Upgrades to Chatswood Public School and Chatswood High School

Appