Unknown

Assistant Driller:

Property: 7-ELEVEN 301 HUME HWY  
BANKSTOWN 2200 NSW

GWMA:  
GW Zone:

Standing Water Level:

Salinity:  
Yield:

### Site Details

Site Chosen By:

County  
Form A: CUMBE  
Licensed:

Parish  
CUMBE.3

Cadastre  
1/575922

Region: 10 - Sydney South Coast

River Basin: - Unknown  
Area/District:

CMA Map:

Grid Zone:

Scale:

Elevation: 0.00 m (A.H.D.)  
Elevation Source: Unknown

Northing: 6246645.0  
Easting: 318958.0

Latitude: 33°54'18.2"S  
Longitude: 151°02'30.8"E

GS Map: -

MGA Zone: 0

Coordinate Source: Unknown

### Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel  
Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details

### Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)

### Geologists Log

#### Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments

### Remarks

17/07/2014: Nat Carling, 17-July-2014; Updated work type, status, drill method & drilled depth.

# NSW Office of Water

## Work Summary

GW112131

Licence: 10BL161854

Licence Status: ACTIVE

Authorised Purpose(s): MONITORING BORE  
Intended Purpose(s): MONITORING BORE

Work Type: Bore

Work Status: Equipped

Construct.Method:

Owner Type: Private

Commenced Date:

Completion Date: 28/01/2003

Final Depth:

Drilled Depth:

Contractor Name:

Driller: Unknown Unknown

Assistant Driller:

Property: 7-ELEVEN 301 HUME HWY  
BANKSTOWN 2200 NSW

GWMA:  
GW Zone:

Standing Water Level:

Salinity:  
Yield:

### Site Details

Site Chosen By:

County  
Form A: CUMBE  
Licensed:

Parish  
CUMBE.3

Cadastre  
1/575922

Region: 10 - Sydney South Coast

River Basin: - Unknown  
Area/District:

CMA Map:

Grid Zone:

Scale:

Elevation: 0.00 m (A.H.D.)  
Elevation Source: Unknown

Northing: 6246623.0  
Easting: 318968.0

Latitude: 33°54'18.9"S  
Longitude: 151°02'31.2"E

GS Map: -

MGA Zone: 0

Coordinate Source: Unknown

### Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel  
Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details

### Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)

### Geologists Log

#### Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments

### Remarks

17/07/2014: Nat Carling, 17-July-2014; Updated status, drill method & drilled depth.

# NSW Office of Water

## Work Summary

GW112130

Licence: 10BL161854

Licence Status: ACTIVE

Authorised Purpose(s): MONITORING BORE  
Intended Purpose(s): MONITORING BORE

Work Type: Bore

Work Status: Equipped

Construct.Method:

Owner Type: Private

Commenced Date:

Completion Date: 28/01/2003

Final Depth:

Drilled Depth:

Contractor Name:

Driller: Unknown Unknown

Assistant Driller:

Property: 7-ELEVEN 301 HUME HWY  
BANKSTOWN 2200 NSW

GWMA:  
GW Zone:

Standing Water Level:

Salinity:  
Yield:

### Site Details

Site Chosen By:

County  
Form A: CUMBE  
Licensed:

Parish  
CUMBE.3

Cadastre  
1 575922

Region: 10 - Sydney South Coast

River Basin: - Unknown  
Area/District:

CMA Map:

Grid Zone:

Scale:

Elevation: 0.00 m (A.H.D.)  
Elevation Source: Unknown

Northing: 6246623.0  
Easting: 318932.0

Latitude: 33°54'18.9"S  
Longitude: 151°02'29.8"E

GS Map: -

MGA Zone: 0

Coordinate Source: Unknown

### Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel  
Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details

### Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)

### Geologists Log

#### Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments

### Remarks

17/07/2014: Nat Carling, 17-July-2014; Updated status, drill method & drilled depth.



# NSW Office of Water

## Work Summary

GW109735

Licence: 10BL162770

Licence Status: ACTIVE

Authorised Purpose(s): MONITORING BORE  
Intended Purpose(s): MONITORING BORE

Work Type: Well

Work Status:

Construct.Method:

Owner Type: Private

Commenced Date:  
Completion Date: 04/12/2003

Final Depth: 11.00 m  
Drilled Depth: 11.00 m

Contractor Name: IT ENVIRONMENTAL

Driller: Bryan Patrick Clancy

Assistant Driller:

Property: MOBIL OIL CNR HUME HIGHWAY &  
BORONIA RD GREENACRE 2190

Standing Water Level: 9.100

GWMA:  
GW Zone:

Salinity:  
Yield:

## Site Details

Site Chosen By:

County  
Form A: CUMBE  
Licensed:

Parish  
CUMBE.3

Cadastre  
1/575922

Region: 10 - Sydney South Coast

CMA Map:

River Basin: - Unknown  
Area/District:

Grid Zone:

Scale:

Elevation: 0.00 m (A.H.D.)  
Elevation Source: Unknown

Northing: 6246624.0  
Easting: 318969.0

Latitude: 33°54'18.9"S  
Longitude: 151°02'31.2"E

GS Map: -

MGA Zone: 0

Coordinate Source: Unknown

## Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel  
Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1		Hole	Hole	0.00	11.00	100			Unknown
1		Annulus	Waterworn/Rounded	0.00	0.00				Graded
1	1	Casing	Pvc Class 18	0.00	6.30	50	49		
1	1	Opening	Screen	6.20	11.00	50		1	PVC

## Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
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## Geologists Log

### Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	0.15	0.15	CONCRETE	Conglomerate	
0.15	2.10	1.95	FILL	Fill	
2.10	4.30	2.20	CLAY	Clay	
4.30	11.00	6.70	SHALE	Shale	

# NSW Office of Water

## Work Summary

GW109734

Licence: 10BL162770

Licence Status: ACTIVE

Authorised Purpose(s): MONITORING BORE  
Intended Purpose(s): MONITORING BORE

Work Type: Well

Work Status:

Construct.Method:

Owner Type: Private

Commenced Date:  
Completion Date: 03/11/2003

Final Depth: 4.00 m  
Drilled Depth: 4.00 m

Contractor Name: Macquarie Drilling  
Driller: Bryan Patrick Clancy  
Assistant Driller:

Property: MOBIL OIL CNR HUME HIGHWAY &  
BORONIA RD GREENACRE 2190  
GWMA:  
GW Zone:

Standing Water Level: 1.800  
Salinity:  
Yield:

## Site Details

Site Chosen By:

County  
Form A: CUMBE  
Licensed:

Parish  
CUMBE.3

Cadastre  
1/575922

Region: 10 - Sydney South Coast  
River Basin: - Unknown  
Area/District:

CMA Map:  
Grid Zone:

Scale:

Elevation: 0.00 m (A.H.D.)  
Elevation Source: Unknown

Northing: 6246624.0  
Easting: 318933.0

Latitude: 33°54'18.9"S  
Longitude: 151°02'29.8"E

GS Map: -

MGA Zone: 0

Coordinate Source: Unknown

## Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel  
Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1		Annulus	Waterworn/Rounded	0.00	0.00				Graded
1	1	Casing	P.V.C.	0.00	1.00	60			Screwed
1	1	Opening	Screen	1.00	4.00	60		1	PVC, Screwed

## Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
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## Geologists Log

### Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	0.20	0.20	CONCRETE	Conglomerate	
0.20	2.40	2.20	FILL	Fill	
2.40	4.00	1.60	CLAY	Clay	

## PLANNING CERTIFICATE

UNDER SECTION 10.7 (2) OF THE ENVIRONMENTAL PLANNING AND ASSESSMENT ACT, 1979

Geoenviro Consultancy Pty Ltd  
 PO Box 1543  
 NORTH RYDE NSW 2113

### CERTIFICATE DETAILS

NUMBER	20183843	DATE	16-Oct-2018
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### RECEIPT AND REFERENCE DETAILS

FEE	\$53.00		
RECEIPT NUMBER	4014457	RECEIPT DATE	11-Oct-2018
REFERENCE	JG18129A:42463		

### PROPERTY DESCRIPTION

PROPERTY	322 Hume Highway, BANKSTOWN NSW 2200		
TITLE	Lot 14 DP 1000689		
PARISH	Liberty Plains	COUNTY	CUMBERLAND

### PLANNING INSTRUMENTS

In accordance with Section 10.7(2) and at the date of this certificate the following Environmental Planning Instruments apply to the land.

Bankstown Local Environmental Plan 2015 Gazetted on 05-Mar-2015

### LAND ZONING

SP2 Infrastructure: Educational Establishment

## PLANNING CERTIFICATE

UNDER SECTION 10.7 (2) OF THE ENVIRONMENTAL PLANNING AND ASSESSMENT ACT, 1979

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### SECTION 10.7(2) DETAILS

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In accordance with section 10.7(2) of the Environmental Planning and Assessment Act 1979 (as amended) and at the date of this certificate, the following prescribed matters relate to the land.

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#### 1. NAMES OF RELEVANT PLANNING INSTRUMENTS AND DCPs

---

Affected by Bankstown Local Environmental Plan 2015 Amendments and Planning Proposals in respect of general information as detailed in Appendix 1.

Affected by State Environmental Planning Policies (SEPP's), Proposed State Environmental Planning Policies and Deemed State Environmental Planning Policies as detailed in Appendix 2.

Affected by Bankstown Development Control Plan 2015 (refer to Appendix 3 which lists the contents chapters within the DCP).

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#### 2. ZONING AND LAND USE UNDER RELEVANT LEPs

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Unless specified otherwise in this section of the certificate, the land does not include or comprise critical habitat, is not in a conservation area and has no environmental heritage item on the land.

The purposes for which the plan or instrument provides that development may be carried out within the zone without the need for development consent are specified in clause 3.1 of the LEP 2015 plan and the land use table as detailed in Appendix 4. Reference should be made to the LEP 2015 plan as a whole for details.

The purposes for which the plan or instrument provides that development may not be carried out within the zone except with development consent are specified in Part 2 and clause 3.2 of the LEP 2015 plan and detailed in Appendix 4. Reference should be made to the LEP 2015 plan as a whole for details.

The purposes for which the plan or instrument provides that development is prohibited within the zone are specified in Part 2 and clauses 4.1A-2(c), 4.1B-2(4), 6.6 and 6.8 of the LEP 2015 plan and detailed in Appendix 4. Reference should be made to the LEP 2015 plan as a whole for details.

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#### 2A. ZONING AND LAND USE UNDER STATE ENVIRONMENTAL PLANNING POLICY (SYDNEY REGION GROWTH CENTRES) 2006

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Unless specified otherwise in this section of the certificate, the land is not within any zone or land use under a Precinct Plan, a proposed Precinct Plan or Part 3 of State Environmental Planning Policy (Sydney Region Growth Centres) 2006.

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## PLANNING CERTIFICATE

UNDER SECTION 10.7 (2) OF THE ENVIRONMENTAL PLANNING AND ASSESSMENT ACT, 1979

### 3. COMPLYING DEVELOPMENT

#### Housing Code

Complying development under the Housing Code within "State Environmental Planning Policy (Exempt and Complying Development Codes) 2008" **may not** be carried out on the land.

The land is non complying because the land has been identified by an environmental planning instrument as being either one of the following zones:-

- B5 Business Development, B6 Enterprise Corridor, B7 Business Park
- IN1 General Industrial, IN2 Light Industrial
- SP1 Special Activities, SP2 Infrastructure
- RE1 Public Recreation, RE2 Private Recreation
- E1 National Park and Nature Reserves
- Land unzoned under LEP 2015.....refer to the Land Zoning of this certificate on page 1.

OR

The land is affected by one or more of the following 4 exemptions:-

- A Heritage item ..... refer to clause 2 of this certificate,
- Land in the 25 or higher ANEF contour ..... refer to clause 7 of this certificate,  
(Unless the development is only for the erection of ancillary development, the alteration of or an addition to ancillary development or the alteration of a dwelling house)
- Acid sulfate soils class 1 or 2 ..... refer to clause 7 of this certificate,
- Land in a vegetated buffer area ..... refer to clause 7 of this certificate.

*Note: If the land has been rendered non complying due to an exemption listed above, you are advised to check with Council for the extent of the exemption. The Code may render the land complying for any land which is outside the extent of the exemption. Reference should be made to the "Planning Maps" on Council's website [www.bankstown.nsw.gov.au](http://www.bankstown.nsw.gov.au) which identifies the land exemptions.*

#### Housing Alterations Code

Complying development under the Housing Alterations Code within the provisions of "State Environmental Planning Policy (Exempt and Complying Development Codes) 2008" **may not** be carried out on the land.

The land is non complying because the land has been identified by an environmental planning instrument as being either one of the following zones:-

- B5 Business Development, B6 Enterprise Corridor, B7 Business Park
- IN1 General Industrial, IN2 Light Industrial
- SP1 Special Activities, SP2 Infrastructure
- RE1 Public Recreation, RE2 Private Recreation
- E1 National Park and Nature Reserves
- Land unzoned under LEP 2015.....refer to the Land Zoning of this certificate on page 1.

OR

The land is affected by the following exemption:-

- A Heritage item .....refer to clause 2 of this certificate.

*Note: If the land has been rendered non complying due to an exemption listed above, you are advised to check with Council for the extent of the exemption. The Code may render the land complying for any land which is outside the extent of the exemption. Reference should be made to the "Planning Maps" on Council's website [www.bankstown.nsw.gov.au](http://www.bankstown.nsw.gov.au) which identifies the land exemptions.*

#### Subdivisions Code (strata subdivision)

Complying development under the Subdivisions Code within "State Environmental Planning Policy (Exempt and Complying Development Codes) 2008" **may** be carried out on the land.

#### Rural Housing Code

Complying development under the Rural Housing Code within "State Environmental Planning Policy (Exempt and Complying Development Codes) 2008" **may not** be carried out on the land.

The land is non complying because the land has been identified by an environmental planning instrument as being either one of the following zones:-

- R2 Low Density Residential, R3 Medium Density Residential, R4 High Density Residential
- B1 Neighbourhood Centre, B2 Local Centre, B4 Mixed Use, B5 Business Development, B6 Enterprise Corridor, B7 Business Park
- IN1 General Industrial, IN2 Light Industrial
- SP1 Special Activities, SP2 Infrastructure
- RE1 Public Recreation, RE2 Private Recreation
- E1 National Park and Nature Reserves

## PLANNING CERTIFICATE

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- Land unzoned under LEP 2015.....refer to the Land Zoning of this certificate on page 1.

OR

The land is affected by one or more of the following 4 exemptions:-

- A Heritage item ..... refer to clause 2 of this certificate,
- Land in the 25 or higher ANEF contour..... refer to clause 7 of this certificate,  
(Unless the development is only for the erection of ancillary development, the alteration of or an addition to ancillary development or the alteration of a dwelling house)
- Acid sulfate soils class 1 or 2 ..... refer to clause 7 of this certificate,
- Land in a vegetated buffer area ..... refer to clause 7 of this certificate,

*Note: If the land has been rendered non complying due to an exemption listed above, you are advised to check with Council for the extent of the exemption. The Code may render the land complying for any land which is outside the extent of the exemption. Reference should be made to the "Planning Maps" on Council's website [www.bankstown.nsw.gov.au](http://www.bankstown.nsw.gov.au) which identifies the land exemptions.*

### General Development Code

Complying development under the General Development Code within "State Environmental Planning Policy (Exempt and Complying Development Codes) 2008" **may** be carried out on the land.

### Demolition Code

Complying development under the Demolition Code within "State Environmental Planning Policy (Exempt and Complying Development Codes) 2008" **may** be carried out on the land.

### Fire Safety Code

Complying development under the Fire Safety Code within "State Environmental Planning Policy (Exempt and Complying Development Codes) 2008" **may** be carried out on the land.

### Commercial and Industrial Alterations Code

Complying development under the Commercial and Industrial Alterations Code within the provisions of "State Environmental Planning Policy (Exempt and Complying Development Codes) 2008" **may not** be carried out on the land.

The land is non complying because the land has been identified by an environmental planning instrument as being either one of the following zones:-

- RU4 Primary Production Small Lots
- R2 Low Density Residential, R3 Medium Density Residential, R4 High Density Residential
- SP1 Special Activities, SP2 Infrastructure
- RE1 Public Recreation, RE2 Private Recreation
- E1 National Park and Nature Reserves
- Land unzoned under LEP 2015.....refer to the Land Zoning of this certificate on page 1.

OR

The land is affected by one of the following exemptions:-

- A Heritage item ..... refer to clause 2 of this certificate.
- A Flood Control Lot .....refer to clause 7A of this certificate.

*Note: If the land has been rendered non complying due to an exemption listed above, you are advised to check with Council for the extent of the exemption. The Code may render the land complying for any land which is outside the extent of the exemption. Reference should be made to the "Planning Maps" on Council's website [www.bankstown.nsw.gov.au](http://www.bankstown.nsw.gov.au) which identifies the land exemptions.*

*Further: Although the land is non complying for Subdivisions 9 & 10, the Code may render the land complying for Subdivisions 1-8 and 11-12. Reference should be made to "Part 5 – Commercial and Industrial Alterations Code" of the SEPP for details.*

### Commercial and Industrial (New Buildings and Additions) Code

Complying development under the Commercial and Industrial (New Buildings and Additions) Code within the provisions of "State Environmental Planning Policy (Exempt and Complying Development Codes) 2008" **may not** be carried out on the land.

The land is non complying because the land has been identified by an environmental planning instrument as being either one of the following zones:-

- RU4 Primary Production Small Lots
- R2 Low Density Residential, R3 Medium Density Residential, R4 High Density Residential
- SP1 Special Activities, SP2 Infrastructure
- RE1 Public Recreation, RE2 Private Recreation

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- E1 National Park and Nature Reserves
- Land unzoned under LEP 2015.....refer to the Land Zoning of this certificate on page 1.

OR

The land is affected by one of the following exemptions:-

- A Heritage item ..... refer to clause 2 of this certificate.
- Acid Sulfate Soils class 1 or 2 .....refer to clause 7 of this certificate
- A Vegetated Buffer Area.....refer to clause 7 of this certificate

*Note: If the land has been rendered non complying due to an exemption listed above, you are advised to check with Council for the extent of the exemption. The Code may render the land complying for any land which is outside the extent of the exemption. Reference should be made to the "Planning Maps" on Council's website [www.bankstown.nsw.gov.au](http://www.bankstown.nsw.gov.au) which identifies the land exemptions.*

### 4. COASTAL PROTECTION

Unless specified otherwise in this section of the certificate, the land is not affected by the operation of Section 38 or 39 of the Coastal Protection Act 1979.

#### 4A. CERTAIN INFORMATION RELATING TO BEACHES AND COASTS

Unless specified otherwise in this section of the certificate, the land is not subject to an order under Part 4D of the Coastal Protection Act 1979 in relation to temporary coastal protection works (or on public land adjacent to the land) and, Council has not been notified under Section 55X of the Coastal Protection Act 1979 that temporary coastal protection works have been placed on the land (or on public land adjacent to the land).

#### 4B. ANNUAL CHARGES UNDER LOCAL GOVERNMENT ACT 1993 FOR COASTAL PROTECTION SERVICES THAT RELATE TO EXISTING COASTAL PROTECTION WORKS

Unless specified otherwise in this section of the certificate, the owner (or any previous owner) has not consented in writing that the land is subject to annual charges under Section 496B of the Local Government Act 1993 for coastal protection services that relate to existing coastal protection works.

### 5. MINE SUBSIDENCE

Not affected by Section 15 of the Mine Subsidence Compensation Act 1961, proclaiming land to be a mine subsidence district.

### 6. ROAD WIDENING AND REALIGNMENT

Not affected by any road widening or road realignment under (1) Division 2 of Part 3 of the Roads Act 1993; or (2) any Environmental Planning Instrument; or (3) any resolution of Council. However, the property fronts an existing or proposed arterial/main road. Please check with the Roads and Maritime Services for possible effects.

## PLANNING CERTIFICATE

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### 7. COUNCIL AND OTHER PUBLIC AUTHORITY POLICIES ON HAZARD RISK RESTRICTIONS

Unless specified otherwise in this section of the certificate, the land is not affected by policies adopted by Council or by any other authority (that has notified Council of its adoption) that restricts development of the land. For bush fire prone land refer to section 11. For flood prone land refer to section 7A.

Affected by a resolution of Council adopting a policy concerning the management of contaminated land. That policy applies to all land in the City of Canterbury-Bankstown and will restrict development of the land if the circumstances set out in the policy prevail. A copy of the policy is available on Council's website at [www.bankstown.nsw.gov.au](http://www.bankstown.nsw.gov.au) or from the Customer Service Area.

Note: Additional information regarding contaminated land matters for this property may also be provided on part 5 of this section 10.7 planning certificate. For further information contact Council on 9707 9000.

### 7A. FLOOD RELATED DEVELOPMENT CONTROLS INFORMATION

Unless specified otherwise in this section of the certificate, the land is not affected by flood related development controls.

#### A Flood control lot.

The property is affected by a policy known as Bankstown Development Control Plan 2015, Part B12 - Flood Risk Management and clause 6.3 – Flood planning of the LEP 2015, by reference to the Rookwood Road Catchment Flood Study, February 2010 (a copy of which is available for inspection at Council's Offices), which categorises land affected by the 100 year flood into two flood risk precincts:

- High flood risk precinct – Land below the 100 year flood that is either subject to a high hydraulic hazard or where there are significant evacuation difficulties; and
- Medium flood risk precinct - Land below the 100 year flood that is not subject to a high hydraulic hazard and where there are no evacuation difficulties.

Bankstown Development Control Plan 2015 includes flood related development controls for properties based on the relevant flood risk precinct. Contact Council for information about the flood risk precinct applying to this property.

### 8. LAND RESERVED FOR ACQUISITION

Not affected by either an Environmental Planning Instrument or proposed Environmental Planning Instrument referred to in clause 5.1 providing for the acquisition of the land or part of the land by a public authority, as referred to in Section 27 of the Environmental Planning & Assessment Act. Reference should be made to the LEP 2015 plan as a whole for details.

### 9. CONTRIBUTION PLANS

Affected by Bankstown City Council Section 94A Development Contributions Plan 2009 which allows Council to impose a levy on development within the City of Canterbury-Bankstown in accordance with Directions issued by the Minister for Planning. The levy will be spent on the provision of public works and infrastructure. Date of commencement 8<sup>th</sup> June 2009. For further details on the plan contact Council on 9707 9000 or visit Council's website – [www.bankstown.nsw.gov.au](http://www.bankstown.nsw.gov.au)



## PLANNING CERTIFICATE

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### 9A. BIODIVERSITY CERTIFIED LAND

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Unless specified otherwise in this section of the certificate, the land is not biodiversity certified land within the meaning of Part 7AA of the Threatened Species Conservation Act 1995.

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### 10. BIOBANKING AGREEMENTS

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Unless specified otherwise in this section of the certificate, the land is not subject to a Biobanking Agreement under Part 7A of the Threatened Species Conservation Act 1995, made by the Department of Environment, Climate Change and Water that has notified Council of the existence of the agreement.

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### 11. BUSHFIRE PRONE LAND

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Unless specified otherwise in this section of the certificate, the land is not bushfire prone.

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### 12. PROPERTY VEGETATION PLANS

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Unless specified otherwise in this section of the certificate, the land is not subject to a Property Vegetation Plan under the Native Vegetation Act 2003, as approved by any other authority that has notified Council of the existence of the plan.

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### 13. ORDERS UNDER TREES (DISPUTES BETWEEN NEIGHBOURS) ACT 2006

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Unless specified otherwise in this section of the certificate, the land is not subject to a Tree Order under the Trees (Disputes Between Neighbours) Act 2006, made by an authority that has notified Council of the existence of the order.

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### 14. DIRECTIONS UNDER PART 3A

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Unless specified otherwise in this section of the certificate, the land is not subject to a Direction by the Minister under section 75P (2) (c1) of the Act that a provision of an EPI does not have an effect.

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### 15. CONDITIONS AFFECTING SENIORS HOUSING

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Unless specified otherwise in this section of the certificate, the land is not subject to a development application granted after 12.10.2007 under SEPP (Housing for Seniors or People with a Disability) 2004 setting out the terms of any conditions imposed under clause 18(2) or a current site compatibility certificate issued under clause 25 of the SEPP.

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## PLANNING CERTIFICATE

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### 16. SITE COMPATIBILITY CERTIFICATES FOR INFRASTRUCTURE

Unless specified otherwise in this section of the certificate, the land is not subject to a development application under clause 19 of SEPP (Infrastructure) 2007 where a valid site compatibility certificate has been issued.

### 17. SITE COMPATIBILITY CERTIFICATES & CONDITIONS FOR AFFORDABLE RENTAL HOUSING

Unless specified otherwise in this section of the certificate, the land is not subject to a development application under SEPP (Affordable Rental Housing) 2009 where a valid site compatibility certificate and conditions have been issued.

### 18. PAPER SUBDIVISION INFORMATION

Unless specified otherwise in this section of the certificate, the land is not subject to a paper subdivision or subdivision order.

### 19. SITE VERIFICATION CERTIFICATES

Unless specified otherwise in this section of the certificate, the land is not subject to a current site verification certificate of which the Council is aware in respect to Division 3 of Part 4AA of State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007.

### 20. LOOSE-FILL ASBESTOS INSULATION

A residential dwelling erected on this land has not been identified in the Loose-Fill Asbestos Insulation Register as containing loose-fill ceiling insulation. Contact NSW Fair Trading for more information.

### MATTERS ARISING UNDER THE CONTAMINATED LAND MANAGEMENT ACT, 1997

Unless specified otherwise in this section of the certificate, there are no matters arising under Section 59(2) of the Contaminated Land Management Act 1997.

### MATTERS ARISING UNDER THE NATION BUILDING AND JOBS PLAN (STATE INFRASTRUCTURE DELIVERY) ACT, 2009

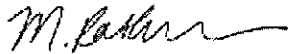
Unless specified otherwise in this section of the certificate, there are no matters arising under Section 26 of the Nation Building and Jobs Plan (State Infrastructure Delivery) Act 2009.

This completes the prescribed matters for the certificate under section 10.7(2) of the Environmental Planning and Assessment Act 1979, as amended. While this certificate indicates the zoning of the land, it is suggested that the relevant Planning Instrument be inspected on Council's website under Development – Planning Maps or at Council's Customer Service Centre to provide an overall view of the area and the site's surrounding zonings.

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Please contact Council's general enquiries number listed at the bottom of this sheet for further information about any matter referred to in this certificate.



Melissa Ratkun  
Manager Information Management

## PLANNING CERTIFICATE

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### Appendix 1

#### **Bankstown Local Environmental Plan 2015 Amendments & Planning Proposals.**

*(relating to general information only which may affect part or the whole of the City)*

Note: As of 1 July 2009, Draft LEP's have been replaced with "Planning Proposals". A planning proposal is a document that explains the intended effect of, and justification for, a proposed LEP.

**Nil**

## PLANNING CERTIFICATE

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### Appendix 2

#### State Environmental Planning Policies (SEPP's), Proposed SEPP's and Deemed SEPP's

Note: The names of the relevant instrument's plus their gazettal dates are listed below. For further details please refer to the Department of Planning website [www.planning.nsw.gov.au](http://www.planning.nsw.gov.au) under the heading "Planning System – Legislation and Planning Instruments".

SEPP No.19 – Bushland in Urban Areas, gazetted 24.10.1986  
 SEPP No.21 – Caravan Parks, gazetted 24.4.1992  
 SEPP No.30 – Intensive Agriculture, gazetted 8.12.1989  
 SEPP No.32 – Urban Consolidation (Redevelopment of Urban Land), gazetted 15.11.1991  
 SEPP No.33 – Hazardous and Offensive Development, gazetted 13.3.1992  
 SEPP No.50 – Canal Estate Development, gazetted 10.11.1997  
 SEPP No.55 – Remediation of Land, gazetted 28.8.1998  
 SEPP No.62 – Sustainable Aquaculture, gazetted 25.8.2000  
 SEPP No.64 – Advertising and Signage, gazetted 16.3.2001  
 SEPP No.65 – Design Quality of Residential Flat Development, gazetted 26.7.2002  
 SEPP – (Housing for Seniors or People with a Disability) 2004, gazetted 31.3.2004  
 SEPP – (Building Sustainability Index: BASIX) 2004, gazetted 25.6.2004  
 SEPP – (Major Development) 2005, gazetted 1.8.2005  
 SEPP – (Mining, Petroleum Production and Extractive Industries) 2007, gazetted 16.2.2007  
 SEPP – (Miscellaneous Consent Provisions) 2007, gazetted 26.10.2007  
 SEPP – (Infrastructure) 2007, gazetted 21.12.2007  
 SEPP – (Exempt and Complying Development Codes) 2008, gazetted 12.12.2008  
 SEPP – (Affordable Rental Housing) 2009, gazetted 31.7.2009  
 SEPP – (Sydney Drinking Water Catchment) 2011, gazetted 21.1.2011

#### PROPOSED SEPP - Competition SEPP, 27.7.2010

Note: As of 1 July 2009, regional environmental plans (REPs) are no longer part of the hierarchy of environmental planning instruments in NSW. The removal of the REP layer is intended to simplify the State's planning system. All existing REPs (listed below) are now deemed State environmental planning policies (SEPPs).

Deemed SEPP – Greater Metropolitan Regional Environmental Plan No. 2 – Georges River Catchment, gazetted 5.2.1999

## PLANNING CERTIFICATE

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### Appendix 3

#### Bankstown Development Control Plan 2015

DATE OF COMMENCEMENT – 13<sup>th</sup> May 2015

The following is a list of the contents within Bankstown Development Control Plan 2015. If further information is required please contact Council on 9707 9000.

INTRODUCTION	
PART A	PRECINCT CONTROLS
A1	Centres
A2	Corridors
A3	Key infill development sites
PART B	GENERAL CONTROLS
B1	Residential development
B2	Commercial centres
B3	Industrial precincts
B4	Sustainable development
B5	Parking
B6	Child care centres
B7	Educational establishments
B8	Places of public worship
B9	Sex services premises
B10	Telecommunications facilities
B11	Tree preservation order
B12	Flood risk management

Please note: Council may from time to time exhibit draft changes to the development control plan that may affect your land. To find out more, please contact Council on 9707 9000 or view Council's website and refer to the Development Control Plan - [www.bankstown.nsw.gov.au](http://www.bankstown.nsw.gov.au)

## PLANNING CERTIFICATE

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### Appendix 4

#### Land Use Table

**Note.** A type of development referred to in the Land Use Table is a reference to that type of development only to the extent it is not regulated by an applicable State environmental planning policy. The following State environmental planning policies in particular may be relevant to development on land to which this Plan applies:

*State Environmental Planning Policy (Affordable Rental Housing) 2009* (including provision for secondary dwellings)  
*State Environmental Planning Policy (Housing for Seniors or People with a Disability) 2004*  
*State Environmental Planning Policy (Infrastructure) 2007* (relating to public facilities such as those for air transport, correction, education, electricity generation, health services, ports, railways, roads, waste management and water supply systems)  
*State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007*  
*State Environmental Planning Policy (Rural Lands) 2008*  
*State Environmental Planning Policy No 33—Hazardous and Offensive Development*  
*State Environmental Planning Policy No 50—Canal Estate Development*  
*State Environmental Planning Policy No 62—Sustainable Aquaculture*  
*State Environmental Planning Policy No 64—Advertising and Signage*

<b>Zone RU4 Primary Production Small Lots</b>
<b>Permitted without consent</b> Home occupations
<b>Permitted with consent</b> Agriculture; Animal boarding or training establishments; Building identification signs; Business identification signs; Dwelling houses; Environmental facilities; Environmental protection works; Extensive agriculture; Farm buildings; Flood mitigation works; Intensive plant agriculture; Kiosks; Plant nurseries; Recreation areas; Recreation facilities (indoor); Recreation facilities (outdoor); Roads; Roadside stalls; Water supply systems
<b>Prohibited</b> Any development not specified in item 2 or 3

<b>Zone R2 Low Density Residential</b>
<b>Permitted without consent</b> Home occupations
<b>Permitted with consent</b> Bed and breakfast accommodation; Boarding houses; Boat sheds; Building identification signs; Business identification signs; Car parks; Child care centres; Community facilities; Dual occupancies; Dwelling houses; Emergency services facilities; Environmental facilities; Environmental protection works; Exhibition homes; Flood mitigation works; Group homes; Health consulting rooms; Home-based child care; Hospitals; Information and education facilities; Jetties; Multi dwelling housing; Places of public worship; Public administration buildings; Recreation areas; Respite day care centres; Roads; Secondary dwellings; Semi-detached dwellings; Seniors housing; Water recreation structures; Water supply systems
<b>Prohibited</b> Any development not specified in item 2 or 3

<b>Zone R3 Medium Density Residential</b>
<b>Permitted without consent</b> Nil
<b>Permitted with consent</b> Attached dwellings; Bed and breakfast accommodation; Boarding houses; Building identification signs; Business identification signs; Car parks; Child care centres; Community facilities; Dwelling houses; Emergency services facilities; Environmental facilities; Environmental protection works; Flood mitigation works; Group homes; Information and education facilities; Multi dwelling housing; Neighbourhood shops; Places of public worship; Public administration buildings; Recreation areas; Respite day care centres; Roads; Secondary dwellings; Seniors housing; Water supply systems
<b>Prohibited</b> Any development not specified in item 2 or 3

## PLANNING CERTIFICATE

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<b>Zone R4 High Density Residential</b>
<b>Permitted without consent</b>
Nil
<b>Permitted with consent</b>
Attached dwellings; Bed and breakfast accommodation; Boarding houses; Building identification signs; Business identification signs; Car parks; Child care centres; Community facilities; Dwelling houses; Emergency services facilities; Environmental facilities; Environmental protection works; Flood mitigation works; Information and education facilities; Multi dwelling housing; Neighbourhood shops; Places of public worship; Public administration buildings; Recreation areas; Residential flat buildings; Respite day care centres; Roads; Secondary dwellings; Seniors housing; Serviced apartments; Shop top housing; Water supply systems
<b>Prohibited</b>
Any development not specified in item 2 or 3

<b>Zone B1 Neighbourhood Centre</b>
<b>Permitted without consent</b>
Nil
<b>Permitted with consent</b>
Boarding houses; Building identification signs; Bulky goods premises; Business identification signs; Business premises; Car parks; Child care centres; Community facilities; Environmental facilities; Environmental protection works; Flood mitigation works; Garden centres; Hardware and building supplies; Health services facilities; Information and education facilities; Kiosks; Landscaping material supplies; Markets; Medical centres; Neighbourhood shops; Office premises; Places of public worship; Plant nurseries; Public administration buildings; Recreation areas; Recreation facilities (indoor); Recreation facilities (outdoor); Registered clubs; Research stations; Residential flat buildings; Respite day care centres; Restaurants or cafes; Roads; Seniors housing; Service stations; Shop top housing; Shops; Take away food and drink premises; Timber yards; Tourist and visitor accommodation; Vehicle repair stations; Vehicle sales or hire premises; Veterinary hospitals; Water supply systems
<b>Prohibited</b>
Any development not specified in item 2 or 3

<b>Zone B2 Local Centre</b>
<b>Permitted without consent</b>
Nil
<b>Permitted with consent</b>
Boarding houses; Building identification signs; Business identification signs; Child care centres; Commercial premises; Community facilities; Educational establishments; Entertainment facilities; Function centres; Information and education facilities; Medical centres; Passenger transport facilities; Recreation facilities (indoor); Registered clubs; Residential flat buildings; Respite day care centres; Restricted premises; Roads; Seniors housing; Service stations; Shop top housing; Tourist and visitor accommodation; Any other development not specified in item 2 or 4
<b>Prohibited</b>
Agriculture; Air transport facilities; Airstrips; Animal boarding or training establishments; Biosolids treatment facilities; Boat building and repair facilities; Boat launching ramps; Boat sheds; Camping grounds; Caravan parks; Cemeteries; Charter and tourism boating facilities; Correctional centres; Crematoria; Depots; Eco-tourist facilities; Electricity generating works; Exhibition homes; Exhibition villages; Extractive industries; Farm buildings; Forestry; Freight transport facilities; Heavy industrial storage establishments; Helipads; Highway service centres; Home occupations (sex services); Industrial retail outlets; Industrial training facilities; Industries; Jetties; Marinas; Mooring pens; Moorings; Mortuaries; Open cut mining; Port facilities; Residential accommodation; Rural industries; Sewage treatment plants; Sex services premises; Signage; Storage premises; Transport depots; Truck depots; Vehicle body repair workshops; Waste or resource management facilities; Water recreation structures; Water recycling facilities; Wharf or boating facilities; Wholesale supplies



## PLANNING CERTIFICATE

UNDER SECTION 10.7 (2) OF THE ENVIRONMENTAL PLANNING AND ASSESSMENT ACT, 1979

<b>Zone B4 Mixed Use</b>
<b>Permitted without consent</b>
Nil
<b>Permitted with consent</b>
Boarding houses; Building identification signs; Business identification signs; Child care centres; Commercial premises; Community facilities; Educational establishments; Entertainment facilities; Function centres; Hotel or motel accommodation; Information and education facilities; Medical centres; Passenger transport facilities; Recreation facilities (indoor); Registered clubs; Residential flat buildings; Respite day care centres; Restricted premises; Roads; Seniors housing; Shop top housing; Any other development not specified in item 2 or 4
<b>Prohibited</b>
Agriculture; Air transport facilities; Airstrips; Animal boarding or training establishments; Biosolids treatment facilities; Boat building and repair facilities; Boat launching ramps; Boat sheds; Camping grounds; Caravan parks; Cemeteries; Charter and tourism boating facilities; Crematoria; Depots; Eco-tourist facilities; Electricity generating works; Exhibition homes; Exhibition villages; Extractive industries; Farm buildings; Forestry; Freight transport facilities; Heavy industrial storage establishments; Highway service centres; Home occupations (sex services); Industrial retail outlets; Industrial training facilities; Industries; Jetties; Marinas; Mooring pens; Moorings; Mortuaries; Open cut mining; Port facilities; Residential accommodation; Resource recovery facilities; Rural industries; Sewage treatment plants; Sex services premises; Signage; Storage premises; Transport depots; Truck depots; Vehicle body repair workshops; Warehouse and distribution centres; Waste disposal facilities; Water recreation structures; Water recycling facilities; Wharf or boating facilities; Wholesale supplies

<b>Zone B5 Business Development</b>
<b>Permitted without consent</b>
Nil
<b>Permitted with consent</b>
Building identification signs; Bulky goods premises; Business identification signs; Business premises; Child care centres; Food and drink premises; Garden centres; Hardware and building supplies; Hotel or motel accommodation; Kiosks; Landscaping material supplies; Markets; Neighbourhood shops; Office premises; Passenger transport facilities; Plant nurseries; Respite day care centres; Roads; Serviced apartments; Timber yards; Vehicle sales or hire premises; Warehouse or distribution centres; Any other development not specified in item 2 or 4
<b>Prohibited</b>
Agriculture; Air transport facilities; Airstrips; Amusement centres; Animal boarding or training establishments; Biosolids treatment facilities; Boat building and repair facilities; Boat launching ramps; Boat sheds; Camping grounds; Caravan parks; Cemeteries; Charter and tourism boating facilities; Commercial premises; Correctional centres; Crematoria; Depots; Eco-tourist facilities; Electricity generating works; Exhibition homes; Exhibition villages; Extractive industries; Farm buildings; Forestry; Freight transport facilities; Heavy industrial storage establishments; Helipads; Home occupations (sex services); Industries; Jetties; Marinas; Mooring pens; Moorings; Mortuaries; Open cut mining; Port facilities; Residential accommodation; Resource recovery facilities; Restricted premises; Rural industries; Sewage treatment plants; Sex services premises; Signage; Storage premises; Tourist and visitor accommodation; Transport depots; Truck depots; Vehicle body repair workshops; Waste disposal facilities; Water recreation structures; Water recycling facilities; Wharf or boating facilities; Wholesale supplies

<b>Zone B6 Enterprise Corridor</b>
<b>Permitted without consent</b>
Nil
<b>Permitted with consent</b>
Building identification signs; Bulky goods premises; Business identification signs; Business premises; Community facilities; Food and drink premises; Garden centres; Hardware and building supplies; Hotel or motel accommodation; Kiosks; Landscaping material supplies; Light industries; Markets; Multi dwelling housing; Neighbourhood shops; Office premises; Passenger transport facilities; Plant nurseries; Residential flat buildings; Roads; Seniors housing; Timber yards; Vehicle sales or hire premises; Warehouse or distribution centres; Any other development not specified in item 2 or 4
<b>Prohibited</b>
Agriculture; Air transport facilities; Airstrips; Amusement centres; Animal boarding or training establishments; Biosolids treatment facilities; Boat building and repair facilities; Boat launching ramps; Boat sheds; Camping grounds; Caravan parks; Cemeteries; Charter and tourism boating facilities; Commercial premises; Correctional centres; Crematoria; Depots; Eco-tourist facilities; Electricity generating works; Exhibition homes; Exhibition villages; Extractive industries; Farm buildings; Forestry; Freight transport facilities; Heavy industrial storage establishments; Helipads; Home occupations (sex services); Industries; Jetties; Marinas; Mooring pens; Moorings; Mortuaries; Open cut mining; Port facilities; Residential accommodation; Resource recovery facilities; Restricted premises; Rural industries; Sewage treatment plants; Sex services premises; Signage; Storage premises; Transport depots; Truck depots; Vehicle body repair workshops; Waste disposal facilities; Water recreation structures; Water recycling facilities; Wharf or boating facilities; Wholesale supplies

## PLANNING CERTIFICATE

UNDER SECTION 10.7 (2) OF THE ENVIRONMENTAL PLANNING AND ASSESSMENT ACT, 1979

<b>Zone B7 Business Park</b>
<b>Permitted without consent</b>
Nil
<b>Permitted with consent</b>
Building identification signs; Business identification signs; Child care centres; Light industries; Neighbourhood shops; Office premises; Passenger transport facilities; Respite day care centres; Roads; Warehouse or distribution centres; Any other development not specified in item 2 or 4
<b>Prohibited</b>
Agriculture; Air transport facilities; Airstrips; Amusement centres; Animal boarding or training establishments; Biosolids treatment facilities; Boat building and repair facilities; Boat launching ramps; Boat sheds; Camping grounds; Caravan parks; Cemeteries; Charter and tourism boating facilities; Commercial premises; Correctional centres; Crematoria; Depots; Eco-tourist facilities; Electricity generating works; Entertainment facilities; Exhibition homes; Exhibition villages; Extractive industries; Farm buildings; Forestry; Freight transport facilities; Function centres; Heavy industrial storage establishments; Highway service centres; Home occupations (sex services); Industrial retail outlets; Industries; Jetties; Marinas; Mooring pens; Moorings; Mortuaries; Open cut mining; Places of public worship; Port facilities; Recreation facilities (indoor); Recreation facilities (major); Recreation facilities (outdoor); Registered clubs; Residential accommodation; Resource recovery facilities; Restricted premises; Rural industries; Service stations; Sewage treatment plants; Sex services premises; Signage; Storage premises; Tourist and visitor accommodation; Transport depots; Truck depots; Vehicle body repair workshops; Vehicle repair stations; Veterinary hospitals; Waste disposal facilities; Water recreation structures; Water recycling facilities; Wharf or boating facilities; Wholesale supplies

<b>Zone IN1 General Industrial</b>
<b>Permitted without consent</b>
Nil
<b>Permitted with consent</b>
Agricultural produce industries; Building identification signs; Business identification signs; Depots; Food and drink premises; Freight transport facilities; Garden centres; General industries; Hardware and building supplies; Hospitals; Industrial training facilities; Kiosks; Landscaping material supplies; Light industries; Markets; Medical centres; Neighbourhood shops; Plant nurseries; Roads; Timber yards; Vehicle sales or hire premises; Warehouse or distribution centres; Any other development not specified in item 2 or 4
<b>Prohibited</b>
Agriculture; Air transport facilities; Airstrips; Amusement centres; Biosolids treatment facilities; Boat launching ramps; Boat sheds; Camping grounds; Caravan parks; Cemeteries; Charter and tourism boating facilities; Child care centres; Commercial premises; Eco-tourist facilities; Entertainment facilities; Exhibition homes; Exhibition villages; Extractive industries; Farm buildings; Forestry; Function centres; Health services facilities; Heavy industrial storage establishments; Home occupations (sex services); Industries; Jetties; Marinas; Mooring pens; Moorings; Open cut mining; Port facilities; Residential accommodation; Respite day care centres; Restricted premises; Rural industries; Schools; Sewage treatment plants; Signage; Tourist and visitor accommodation; Water recreation structures; Water recycling facilities; Wharf or boating facilities; Wholesale supplies

<b>Zone IN2 Light Industrial</b>
<b>Permitted without consent</b>
Nil
<b>Permitted with consent</b>
Agricultural produce industries; Building identification signs; Business identification signs; Depots; Food and drink premises; Garden centres; Hardware and building supplies; Hospitals; Industrial training facilities; Kiosks; Landscaping material supplies; Light industries; Markets; Medical centres; Neighbourhood shops; Plant nurseries; Roads; Timber yards; Vehicle sales or hire premises; Warehouse or distribution centres; Any other development not specified in item 2 or 4
<b>Prohibited</b>
Agriculture; Air transport facilities; Airstrips; Amusement centres; Biosolids treatment facilities; Boat launching ramps; Boat sheds; Camping grounds; Caravan parks; Cemeteries; Charter and tourism boating facilities; Child care centres; Commercial premises; Correctional centres; Crematoria; Eco-tourist facilities; Entertainment facilities; Exhibition homes; Exhibition villages; Extractive industries; Farm buildings; Forestry; Freight transport facilities; Function centres; Health services facilities; Heavy industrial storage establishments; Helipads; Highway service centres; Home occupations (sex services); Industries; Jetties; Marinas; Mooring pens; Moorings; Mortuaries; Open cut mining; Port facilities; Recreation facilities (major); Residential accommodation; Resource recovery facilities; Respite day care centres; Restricted premises; Rural industries; Schools; Sewage treatment plants; Signage; Tourist and visitor accommodation; Transport depots; Truck depots; Waste disposal facilities; Water recreation structures; Water recycling facilities; Wharf or boating facilities; Wholesale supplies

## PLANNING CERTIFICATE

UNDER SECTION 10.7 (2) OF THE ENVIRONMENTAL PLANNING AND ASSESSMENT ACT, 1979

<b>Zone SP1 Special Activities</b>
<b>Permitted without consent</b>
Nil
<b>Permitted with consent</b>
The purpose shown on the Land Zoning Map, including any development that is ordinarily incidental or ancillary to development for that purpose
<b>Prohibited</b>
Any development not specified in item 2 or 3

<b>Zone SP2 Infrastructure</b>
<b>Permitted without consent</b>
Nil
<b>Permitted with consent</b>
Roads; The purpose shown on the Land Zoning Map, including any development that is ordinarily incidental or ancillary to development for that purpose
<b>Prohibited</b>
Any development not specified in item 2 or 3

<b>Zone RE1 Public Recreation</b>
<b>Permitted without consent</b>
Nil
<b>Permitted with consent</b>
Boat launching ramps; Boat sheds; Building identification signs; Business identification signs; Car parks; Caravan parks; Charter and tourism boating facilities; Child care centres; Community facilities; Eco-tourist facilities; Emergency services facilities; Entertainment facilities; Environmental facilities; Environmental protection works; Extensive agriculture; Flood mitigation works; Food and drink premises; Function centres; Information and education facilities; Intensive plant agriculture; Jetties; Kiosks; Marinas; Markets; Recreation areas; Recreation facilities (indoor); Recreation facilities (major); Recreation facilities (outdoor); Respite day care centres; Roads; Water recreation structures; Water supply systems; Wharf or boating facilities
<b>Prohibited</b>
Any development not specified in item 2 or 3

<b>Zone RE2 Private Recreation</b>
<b>Permitted without consent</b>
Nil
<b>Permitted with consent</b>
Building identification signs; Business identification signs; Car parks; Community facilities; Environmental facilities; Environmental protection works; Flood mitigation works; Helipads; Kiosks; Marinas; Recreation areas; Recreation facilities (indoor); Recreation facilities (outdoor); Registered clubs; Roads; Water supply systems
<b>Prohibited</b>
Any development not specified in item 2 or 3

<b>Zone E1 National Parks and Nature Reserves</b>
<b>Permitted without consent</b>
Uses authorised under the National Parks and Wildlife Act 1974
<b>Permitted with consent</b>
Nil
<b>Prohibited</b>
Any development not specified in item 2 or 3

<b>Zone W1 Natural Waterways</b>
<b>Permitted without consent</b>
Nil
<b>Permitted with consent</b>
Boat launching ramps; Boat sheds; Charter and tourism boating facilities; Environmental facilities; Environmental protection works; Flood mitigation works; Jetties; Marinas; Mooring pens; Moorings; Water recreation structures; Wharf or boating facilities
<b>Prohibited</b>
Business premises; Hotel or motel accommodation; Industries; Multi dwelling housing; Recreation facilities (major); Residential flat buildings; Restricted premises; Retail premises; Seniors housing; Service stations; Warehouse or distribution centres; Any other development not specified in item 2 or 3

## **APPENDIX C**

### **Laboratory Certificates – Geotechnical**



# GeoEnviro Consultancy Pty Ltd

Unit 5, 39-41 Fourth Avenue, Blacktown NSW 2148, Australia  
Tel: (02) 96798733 Fax: (02) 96798744

## Test Results - California Bearing Ratio

Client / Address: JDH Architects / Darlinghurst			Job No: JG18129A			
Project: Proposed School Upgrade			Date: 17/10/18			
Location: Bankstown North Public School			Report No: R01A			
<b>SAMPLE INFORMATION Test Methods</b>						
Lab Reference No.	SR12360	SR12361	SR 12364	SR 12369		
Date Sampled	02-Oct-18	02-Oct-18	02-Oct-18	02-Oct-18		
Date Tested	19-Oct-18	19-Oct-18	19-Oct-18	19-Oct-18		
Sample Identification	BH 1 (0.6-1.0m)	BH 3 (0.7-1.0m)	BH 6 (0.3-0.5m)	BH 12 (0.5-1.0m)		
Laboratory Specimen Description	Silty Clay brown	Silty Clay Brown	Silty Clay Red brown	Silty Clay: brown		
<b>Preparation of the test sample</b>						
Liquid Limit Preformed Yes / No	No	No	No	No		
Visual / Tactile Assessment Yes / No	Yes	Yes	Yes	Yes		
Sample Curing Time	96 h (4 days)	96 h (4 days)	96 h (4 days)	96 h (4 days)		
<b>TEST RESULTS</b>						
<b>Laboratory Compaction &amp; Moisture Content - Test Methods AS1289 5.1.1 Mould A and AS1289 2.1.1</b>						
Maximum Dry Density t/m3	1.62	1.61	1.56	1.55		
Optimum Moisture Content %	21.0	23.0	24.0	25.0		
Field Moisture Content %	19.0	19.5	21.0	26.5		
% Of Oversize 19mm	Nil	Nil	Nil	Nil		
Replacement of Oversize (See note B)	NA	NA	NA	NA		
<b>California Bearing Ratio - Test Method AS1289 6.1.1</b>						
C B R  T E S T	Dry Density t/m3	Before Soaking	1.62	1.61	1.57	1.56
		After Soaking	1.57	1.56	1.53	1.51
	Density Ratio %	Before Soaking	100.5	100.0	100.5	100.5
		After Soaking	97.0	97.0	97.5	97.0
	Moisture Content %	Before Soaking	21.5	22.5	24.5	25.0
		After Soaking	25.0	25.0	27.5	28.0
	Number of Days Soaked	4	4	4	4	
	Surcharge kg	4.5	4.5	4.5	6.75	
	Moisture Content After Test %	Top 30mm	28.5	28.5	28.5	33.0
		Whole Sample	24.5	25.0	27.0	28.0
Swell After Soaking %	3.5	3.0	2.5	3.0		
Penetration mm	2.5	2.5	2.5	2.5		
CBR Value %	2.0	2.0	2.0	2.5		
Notes: (A) Test specimen was compacted to a target dry density of 100 percent standard (AS 1289 5.1.1)						
(B) If specified the percentage of oversize retained on the 19mm may be replaced by an equal portion of -19mm to +4.75mm						
Remarks						

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Form No. R003/Ver08/06/18



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Authorised Signatory

Solem Liew Date 17/10/18



# GeoEnviro Consultancy Pty Ltd

Unit 5, 39-41 Fourth Avenue, Blacktown NSW 2148, Australia

Tel: (02) 96798733 Fax: (02) 96798744

## Test Results - Shrink/Swell Index

Client / Address: JDH Architects / Darlinghurst		Job No: JG18129A		
Project: Proposed School Upgrade		Date: 17/10/18		
Location: Bankstown North Public School		Report No: R02A		
Test Procedure: AS 1289 7.1.1				
Sample Identification	BH 3 (1.0-1.4m)	BH 4 (0.8-1.1m)	BH 6 (0.5-0.9m)	BH 12 (0.5-1.0m)
Sample Register No	SR12362	SR12363	SR12366	SR12370
Sample Date	3-Oct-18	3-Oct-18	3-Oct-18	3-Oct-18
Test Date	10-Oct-18	10-Oct-18	10-Oct-18	10-Oct-18
Sample Procedure	AS 1289 1.1, 1.2.1 (6.5.3)	AS 1289 1.1, 1.2.1 (6.5.3)	AS 1289 1.1, 1.2.1 (6.5.3)	AS 1289 1.1, 1.2.1 (6.5.3)
<b>Test Results</b>				
Test Procedure	AS 1289 2.1.1	AS 1289 2.1.1	AS 1289 2.1.1	AS 1289 2.1.1
Moisture Content				
Initial %	22.5	15.5	22.5	26.5
Final %	27.0	21.5	26.5	29.5
Test Procedure	AS 1289 7.1.1	AS 1289 7.1.1	AS 1289 7.1.1	AS 1289 7.1.1
Estimated UCS				
Before Test kPa	>600	>600	>600	>600
After Test kPa	180	490	340	140
Swell %	5.7	4.8	4.1	2.2
Shrinkage %	4.3	1.7	4.0	3.0
Shrink/Swell Index %/pF	3.9	2.3	3.3	2.3
Material Description	Silty Clay: brown red grey	Silty Clay: red brown	Silty Clay: red brown	Silty Clay: red brown
Remarks				

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Form No. R013/Ver 07/07/13



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Solern Liew Date 17/10/18



# GeoEnviro Consultancy Pty Ltd

Unit 5, 39-41 Fourth Avenue, Blacktown NSW 2148, Australia  
Tel: (02) 96798733 Fax: (02) 96798744

## Test Results - Atterberg Limits

Client / Address: JDH Architects / Darlinghurst			Job No: JG18129A	
Project: Proposed School Upgrade			Date: 17/10/18	
Location: Bankstown North Public School			Report No: R03A	
Sample Identification	BH 6 (0.3-0.5m)	BH 9 (1.3-1.5m)	BH 10 (0.4-0.8m)	BH 12 (2.3-2.5m)
Sample Register No	SR12365	SR12367	SR12368	SR12371
Sample Date	3-Oct-18	3-Oct-18	3-Oct-18	3-Oct-18
Test Date	10-Oct-18	10-Oct-18	10-Oct-18	10-Oct-18
Sample Procedure	AS 1289 1.1, 1.2.1 (6.5.3)	AS 1289 1.1, 1.2.1 (6.5.3)	AS 1289 1.1, 1.2.1 (6.5.3)	AS 1289 1.1, 1.2.1 (6.5.3)
<b>Test Results</b>				
Test Procedure:	AS 1289 3.1.2	AS 1289 3.1.2	AS 1289 3.1.2	AS 1289 3.1.2
Liquid Limit (%)	70	40	57	53
Test Procedure:	AS 1289 3.2.1	AS 1289 3.2.1	AS 1289 3.2.1	AS 1289 3.2.1
Plastic Limit (%)	30	20	25	22
Test Procedure:	AS 1289 3.3.1	AS 1289 3.3.1	AS 1289 3.3.1	AS 1289 3.3.1
Plasticity Index (%)	41	23	32	31
Test Procedure:	AS 1289 3.4.1	AS 1289 3.4.1	AS 1289 3.4.1	AS 1289 3.4.1
Linear Shrinkage (%)	15.5	11.0	12.0	12.0
Test Procedure:	AS 1289 2.1.1	AS 1289 2.1.1	AS 1289 2.1.1	AS 1289 2.1.1
Natural Moisture Content %	21.0	9.5	27.5	16.5
Material Description	(CH) Silty Clay: high plasticity, red brown	(CI) Silty Clay: medium plasticity, grey brown	(CH) Silty Clay: high plasticity, grey brown	(CI-CH) Silty Clay: medium to high plasticity, grey brown
Remarks				

c:/lab/reports/R004

Form No. R004/Ver 08/07/13



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Authorised Signatory

Solern Liew Date 17/10/18

## **APPENDIX D**

### **Laboratory Certificates – Salinity**



## CERTIFICATE OF ANALYSIS 202313

### Client Details

<b>Client</b>	Geoenviro Consultancy Pty Ltd
<b>Attention</b>	Solern Liew
<b>Address</b>	PO Box 1543, Macquarie Centre, North Ryde, NSW, 2113

### Sample Details

<b>Your Reference</b>	<b><u>JG18129A, Proposed School Upgrade</u></b>
<b>Number of Samples</b>	21 Soil
<b>Date samples received</b>	04/10/2018
<b>Date completed instructions received</b>	04/10/2018

### 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>	11/10/2018
<b>Date of Issue</b>	11/10/2018
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>	

#### Asbestos Approved By

Analysed by Asbestos Approved Identifier: Lucy Zhu  
 Authorised by Asbestos Approved Signatory: Lucy Zhu

#### Results Approved By

Jeremy Faircloth, Organics Supervisor  
 Leon Ow, Chemist  
 Lucy Zhu, Asbestos Analyst  
 Priya Samarawickrama, Senior Chemist  
 Steven Luong, Senior Chemist

#### Authorised By



Jacinta Hurst, Laboratory Manager

**Client Reference: JG18129A, Proposed School Upgrade**

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		202313-1	202313-3	202313-4	202313-8	202313-10
Your Reference	UNITS	BH 1	BH 2	BH 3	BH 5	BH 6
Depth		0.4-0.5	0.2-0.3	0.2-0.3	0.1-0.2	0.2-0.3
Date Sampled		03/10/2018	03/10/2018	03/10/2018	03/10/2018	03/10/2018
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	08/10/2018	08/10/2018	08/10/2018	08/10/2018	08/10/2018
Date analysed	-	09/10/2018	09/10/2018	09/10/2018	09/10/2018	09/10/2018
TRH C <sub>6</sub> - C <sub>9</sub>	mg/kg	<25	<25	<25	<25	<25
TRH C <sub>6</sub> - C <sub>10</sub>	mg/kg	<25	<25	<25	<25	<25
vTPH C <sub>6</sub> - C <sub>10</sub> less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
naphthalene	mg/kg	<1	<1	<1	<1	<1
Total +ve Xylenes	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	113	116	133	110	108

vTRH(C6-C10)/BTEXN in Soil				
Our Reference		202313-14	202313-16	202313-20
Your Reference	UNITS	BH 9	BH 10	BH 12
Depth		0.1-0.2	0.1-0.2	0.2-0.3
Date Sampled		03/10/2018	03/10/2018	03/10/2018
Type of sample		Soil	Soil	Soil
Date extracted	-	08/10/2018	08/10/2018	08/10/2018
Date analysed	-	09/10/2018	09/10/2018	09/10/2018
TRH C <sub>6</sub> - C <sub>9</sub>	mg/kg	<25	<25	<25
TRH C <sub>6</sub> - C <sub>10</sub>	mg/kg	<25	<25	<25
vTPH C <sub>6</sub> - C <sub>10</sub> less BTEX (F1)	mg/kg	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1
naphthalene	mg/kg	<1	<1	<1
Total +ve Xylenes	mg/kg	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	105	120	128

**Client Reference: JG18129A, Proposed School Upgrade**

svTRH (C10-C40) in Soil						
Our Reference		202313-1	202313-3	202313-4	202313-8	202313-10
Your Reference	UNITS	BH 1	BH 2	BH 3	BH 5	BH 6
Depth		0.4-0.5	0.2-0.3	0.2-0.3	0.1-0.2	0.2-0.3
Date Sampled		03/10/2018	03/10/2018	03/10/2018	03/10/2018	03/10/2018
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	08/10/2018	08/10/2018	08/10/2018	08/10/2018	08/10/2018
Date analysed	-	09/10/2018	09/10/2018	09/10/2018	09/10/2018	09/10/2018
TRH C <sub>10</sub> - C <sub>14</sub>	mg/kg	<50	<50	<50	<50	<50
TRH C <sub>15</sub> - C <sub>28</sub>	mg/kg	<100	180	<100	<100	<100
TRH C <sub>29</sub> - C <sub>36</sub>	mg/kg	<100	320	<100	190	<100
TRH >C <sub>10</sub> -C <sub>16</sub>	mg/kg	<50	<50	<50	<50	<50
TRH >C <sub>10</sub> - C <sub>16</sub> less Naphthalene (F2)	mg/kg	<50	<50	<50	<50	<50
TRH >C <sub>16</sub> -C <sub>34</sub>	mg/kg	<100	400	<100	190	<100
TRH >C <sub>34</sub> -C <sub>40</sub>	mg/kg	<100	400	<100	220	<100
Total +ve TRH (>C10-C40)	mg/kg	<50	800	<50	410	<50
Surrogate o-Terphenyl	%	93	96	91	90	91

svTRH (C10-C40) in Soil				
Our Reference		202313-14	202313-16	202313-20
Your Reference	UNITS	BH 9	BH 10	BH 12
Depth		0.1-0.2	0.1-0.2	0.2-0.3
Date Sampled		03/10/2018	03/10/2018	03/10/2018
Type of sample		Soil	Soil	Soil
Date extracted	-	08/10/2018	08/10/2018	08/10/2018
Date analysed	-	09/10/2018	09/10/2018	09/10/2018
TRH C <sub>10</sub> - C <sub>14</sub>	mg/kg	<50	<50	<50
TRH C <sub>15</sub> - C <sub>28</sub>	mg/kg	370	<100	180
TRH C <sub>29</sub> - C <sub>36</sub>	mg/kg	460	<100	<100
TRH >C <sub>10</sub> -C <sub>16</sub>	mg/kg	<50	<50	<50
TRH >C <sub>10</sub> - C <sub>16</sub> less Naphthalene (F2)	mg/kg	<50	<50	<50
TRH >C <sub>16</sub> -C <sub>34</sub>	mg/kg	710	<100	200
TRH >C <sub>34</sub> -C <sub>40</sub>	mg/kg	440	<100	100
Total +ve TRH (>C10-C40)	mg/kg	1,200	<50	300
Surrogate o-Terphenyl	%	99	86	87

**Client Reference: JG18129A, Proposed School Upgrade**

PAHs in Soil						
Our Reference		202313-1	202313-3	202313-4	202313-8	202313-10
Your Reference	UNITS	BH 1	BH 2	BH 3	BH 5	BH 6
Depth		0.4-0.5	0.2-0.3	0.2-0.3	0.1-0.2	0.2-0.3
Date Sampled		03/10/2018	03/10/2018	03/10/2018	03/10/2018	03/10/2018
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	08/10/2018	08/10/2018	08/10/2018	08/10/2018	08/10/2018
Date analysed	-	09/10/2018	09/10/2018	09/10/2018	09/10/2018	09/10/2018
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	0.2	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	2.5	<0.1	<0.1	<0.1
Anthracene	mg/kg	<0.1	0.4	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	0.2	3.4	0.2	0.2	<0.1
Pyrene	mg/kg	0.2	3.2	0.2	0.2	<0.1
Benzo(a)anthracene	mg/kg	0.1	1.4	0.1	<0.1	<0.1
Chrysene	mg/kg	0.2	1.3	0.1	0.1	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	0.3	2.1	0.3	0.2	<0.2
Benzo(a)pyrene	mg/kg	0.1	1.4	0.2	0.1	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	0.7	<0.1	0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	0.2	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	0.1	0.9	0.1	0.2	<0.1
Total +ve PAH's	mg/kg	1.3	18	1.1	1.1	<0.05
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	2.0	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	2.0	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	2.0	<0.5	<0.5	<0.5
Surrogate <i>p</i> -Terphenyl-d14	%	112	112	112	110	114

PAHs in Soil				
Our Reference		202313-14	202313-16	202313-20
Your Reference	UNITS	BH 9	BH 10	BH 12
Depth		0.1-0.2	0.1-0.2	0.2-0.3
Date Sampled		03/10/2018	03/10/2018	03/10/2018
Type of sample		Soil	Soil	Soil
Date extracted	-	08/10/2018	08/10/2018	08/10/2018
Date analysed	-	09/10/2018	09/10/2018	09/10/2018
Naphthalene	mg/kg	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	0.1	<0.1	<0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	<0.1	<0.1	<0.1
Pyrene	mg/kg	<0.1	<0.1	<0.1
Benzo(a)anthracene	mg/kg	<0.1	<0.1	<0.1
Chrysene	mg/kg	0.2	<0.1	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	<0.2	<0.2
Benzo(a)pyrene	mg/kg	<0.05	<0.05	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1	<0.1
Total +ve PAH's	mg/kg	0.3	<0.05	<0.05
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	<0.5
Surrogate <i>p</i> -Terphenyl-d14	%	112	111	109

**Client Reference: JG18129A, Proposed School Upgrade**

Organochlorine Pesticides in soil						
Our Reference		202313-1	202313-3	202313-4	202313-8	202313-10
Your Reference	UNITS	BH 1	BH 2	BH 3	BH 5	BH 6
Depth		0.4-0.5	0.2-0.3	0.2-0.3	0.1-0.2	0.2-0.3
Date Sampled		03/10/2018	03/10/2018	03/10/2018	03/10/2018	03/10/2018
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	08/10/2018	08/10/2018	08/10/2018	08/10/2018	08/10/2018
Date analysed	-	08/10/2018	08/10/2018	08/10/2018	08/10/2018	08/10/2018
HCB	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve DDT+DDD+DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	102	104	102	97	95

Organochlorine Pesticides in soil				
Our Reference		202313-14	202313-16	202313-20
Your Reference	UNITS	BH 9	BH 10	BH 12
Depth		0.1-0.2	0.1-0.2	0.2-0.3
Date Sampled		03/10/2018	03/10/2018	03/10/2018
Type of sample		Soil	Soil	Soil
Date extracted	-	08/10/2018	08/10/2018	08/10/2018
Date analysed	-	08/10/2018	08/10/2018	08/10/2018
HCB	mg/kg	<0.1	<0.1	<0.1
alpha-BHC	mg/kg	<0.1	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1
Total +ve DDT+DDD+DDE	mg/kg	<0.1	<0.1	<0.1
Surrogate TCMX	%	97	103	94

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PCBs in Soil						
Our Reference	UNITS	202313-1	202313-3	202313-4	202313-8	202313-10
Your Reference		BH 1	BH 2	BH 3	BH 5	BH 6
Depth		0.4-0.5	0.2-0.3	0.2-0.3	0.1-0.2	0.2-0.3
Date Sampled		03/10/2018	03/10/2018	03/10/2018	03/10/2018	03/10/2018
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	08/10/2018	08/10/2018	08/10/2018	08/10/2018	08/10/2018
Date analysed	-	08/10/2018	08/10/2018	08/10/2018	08/10/2018	08/10/2018
Aroclor 1016	mg/kg	<0.1	<0.2	<0.1	<0.1	<0.1
Aroclor 1221	mg/kg	<0.1	<0.2	<0.1	<0.1	<0.1
Aroclor 1232	mg/kg	<0.1	<0.2	<0.1	<0.1	<0.1
Aroclor 1242	mg/kg	<0.1	<0.2	<0.1	<0.1	<0.1
Aroclor 1248	mg/kg	<0.1	<0.2	<0.1	<0.1	<0.1
Aroclor 1254	mg/kg	<0.1	<0.2	<0.1	<0.1	<0.1
Aroclor 1260	mg/kg	<0.1	<0.2	<0.1	<0.1	<0.1
Total +ve PCBs (1016-1260)	mg/kg	<0.1	<0.2	<0.1	<0.1	<0.1
Surrogate TCLMX	%	102	104	102	97	95

PCBs in Soil				
Our Reference	UNITS	202313-14	202313-16	202313-20
Your Reference		BH 9	BH 10	BH 12
Depth		0.1-0.2	0.1-0.2	0.2-0.3
Date Sampled		03/10/2018	03/10/2018	03/10/2018
Type of sample		Soil	Soil	Soil
Date extracted	-	08/10/2018	08/10/2018	08/10/2018
Date analysed	-	08/10/2018	08/10/2018	08/10/2018
Aroclor 1016	mg/kg	<0.1	<0.1	<0.1
Aroclor 1221	mg/kg	<0.1	<0.1	<0.1
Aroclor 1232	mg/kg	<0.1	<0.1	<0.1
Aroclor 1242	mg/kg	<0.1	<0.1	<0.1
Aroclor 1248	mg/kg	<0.1	<0.1	<0.1
Aroclor 1254	mg/kg	<0.1	<0.1	<0.1
Aroclor 1260	mg/kg	<0.1	<0.1	<0.1
Total +ve PCBs (1016-1260)	mg/kg	<0.1	<0.1	<0.1
Surrogate TCLMX	%	97	103	94



**Client Reference: JG18129A, Proposed School Upgrade**

Acid Extractable metals in soil						
Our Reference		202313-1	202313-3	202313-4	202313-8	202313-10
Your Reference	UNITS	BH 1	BH 2	BH 3	BH 5	BH 6
Depth		0.4-0.5	0.2-0.3	0.2-0.3	0.1-0.2	0.2-0.3
Date Sampled		03/10/2018	03/10/2018	03/10/2018	03/10/2018	03/10/2018
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	08/10/2018	08/10/2018	08/10/2018	08/10/2018	08/10/2018
Date analysed	-	08/10/2018	08/10/2018	08/10/2018	08/10/2018	08/10/2018
Arsenic	mg/kg	10	<4	11	12	14
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	15	18	15	13	15
Copper	mg/kg	15	39	21	31	17
Lead	mg/kg	32	22	72	64	10
Mercury	mg/kg	<0.1	<0.1	0.2	0.1	<0.1
Nickel	mg/kg	9	13	9	9	4
Zinc	mg/kg	44	44	45	110	30

Acid Extractable metals in soil				
Our Reference		202313-14	202313-16	202313-20
Your Reference	UNITS	BH 9	BH 10	BH 12
Depth		0.1-0.2	0.1-0.2	0.2-0.3
Date Sampled		03/10/2018	03/10/2018	03/10/2018
Type of sample		Soil	Soil	Soil
Date prepared	-	08/10/2018	08/10/2018	08/10/2018
Date analysed	-	08/10/2018	08/10/2018	08/10/2018
Arsenic	mg/kg	<4	8	5
Cadmium	mg/kg	<0.4	<0.4	<0.4
Chromium	mg/kg	45	42	13
Copper	mg/kg	33	33	14
Lead	mg/kg	8	10	22
Mercury	mg/kg	<0.1	<0.1	<0.1
Nickel	mg/kg	52	45	11
Zinc	mg/kg	31	49	43

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Soil Aggressivity						
Our Reference		202313-1	202313-2	202313-3	202313-4	202313-5
Your Reference	UNITS	BH 1	BH 1	BH 2	BH 3	BH 3
Depth		0.4-0.5	2.4-2.5	0.2-0.3	0.2-0.3	1-1.45
Date Sampled		03/10/2018	03/10/2018	03/10/2018	03/10/2018	03/10/2018
Type of sample		Soil	Soil	Soil	Soil	Soil
pH 1:5 soil:water	pH Units	6.8	7.8	11.5	7.9	5.3
Electrical Conductivity 1:5 soil:water	µS/cm	79	270	840	68	800
Resistivity by calculation	ohm m	[NA]	38	[NA]	[NA]	[NA]
Chloride, Cl 1:5 soil:water	mg/kg	[NA]	180	[NA]	[NA]	690
Sulphate, SO4 1:5 soil:water	mg/kg	[NA]	150	[NA]	[NA]	420

Soil Aggressivity						
Our Reference		202313-6	202313-7	202313-8	202313-9	202313-10
Your Reference	UNITS	BH 4	BH 4	BH 5	BH 5	BH 6
Depth		0.4-0.5	1.9-2	0.1-0.2	0.9-1	0.2-0.3
Date Sampled		03/10/2018	03/10/2018	03/10/2018	03/10/2018	03/10/2018
Type of sample		Soil	Soil	Soil	Soil	Soil
pH 1:5 soil:water	pH Units	5.6	6.3	8.5	5.3	5.3
Electrical Conductivity 1:5 soil:water	µS/cm	110	160	240	190	330
Resistivity by calculation	ohm m	[NA]	64	[NA]	[NA]	[NA]
Chloride, Cl 1:5 soil:water	mg/kg	[NA]	100	[NA]	[NA]	[NA]
Sulphate, SO4 1:5 soil:water	mg/kg	[NA]	50	[NA]	[NA]	[NA]

Soil Aggressivity						
Our Reference		202313-11	202313-12	202313-13	202313-14	202313-15
Your Reference	UNITS	BH 6	BH 7	BH 7	BH 9	BH 9
Depth		0.9-1	0.9-1	2.9-3	0.1-0.2	0.5-0.6
Date Sampled		03/10/2018	03/10/2018	03/10/2018	03/10/2018	03/10/2018
Type of sample		Soil	Soil	Soil	Soil	Soil
pH 1:5 soil:water	pH Units	5.4	5.6	9.8	9.5	5.7
Electrical Conductivity 1:5 soil:water	µS/cm	350	85	390	90	210
Resistivity by calculation	ohm m	28	[NA]	[NA]	[NA]	47
Chloride, Cl 1:5 soil:water	mg/kg	140	[NA]	46	[NA]	130
Sulphate, SO4 1:5 soil:water	mg/kg	310	[NA]	78	[NA]	140

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Soil Aggressivity						
Our Reference		202313-16	202313-17	202313-18	202313-19	202313-20
Your Reference	UNITS	BH 10	BH 10	BH 11	BH 11	BH 12
Depth		0.1-0.2	1-1.45	0.9-1	2.5-2.95	0.2-0.3
Date Sampled		03/10/2018	03/10/2018	03/10/2018	03/10/2018	03/10/2018
Type of sample		Soil	Soil	Soil	Soil	Soil
pH 1:5 soil:water	pH Units	8.7	5.5	5.3	7.0	5.8
Electrical Conductivity 1:5 soil:water	µS/cm	220	430	310	390	66
Resistivity by calculation	ohm m	[NA]	23	[NA]	26	[NA]
Chloride, Cl 1:5 soil:water	mg/kg	[NA]	380	[NA]	420	[NA]
Sulphate, SO4 1:5 soil:water	mg/kg	[NA]	250	[NA]	150	[NA]

Soil Aggressivity		
Our Reference		202313-21
Your Reference	UNITS	BH 12
Depth		1-1.45
Date Sampled		03/10/2018
Type of sample		Soil
pH 1:5 soil:water	pH Units	5.3
Electrical Conductivity 1:5 soil:water	µS/cm	510

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Moisture						
Our Reference	UNITS	202313-1	202313-3	202313-4	202313-8	202313-10
Your Reference		BH 1	BH 2	BH 3	BH 5	BH 6
Depth		0.4-0.5	0.2-0.3	0.2-0.3	0.1-0.2	0.2-0.3
Date Sampled		03/10/2018	03/10/2018	03/10/2018	03/10/2018	03/10/2018
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	08/10/2018	08/10/2018	08/10/2018	08/10/2018	08/10/2018
Date analysed	-	09/10/2018	09/10/2018	09/10/2018	09/10/2018	09/10/2018
Moisture	%	10	7.6	8.9	6.7	17

Moisture				
Our Reference	UNITS	202313-14	202313-16	202313-20
Your Reference		BH 9	BH 10	BH 12
Depth		0.1-0.2	0.1-0.2	0.2-0.3
Date Sampled		03/10/2018	03/10/2018	03/10/2018
Type of sample		Soil	Soil	Soil
Date prepared	-	08/10/2018	08/10/2018	08/10/2018
Date analysed	-	09/10/2018	09/10/2018	09/10/2018
Moisture	%	2.9	15	14

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Asbestos ID - soils						
Our Reference	UNITS	202313-1	202313-3	202313-4	202313-8	202313-10
Your Reference		BH 1	BH 2	BH 3	BH 5	BH 6
Depth		0.4-0.5	0.2-0.3	0.2-0.3	0.1-0.2	0.2-0.3
Date Sampled		03/10/2018	03/10/2018	03/10/2018	03/10/2018	03/10/2018
Type of sample		Soil	Soil	Soil	Soil	Soil
Date analysed	-	09/10/2018	09/10/2018	09/10/2018	09/10/2018	09/10/2018
Sample mass tested	g	Approx. 30g	Approx. 40g	Approx. 35g	Approx. 40g	Approx. 35g
Sample Description	-	Brown fine-grained soil & rocks	Brown fine-grained soil & rocks	Brown fine-grained soil & rocks	Brown fine-grained soil & rocks	Brown clayey soil & rocks
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg  Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg  Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg  Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg  Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg  Organic fibres detected
Trace Analysis	-	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected

Asbestos ID - soils				
Our Reference	UNITS	202313-14	202313-16	202313-20
Your Reference		BH 9	BH 10	BH 12
Depth		0.1-0.2	0.1-0.2	0.2-0.3
Date Sampled		03/10/2018	03/10/2018	03/10/2018
Type of sample		Soil	Soil	Soil
Date analysed	-	09/10/2018	09/10/2018	09/10/2018
Sample mass tested	g	Approx. 40g	Approx. 35g	Approx. 35g
Sample Description	-	Brown fine-grained soil & rocks	Brown fine-grained soil & rocks	Brown fine-grained soil & rocks
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg  Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg  Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg  Organic fibres detected
Trace Analysis	-	No asbestos detected	No asbestos detected	No asbestos detected

## Client Reference: JG18129A, Proposed School Upgrade

Method ID	Methodology Summary
<b>ASB-001</b>	Asbestos ID - Qualitative identification of asbestos in bulk samples using Polarised Light Microscopy and Dispersion Staining Techniques including Synthetic Mineral Fibre and Organic Fibre as per Australian Standard 4964-2004.
<b>Inorg-001</b>	pH - Measured using pH meter and electrode in accordance with APHA latest edition, 4500-H+. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times.
<b>Inorg-002</b>	Conductivity and Salinity - measured using a conductivity cell at 25°C in accordance with APHA latest edition 2510 and Rayment & Lyons.
<b>Inorg-002</b>	Conductivity and Salinity - measured using a conductivity cell at 25°C in accordance with APHA 22nd ED 2510 and Rayment & Lyons. Resistivity is calculated from Conductivity.
<b>Inorg-008</b>	Moisture content determined by heating at 105+/-5 °C for a minimum of 12 hours.
<b>Inorg-081</b>	Anions - a range of Anions are determined by Ion Chromatography, in accordance with APHA latest edition, 4110-B. Alternatively determined by colourimetry/turbidity using Discrete Analyser.
<b>Metals-020</b>	Determination of various metals by ICP-AES.
<b>Metals-021</b>	Determination of Mercury by Cold Vapour AAS.
<b>Org-003</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-003</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.  Note, the Total +ve TRH PQL is reflective of the lowest individual PQL and is therefore "Total +ve TRH" is simply a sum of the positive individual TRH fractions (>C10-C40).
<b>Org-005</b>	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC with dual ECD's.
<b>Org-005</b>	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC with dual ECD's. Note, the Total +ve reported DDD+DDE+DDT PQL is reflective of the lowest individual PQL and is therefore simply a sum of the positive individually report DDD+DDE+DDT.
<b>Org-006</b>	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD.
<b>Org-006</b>	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD. Note, the Total +ve PCBs PQL is reflective of the lowest individual PQL and is therefore "Total +ve PCBs" is simply a sum of the positive individual PCBs.

## Client Reference: JG18129A, Proposed School Upgrade

Method ID	Methodology Summary
<b>Org-012</b>	<p>Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013.</p> <p>For soil results:-</p> <ol style="list-style-type: none"> <li>1. 'EQ PQL' values are assuming all contributing PAHs reported as &lt;PQL are actually at the PQL. This is the most conservative approach and can give false positive TEQs given that PAHs that contribute to the TEQ calculation may not be present.</li> <li>2. 'EQ zero' values are assuming all contributing PAHs reported as &lt;PQL are zero. This is the least conservative approach and is more susceptible to false negative TEQs when PAHs that contribute to the TEQ calculation are present but below PQL.</li> <li>3. 'EQ half PQL' values are assuming all contributing PAHs reported as &lt;PQL are half the stipulated PQL. Hence a mid-point between the most and least conservative approaches above.</li> </ol> <p>Note, the Total +ve PAHs PQL is reflective of the lowest individual PQL and is therefore "Total +ve PAHs" is simply a sum of the positive individual PAHs.</p>
<b>Org-014</b>	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS.
<b>Org-016</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)-BTX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.
<b>Org-016</b>	<p>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)-BTX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.</p> <p>Note, the Total +ve Xylene PQL is reflective of the lowest individual PQL and is therefore "Total +ve Xylenes" is simply a sum of the positive individual Xylenes.</p>



**Client Reference: JG18129A, Proposed School Upgrade**

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-2	202313-3
Date extracted	-			08/10/2018	1	08/10/2018	08/10/2018		08/10/2018	08/10/2018
Date analysed	-			09/10/2018	1	09/10/2018	09/10/2018		09/10/2018	09/10/2018
TRH C <sub>6</sub> - C <sub>9</sub>	mg/kg	25	Org-016	<25	1	<25	<25	0	107	104
TRH C <sub>6</sub> - C <sub>10</sub>	mg/kg	25	Org-016	<25	1	<25	<25	0	107	104
Benzene	mg/kg	0.2	Org-016	<0.2	1	<0.2	<0.2	0	112	94
Toluene	mg/kg	0.5	Org-016	<0.5	1	<0.5	<0.5	0	101	103
Ethylbenzene	mg/kg	1	Org-016	<1	1	<1	<1	0	108	107
m+p-xylene	mg/kg	2	Org-016	<2	1	<2	<2	0	107	108
o-Xylene	mg/kg	1	Org-016	<1	1	<1	<1	0	109	110
naphthalene	mg/kg	1	Org-014	<1	1	<1	<1	0	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-016	112	1	113	112	1	138	117

**Client Reference: JG18129A, Proposed School Upgrade**

QUALITY CONTROL: svTRH (C10-C40) in Soil					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-2	202313-3
Date extracted	-			08/10/2018	1	08/10/2018	08/10/2018		08/10/2018	08/10/2018
Date analysed	-			09/10/2018	1	09/10/2018	09/10/2018		09/10/2018	09/10/2018
TRH C <sub>10</sub> - C <sub>14</sub>	mg/kg	50	Org-003	<50	1	<50	<50	0	104	102
TRH C <sub>15</sub> - C <sub>28</sub>	mg/kg	100	Org-003	<100	1	<100	<100	0	91	89
TRH C <sub>29</sub> - C <sub>36</sub>	mg/kg	100	Org-003	<100	1	<100	<100	0	97	#
TRH >C <sub>10</sub> -C <sub>16</sub>	mg/kg	50	Org-003	<50	1	<50	<50	0	104	102
TRH >C <sub>16</sub> -C <sub>34</sub>	mg/kg	100	Org-003	<100	1	<100	<100	0	91	89
TRH >C <sub>34</sub> -C <sub>40</sub>	mg/kg	100	Org-003	<100	1	<100	<100	0	97	#
Surrogate o-Terphenyl	%		Org-003	128	1	93	89	4	104	96

**Client Reference: JG18129A, Proposed School Upgrade**

QUALITY CONTROL: PAHs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-2	202313-3
Date extracted	-			08/10/2018	1	08/10/2018	08/10/2018		08/10/2018	08/10/2018
Date analysed	-			09/10/2018	1	09/10/2018	09/10/2018		09/10/2018	09/10/2018
Naphthalene	mg/kg	0.1	Org-012	<0.1	1	<0.1	<0.1	0	114	120
Acenaphthylene	mg/kg	0.1	Org-012	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-012	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Fluorene	mg/kg	0.1	Org-012	<0.1	1	<0.1	<0.1	0	120	114
Phenanthrene	mg/kg	0.1	Org-012	<0.1	1	<0.1	<0.1	0	121	104
Anthracene	mg/kg	0.1	Org-012	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-012	<0.1	1	0.2	0.2	0	119	110
Pyrene	mg/kg	0.1	Org-012	<0.1	1	0.2	0.2	0	115	103
Benzo(a)anthracene	mg/kg	0.1	Org-012	<0.1	1	0.1	<0.1	0	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-012	<0.1	1	0.2	0.1	67	116	109
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-012	<0.2	1	0.3	0.3	0	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-012	<0.05	1	0.1	0.1	0	121	108
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-012	<0.1	1	0.1	<0.1	0	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-012	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-012	<0.1	1	0.1	0.1	0	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-012	114	1	112	113	1	112	119

**Client Reference: JG18129A, Proposed School Upgrade**

QUALITY CONTROL: Organochlorine Pesticides in soil					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-2	202313-3
Date extracted	-			08/10/2018	1	08/10/2018	08/10/2018		08/10/2018	08/10/2018
Date analysed	-			08/10/2018	1	08/10/2018	08/10/2018		08/10/2018	08/10/2018
HCB	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
alpha-BHC	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	95	91
gamma-BHC	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
beta-BHC	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	86	82
Heptachlor	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	95	96
delta-BHC	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aldrin	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	91	89
Heptachlor Epoxide	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	95	92
gamma-Chlordane	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
alpha-chlordane	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Endosulfan I	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
pp-DDE	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	91	87
Dieldrin	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	100	97
Endrin	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	103	104
pp-DDD	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	84	81
Endosulfan II	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
pp-DDT	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Endrin Aldehyde	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Endosulfan Sulphate	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	74	82
Methoxychlor	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-005	101	1	102	103	1	117	112

**Client Reference: JG18129A, Proposed School Upgrade**

QUALITY CONTROL: PCBs in Soil					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-2	202313-3
Date extracted	-			08/10/2018	1	08/10/2018	08/10/2018		08/10/2018	08/10/2018
Date analysed	-			08/10/2018	1	08/10/2018	08/10/2018		08/10/2018	08/10/2018
Aroclor 1016	mg/kg	0.1	Org-006	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1221	mg/kg	0.1	Org-006	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1232	mg/kg	0.1	Org-006	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1242	mg/kg	0.1	Org-006	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1248	mg/kg	0.1	Org-006	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1254	mg/kg	0.1	Org-006	<0.1	1	<0.1	<0.1	0	130	133
Aroclor 1260	mg/kg	0.1	Org-006	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCLMX	%		Org-006	101	1	102	103	1	102	110

**Client Reference: JG18129A, Proposed School Upgrade**

QUALITY CONTROL: Acid Extractable metals in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-2	202313-3
Date prepared	-			08/10/2018	1	08/10/2018	08/10/2018		08/10/2018	08/10/2018
Date analysed	-			08/10/2018	1	08/10/2018	08/10/2018		08/10/2018	08/10/2018
Arsenic	mg/kg	4	Metals-020	<4	1	10	8	22	104	93
Cadmium	mg/kg	0.4	Metals-020	<0.4	1	<0.4	<0.4	0	96	81
Chromium	mg/kg	1	Metals-020	<1	1	15	12	22	100	98
Copper	mg/kg	1	Metals-020	<1	1	15	15	0	107	102
Lead	mg/kg	1	Metals-020	<1	1	32	30	6	100	79
Mercury	mg/kg	0.1	Metals-021	<0.1	1	<0.1	<0.1	0	98	102
Nickel	mg/kg	1	Metals-020	<1	1	9	9	0	101	82
Zinc	mg/kg	1	Metals-020	<1	1	44	41	7	96	70

**Client Reference: JG18129A, Proposed School Upgrade**

QUALITY CONTROL: Soil Aggressivity					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-2	[NT]
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	1	6.8	6.9	1	102	[NT]
Electrical Conductivity 1:5 soil:water	µS/cm	1	Inorg-002	<1	1	79	84	6	107	[NT]
Resistivity by calculation	ohm m	0.1	Inorg-002	<0.1	11	28	29	4	[NT]	[NT]
Chloride, Cl 1:5 soil:water	mg/kg	10	Inorg-081	<10	11	140	140	0	94	[NT]
Sulphate, SO4 1:5 soil:water	mg/kg	10	Inorg-081	<10	11	310	300	3	107	[NT]

QUALITY CONTROL: Soil Aggressivity					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-3	[NT]
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	11	5.4	5.3	2	102	[NT]
Electrical Conductivity 1:5 soil:water	µS/cm	1	Inorg-002	[NT]	11	350	350	0	105	[NT]
Chloride, Cl 1:5 soil:water	mg/kg	10	Inorg-081	[NT]	[NT]	[NT]	[NT]	[NT]	98	[NT]
Sulphate, SO4 1:5 soil:water	mg/kg	10	Inorg-081	[NT]	[NT]	[NT]	[NT]	[NT]	109	[NT]

QUALITY CONTROL: Soil Aggressivity					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	21	5.3	5.4	2	[NT]	[NT]
Electrical Conductivity 1:5 soil:water	µS/cm	1	Inorg-002	[NT]	21	510	420	19	[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.	



## 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; 60-140% for organics (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

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

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

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

Measurement Uncertainty estimates are available for most tests upon request.

## Report Comments

PCBs in Soil - PQL has been raised due to interference from analytes (other than those being tested) in the sample 3.

Asbestos: A portion of the supplied samples were sub-sampled for asbestos analysis according to Envirolab procedures. We cannot guarantee that this sub-sample is indicative of the entire sample. Envirolab recommends supplying 40-50g of sample in its own container.

Note: Samples requested for asbestos testing were sub-sampled from jars provided by the client.

TRH Soil C10-C40 NEPM - (3MS)# Percent recovery is not possible to report as the high concentration of analytes in the sample/s have caused interference.

## SAMPLE RECEIPT ADVICE

### Client Details

<b>Client</b>	Geoenviro Consultancy Pty Ltd
<b>Attention</b>	Solern Liew

### Sample Login Details

<b>Your reference</b>	JG18129A, Proposed School Upgrade
<b>Envirolab Reference</b>	202313
<b>Date Sample Received</b>	04/10/2018
<b>Date Instructions Received</b>	04/10/2018
<b>Date Results Expected to be Reported</b>	11/10/2018

### Sample Condition

<b>Samples received in appropriate condition for analysis</b>	YES
<b>No. of Samples Provided</b>	21 Soil
<b>Turnaround Time Requested</b>	Standard
<b>Temperature on Receipt (°C)</b>	11.2
<b>Cooling Method</b>	Ice Pack
<b>Sampling Date Provided</b>	YES

### Comments

Nil

Please direct any queries to:

<b>Aileen Hie</b>	<b>Jacinta Hurst</b>
<b>Phone:</b> 02 9910 6200	<b>Phone:</b> 02 9910 6200
<b>Fax:</b> 02 9910 6201	<b>Fax:</b> 02 9910 6201
<b>Email:</b> ahie@envirolab.com.au	<b>Email:</b> jhurst@envirolab.com.au

*Analysis Underway, details on the following page:*

Sample ID	VTRH(C6-C10)/BTEXN in Soil	svTRH (C10-C40) in Soil	PAHs in Soil	Organochlorine Pesticides in soil	PCBs in Soil	Acid Extractable metals in soil	Soil Aggressivity	Asbestos ID - soils
BH 1 -0.4-0.	✓	✓	✓	✓	✓	✓	✓	✓
BH 1-2.4-2.5							✓	
BH 2-0.2-0.3	✓	✓	✓	✓	✓	✓	✓	✓
BH 3-0.2-0.3	✓	✓	✓	✓	✓	✓	✓	✓
BH 3-1-1.45							✓	
BH 4-0.4-0.5							✓	
BH 4-1.9-2							✓	
BH 5-0.1-0.2	✓	✓	✓	✓	✓	✓	✓	✓
BH 5-0.9-1							✓	
BH 6-0.2-0.3	✓	✓	✓	✓	✓	✓	✓	✓
BH 6-0.9-1							✓	
BH 7-0.9-1							✓	
BH 7-2.9-3							✓	
BH 9-0.1-0.2	✓	✓	✓	✓	✓	✓	✓	✓
BH 9-0.5-0.6							✓	
BH 10 -0.1-0.	✓	✓	✓	✓	✓	✓	✓	✓
BH 10-1-1.45							✓	
BH 11-0.9-1							✓	
BH 11-2.5-2.95							✓	
BH 12-0.2-0.3	✓	✓	✓	✓	✓	✓	✓	✓
BH 12-1-1.45							✓	

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

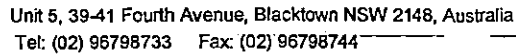
### Additional Info

Sample storage - Waters are routinely disposed of approximately 1 month and soils approximately 2 months from receipt.

Requests for longer term sample storage must be received in writing.

## Laboratory Test Request/Chain of Custody Record

Job Details				Sample Date: 03/10/2018				External Laboratory Details:																						
Job Number: JG18129A				Sampled By: SG				Laboratory name: Envirolab Services Pty Ltd																						
Client:				Project Manager: SL				Address: 12 Ashley Street																						
Project: Proposed School Upgrade				Store Location:				Chatswood																						
Location: 322 Hume Highway Bankstown								Contact: Tania Notaris																						
Sampling Details		Sample Type		Test Required (Y)										Test Performed (X)																
Location		Depth (m)		Soil	Water																									
		From	To			Metals (As Cd Cr Cu Pb Zn Ni Hg)	OCB / PCB	Combination 12a	Combination 5a	Combination 5			pH	EC	CEC/ESP	Cl / SO4	Resistivity													Keep Sample
1	BH 1	0.40	0.50	DG				/					/	/		/	/													
2	BH 1	2.40	2.50	DG				/					/	/		/	/													
3	BH 2	0.20	0.30	DG				/					/	/		/	/													
4	BH 3	0.20	0.30	DG				/					/	/		/	/													
5	BH 3	1.00	1.45	DG				/					/	/		/	/													
6	BH 4	0.40	0.50	DG				/					/	/		/	/													
7	BH 4	1.90	2.00	DG				/					/	/		/	/													
8	BH 5	0.10	0.20	DG				/					/	/		/	/													
9	BH 5	0.90	1.00	DG				/					/	/		/	/													
10	BH 6	0.20	0.30	DG				/					/	/		/	/													
11	BH 6	0.90	1.00	DG				/					/	/		/	/													
12	BH 7	0.90	1.00	DG				/					/	/		/	/													
13	BH 7	2.90	3.00	DG				/					/	/		/	/													
14	BH 9	0.10	0.20	DG				/					/	/		/	/													
15	BH 9	0.50	0.60	DG				/					/	/		/	/													
Relinquished by				Received By																										
Laboratory	Name	Signature	Date	Laboratory	Name	Signature	Date																							
GeoEnviro Consultancy	Steven Goss	<i>SM Goss</i>	27/09/2018		<i>EW</i>	<i>May</i>																								
<p>Legend</p> <p>DB Disturbed Sample (Bulk, Plastic bag)      U50 Undisturbed Sample, 50mm Tube      Y Keep Sample</p> <p>DS Disturbed Sample (Small, Plastic bag)      U75 Undisturbed Sample, 75mm Tube      N Discard Sample</p> <p>DG Disturbed Sample (Glass Jar)      WG Water Sample, Amber Glass Jar</p> <p>STP Standard Penetration Test Sample      WP Water Sample, Plastic Bottle</p>																														



Laboratory name: Envirolab Services Pty Ltd  
Address: 12 Ashley Street  
Chatswood  
Contact: Tania Notaris

### Job Details

**Location: 322 Hume Highway Bankstown**

Store Location:

Relinquished by

Received By

Date	27/09/2018
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Date \_\_\_\_\_

27/09/2018

11/1/14	
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WP Water Sample, Plastic Bottle

**N Discard Sample**

Form No. W019-1/Ver06/12/09

## **APPENDIX D**

### **Unexpected Asbestos Finds Protocol**



# GeoEnviro Consultancy Pty Ltd

Unit 5, 39-41 Fourth Avenue, Blacktown, NSW 2148, Australia  
PO Box 1543, Macquarie Centre. North Ryde, NSW 2113

ABN 62 084 294 762

Tel : (02) 9679 8733

Fax : (02) 9679 8744

## UNEXPECTED FINDS PROTOCOL

ITEM	REQUIREMENTS	
<b>DEFINITION</b>	An unexpected find may be identified as a result of site activity, for example through earthworks and movement of plant on site including preparatory site works.	
<b>SITE SUPERVISOR</b>	<p>On being notified of an <b>Unexpected Find</b>, the Principal Contractor must:</p> <ul style="list-style-type: none"> <li>• Stop work &amp; notify the site manager/HSE coordinator as soon as practically possible.</li> <li>• Ensure the find is not further disturbed.</li> <li>• Ensure all personnel are removed from the area with the exception of personnel required to isolate or make safe the area.</li> <li>• Establish an “unexpected find” isolation zone as required to prevent or minimise exposure risks for site personnel, members of the public, fauna or flora. Note: Persons are not to expose themselves to further risk whilst establishing isolation zone.</li> <li>• Assess the requirement to evacuate areas or the entire site.</li> <li>• Co-ordinate site or area evacuation as assessed. Note: It is preferable to evacuate the whole site if there is any doubt as to the safety of personnel or the environment.</li> <li>• As soon as the safety of personnel, environment &amp; the site is secured the Site Manager/Supervisor should notify their relevant HSE Manager, Project Manager &amp; Construction Manager.</li> <li>• As soon as practically possible record the events associated with the unexpected find.</li> </ul>	
<b>PROJECT MANAGER</b>	<p>The Project Manager and/or HSE Manager in consultation with the relevant General Manager notify regulatory authorities as required.</p> <p>Establish a risk based process for managing clearance of the unexpected find &amp; establishing incident investigation.</p>	
	<p>The Project Manager or HSE Manager must also ensure that the find is reported to the Principal.</p> <p>This may be by verbal communication.</p>	
<b>UNEXPLODED ORDNANCE</b>	<ul style="list-style-type: none"> <li>• Do not touch or disturb.</li> <li>• Contact Police immediately.</li> </ul>	
<b>UNEXPECTED SERVICES (LIVE OR DISUSED)</b>	<ul style="list-style-type: none"> <li>• This may include power, gas or fuel.</li> <li>• Do not touch or further disturb.</li> <li>• The area must be immediately designated a non-smoking and “no naked flames” area.</li> <li>• All nearby machinery should be turned off.</li> <li>• Contact relevant governing authority.</li> <li>• Contact appropriate trade supervisor.</li> </ul>	
<b>ASBESTOS OR OTHER CONTAMINANTS</b>	<p>Products made from asbestos cement not only include fibro sheeting (flat and corrugated), but items such as water, drainage and flue pipes, roofing shingles and gutters.</p> <ul style="list-style-type: none"> <li>• Do not touch or further disturb.</li> <li>• Isolate area (10 metre isolation zone required for asbestos).</li> <li>• Contact hygienist.</li> <li>• Implement hygienist’s recommendations.</li> <li>• If persons have been exposed arrange medical advice/consultation i.e. possible asbestos fibre exposure will require lung function test &amp; chest x-ray. Note: This applies more specifically to friable type asbestos rather than non friable asbestos containing material however if any doubt exists treat as friable.</li> <li>• Obtain clearance from hygienist prior to re-entering area.</li> </ul>	
	<p><b>Non-Friable Asbestos</b></p> <p>Over 97% of the products in Australia were non-friable material in which the Asbestos fibres were bonded by cement, vinyl, resin or other similar material.</p>	<p><b>Friable Asbestos</b></p> <p>The hazardous friable asbestos is material which can be crumbled, pulverised, or reduced to powder by hand pressure. This may also include previously non-friable material which becomes broken or damaged by mechanical force.</p>



ITEM	REQUIREMENTS
<b>HUMAN REMAINS</b>	<ul style="list-style-type: none"> <li>Do not touch or disturb.</li> <li>Contact Police immediately.</li> </ul> <p>Please note that aboriginal burial objects (such as bark coffins) are defined by legislation as human remains.</p>
<b>HERITAGE ITEMS</b>	<ul style="list-style-type: none"> <li>Do not touch or disturb.</li> <li>Contact Heritage Office or relevant State or Local Government Authority.</li> </ul>
<b>OBJECTS OF POSSIBLE CULTURAL SIGNIFICANCE</b>	<ul style="list-style-type: none"> <li>Do not touch or disturb.</li> </ul> <p>Contact Department of Indigenous Affairs or relevant State or Local Government Authority.</p>
<b>UNEXPECTED FIND PROCESS</b>	<div style="text-align: center;"> <div style="border: 1px solid black; padding: 5px; margin: 10px auto; width: 300px;">Unexpected Find Discovered</div> <div style="margin: 10px auto; width: 10px;">↓</div> <div style="border: 1px solid black; padding: 5px; margin: 10px auto; width: 650px;"> <div style="text-align: center;"><b>Person Uncovering Find</b></div> <div style="display: flex; justify-content: space-between;"> <div> 1. Stop work 2. Consider personnel safety etc </div> <div> 3. Notify Site Supervisor/ Manager location </div> </div> </div> <div style="margin: 10px auto; width: 10px;">↓</div> <div style="border: 1px solid black; padding: 5px; margin: 10px auto; width: 650px;"> <div style="text-align: center;"><b>Site Supervisor/Manager</b></div> <ul style="list-style-type: none"> <li>Establish Unexpected Find isolation zone as required</li> <li>Notify Project Manager/ Construction Manager and HSE Managers</li> </ul> </div> <div style="margin: 10px auto; width: 10px;">↓</div> <div style="border: 1px solid black; padding: 5px; margin: 10px auto; width: 650px;"> <div style="text-align: center;"><b>Project Manager/Construction Manager</b></div> <ul style="list-style-type: none"> <li>In consultation with State General Manager/HSE Manager notify relevant authority (where required)</li> <li>Complete Incident Register in site diary</li> <li>Develop, document and implement process to clear find</li> </ul> </div> </div>

## **APPENDIX F**

### **Important Information about your Environmental Site Assessment Explanatory Notes**



## EXPLANATORY NOTES

### Introduction

These notes have been provided to amplify the geotechnical report with regard to investigation procedures, classification methods and certain matters relating to the Discussion and Comments sections. Not all notes are necessarily relevant to all reports.

Geotechnical reports are based on information gained from finite sub-surface probing, excavation, boring, sampling or other means of investigation, supplemented by experience and knowledge of local geology. For this reason they must be regarded as interpretative rather than factual documents, limited to some extent by the scope of information on which they rely.

### Description and Classification Methods

The methods the description and classification of soils and rocks used in this report are based on Australian standard 1726, the SSA Site investigation Code, in general descriptions cover the following properties - strength or density, colour, structure, soil or rock type and inclusions. Identification and classification of soil and rock involves to a large extent, judgement within the acceptable level commonly adopted by current geotechnical practices.

Soil types are described according to the predominating particle size, qualified by the grading or other particles present (eg sandy clay) on the following bases:

Soil Classification	Particle Size
Clay	Less than 0.002mm
Silt	0.002 to 0.6mm
Sand	0.6 to 2.00mm
Gravel	2.00mm to 60.00mm

Soil Classification	Particle size
Clay	less than 0.002mm
Silt	0.002 to 0.06mm
Sand	0.06 to 2.00mm
Gravel	2.00mm to 60.00mm

Cohesive soils are classified on the basis of strength, either by laboratory testing or engineering examination. The strength terms are defined as follows:

Classification	Undrained Shear Strength kPa
Very Soft	Less than 12
Soft	12 - 25
Firm	25 - 50
Stiff	50 - 100
Very Stiff	100 - 200
Hard	Greater than 200

Non-cohesive soils are classified on the basis of relative density, generally from the results of standard penetration tests (SPT) or Dutch cone penetrometer test (CPT), as below:

Relative Dense	SPT 'N' Value (blows/300mm)	CPT Cone Value (q <sub>c</sub> -Mpa)
Very Loose	Less than 5	Less than 2
Loose	5 - 10	2 - 5
Medium Dense	10 - 30	5 - 15
Dense	30 - 50	15 - 25
Very Dense	> 50	> 25

Rock types are classified by their geological names, together with descriptive terms on degrees of weathering strength, defects and other minor components. Where relevant, further information

regarding rock classification, is given on the following sheet.

### Sampling

Sampling is carried out during drilling to allow engineering examination (and laboratory testing where required) of the soil or rock.

Disturbed samples taken during drilling provided information on plasticity, grained size, colour, type, moisture content, inclusions and depending upon the degree of disturbance, some information on strength and structure.

Undisturbed samples are taken by pushing a thin walled sample tube (normally know as U<sub>50</sub>) into the soil and withdrawing a sample of the soil in a relatively undisturbed state. Such Samples yield information on structure and strength and are necessary for laboratory determination of shear strength and compressibility. Undisturbed sampling is generally effective only in cohesive soils. Details of the type and method of sampling are given in the report.

### Field Investigation Methods

The following is a brief summary of investigation methods currently carried out by this company and comments on their use and application.

### Hand Auger Drilling

The borehole is advanced by manually operated equipment. The diameter of the borehole ranges from 50mm to 100mm. Penetration depth of hand augered boreholes may be limited by premature refusal on a variety of materials, such as hard clay, gravels or ironstone.

### Test Pits

These are excavated with a tractor-mounted backhoe or a tracked excavator, allowing close examination of the insitu soils if it is safe to descend into the pit. The depth of penetration is limited to about 3.0m for a backhoe and up to 6.0m for an excavator. A potential disadvantage is the disturbance caused by the excavation.

Care must be taken if construction is to be carried out near, or within the test pit locations, to either adequately recompact the backfill during construction, or to design the structure or accommodate the poorly compacted backfill.

### Large Diameter Auger (eg Pengo)

The hole is advanced by a rotating plate or short spiral auger generally 300mm or larger in diameter. The cuttings are returned to the surface at intervals (generally of not more than 05m) and are disturbed, but usually unchanged in moisture content. Identification of soil strata is generally much more reliable than with continuous spiral flight augers and is usually supplemented by occasional undisturbed tube sampling.

### Continuous Spiral Flight Augers

The hole is advanced by using 90mm - 115mm diameter continuous spiral flight augers, which are withdrawn at intervals to allow sampling or 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, or may be collected after withdrawal of the augers flights, but they are very disturbed and may be highly mixed with soil of other stratum.

Information from the drilling (as distinct from specific sampling by SPT or undisturbed samples) is of relatively low reliability due to remoulding, mixing or softening of samples by ground water, resulting in uncertainties of the original sample depth.

### Continuous Spiral Flight Augers (continued)

The spiral augers are usually advanced by using a V - bit through the soil profile refusal, followed by Tungsten Carbide (TC) bit, to penetrate into bedrock. The quality and continuity of the bedrock may be assessed by examination of the recovered rock fragments and through observation of the drilling penetration resistance.

### Non - core Rotary Drilling (Wash Boring)

The hole is advanced by a rotary bit, with water being pumped down the drill rod and returned up the annulus, carrying the cuttings, together with some information from the "feel" and rate of penetration.

### Rotary Mud Stabilised Drilling

This is similar to rotary drilling, but uses drilling mud as a circulating fluid, which may consist of a range of products, from bentonite to polymers such as Revert or Biogel. The mud tends to mask the cuttings and reliable identification is again only possible from separate intact sampling (eg SPT and  $U_{50}$  samples).

### Continuous Core Drilling

A continuous core sample is obtained using a diamond tipped core barrel. Providing full core recovery is achieved (which is not always possible in very weak rock and granular soils) this technique provides a very reliable (but relatively expensive) method of investigation. In rocks an NMLC triple tube core barrel which gives a core of about 50mm diameter, is usually used with water flush.

### Portable Proline Drilling

This is manually operated equipment and is only used in sites which require bedrock core sampling and there is restricted site access to truck mounted drill rigs. The boreholes are usually advanced initially using a tricone roller bit and water circulation to penetrate the upper soil profile. In some instances a hand auger may be used to penetrate the soil profile. Subsequent drilling into bedrock involves the use of NMLC triple tube equipment, using water as a lubricant.

### Standard Penetration Tests

Standard penetration tests are used mainly in non-cohesive soils, but occasionally also in cohesive soils, as a means of determining density or strength and of obtaining a relatively undisturbed sample. The test procedure is described in Australian Standard 1289 "Methods of testing Soils for Engineering Purpose"- Test F31.

The test is carried out in a borehole by driving a 50mm diameter split sample tube under the impact of a 63Kg hammer with a free fall of 769mm. 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 rocks, the full 450mm penetration may not be practicable and the test is discontinued.

The test results are reported in the following form:

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

$$\begin{aligned} &\text{as 4, 6, 7} \\ &N = 13 \end{aligned}$$

- 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.

$$\text{as 15,30/40mm}$$

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

methods is used to obtain samples in 50mm diameter thin walled samples tubes in clays. In these circumstances, the best results are shown on the bore logs in brackets.

### Dynamic Cone Penetration Test

A modification to the SPT test 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 cone can be continuously driven into the borehole and is normally used in areas with thick layers of soft clays or loose sand. The results of this test are shown as ' $N_c$ ' on the bore logs, together with the number of blows per 150mm penetration.

### Cone Penetrometer Testing and Interpretation

Cone penetrometer testing (sometimes referred to as Dutch Cone-CPT) described in this report, has been carried out using an electrical friction cone penetrometer and the test is described in Australian Standard 1289 test F5.1.

In the test, a 35mm diameter rod with cone tipped end is pushed continuously into the soil, the reaction being provided by a specially designed truck or rig, which is fitted with a hydraulic ram system. Measurements are made of the end bearing resistance on the cone and the friction resistance on a separate 130mm long sleeve, immediately behind the cone. Transducer in the tip of the assembly are connected by electrical wires passing through the centre of the push rods to an amplifier and recorder unit mounted on the control truck.

As penetration occurs (at a rate of approximately 20mm per second) the information is output on continuous chart recorders. The plotted results in this report have been traced from the original records. The information provided on the charts comprises:

- Cone resistance - the actual end bearing force divided by the cross sectional area of the cone, expressed in Mpa.
- Sleeve friction - the frictional force on the sleeve divided by the surface area, expressed in kPa.
- Friction ratio - the ratio of sleeve friction to cone resistance, expressed in percentage.

There are two scales available for measurement of cone resistance. The lower "A" scale (0-5Mpa) is used in very soft soils where increased sensitivity is required and is shown in the graphs as a dotted line. The main "B" scale (0-50Mpa) is less sensitive and is shown as a full line.

The ratios of the sleeve resistance to cone resistance will vary with the type of soil encountered, with higher relative frictions in clays than in sands. Friction ratios of 1% to 2% are commonly encountered in sands and very soft clays, rising to 4% to 10% in stiff clays.

In sands, the relationship between cone resistance and SPT value is commonly in the range:

$$q_c \text{ (Mpa)} = (0.4 \text{ to } 0.6) N \text{ (blows per 300mm)}$$

In clays the relationship between undrained shear strength and cone resistance is commonly in the range:

$$q_c = (12 \text{ to } 18) C_u$$

Interpretation of CPT values can also be made to allow estimate of modulus or compressibility values to allow calculation of foundation settlements. Inferred stratification, as shown on the attached report, is assessed from the cone and friction traces, from experience and information from nearby boreholes etc.



### **Cone Penetrometer Testing and Interpretation continued**

This information is presented for general guidance, but must be regarded as being to some extent interpretive. The test method provides a continuous profile of engineering properties and where precise information or soil classification is required, direct drilling and sampling may be preferable.

#### **Portable Dynamic Cone Penetrometer (AS1289)**

Portable dynamic cone penetrometer tests are carried out by driving a rod in to the ground with a falling weight hammer and measuring the blows per successive 100mm increments of penetration.

There are two similar tests, Cone Penetrometer (commonly known as Scala Penetrometer) and the Perth Sand Penetrometer. Scala Penetrometer is commonly adopted by this company and consists of a 16mm rod with a 20mm diameter cone end, driven with a 9kg hammer, dropping 510mm (AS 1289 Test F3.2).

#### **Laboratory Testing**

Laboratory testing is carried out in accordance with Australian Standard 1289 "Methods of Testing Soil for Engineering Purposes". Details of the test procedures are given on the individual report forms.

#### **Engineering Logs**

The engineering logs presented herein are an engineering and/or geological interpretation of the sub-surface conditions and their reliability will depend to some extent on frequency of sampling and the method of drilling. Ideally, continuous undisturbed sampling or core drilling will provide the most reliable assessment, however, this is not always practicable or possible to justify economically. As it is, the boreholes represent only a small sample of the total sub-surface profile. Interpretation of the information and its application to design and construction should take into account the spacing of boreholes, frequency of sampling and the possibility of other than "straight line" variations between the boreholes.

#### **Ground water**

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

- In low permeability soils, ground water although present, may enter the hole slowly, or perhaps not at all, during the investigation period.
- A localised perched water table may lead to a erroneous indication of the true water table.
- Water table levels will vary from time to time, due to the seasons or recent weather changes. They may not be the same at the time of construction as indicated in the report.
- The use of water or mud as a drilling fluid will mask any ground water inflow. Water has to be blown out of the hole and drilling mud must be washed out of the hole if any water observations are to be made.

More reliable measurements can be made by installing stand pipes, which are read at intervals over several days, or weeks for low permeability soils. Piezometers sealed in a particular stratum may be interference from a perched water table or surface water.

#### **Engineering Reports**

Engineering reports are prepared by qualified personnel and are based on the information obtained and on current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal is changed, say to a twenty storey building. If this occurs, the company will be pleased to review the report and sufficiency of the investigation work.

Every care is taken with the report as it relates to interpretation of sub-surface conditions, discussions of geotechnical aspects and recommendations or suggestions for design and construction. However, the company cannot always anticipate or assume responsibility for:

- Unexpected variations in ground conditions. The potential for this will depend partly on bore spacing and sampling frequency.
- Changes in policy or interpretation of policy by statutory authorities.
- The actions of contractors responding to commercial pressures.

If these occur, the company will be pleased to assist with investigation or advice to resolve the matter.

#### **Site Anomalies**

In the event that conditions encountered on site during construction appear to vary from those which were expected from the information contained in the report, the company request immediate notification. Most problems are much more readily resolved when conditions are exposed than at some later stage, well after the event.

#### **Reproduction of Information for Contractual Purposes**

Attention is drawn to the document "Guidelines for the Provision of Geotechnical Information trader Documents", published by the Institute of Engineers Australia. Where information obtained for this investigation is provided for tender purposes, it is recommended that all information, including the written report and discussion, be made available. In circumstances where the discussion or comments section is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. The Company would be pleased to assist in this regard and/or make additional copies of the report available for contract purpose, at a nominal charge.

#### **Site Inspection**

























The Company will always be pleased to provide engineering inspection services for geotechnical aspect of work to which this report is related. This could range from a site visit to confirm that the conditions exposed are as expected, to full time engineering presence on site

#### **Review of Design**

Where major civil or structural developments are proposed, or where only a limited investigation has been completed, or where the geotechnical conditions are complex, it is prudent to have the design reviewed by a Senior Geotechnical Engineer.



## Graphic Symbols For Soil and Rock

SOIL		ROCK	
	Fill		Shale
	Topsoil		Sandstone
	Gravel (GW , GP)		Siltstone, Mudstone, Claystone
	Sand (SP, SW)		Granite, Gabbro
	Silt (ML, MH)		Dolerite, Diorite
	Clay (CL, CH)		Basalt, Andesite
	Clayey Gravel (GC)	<b>Other Materials</b>	
	Silty Sand (SM)		Concrete
	Clayey Sand (SC)		Bitumen, Asphaltic Concrete, Coal
	Sandy Silt (ML)		Ironstone Gravel
	Gravelly Clay (CL, CH)		Organic Material
	Silty Clay (CL, CH)		
	Sandy Clay (CL, CH)		
	Peat or Organic Soil		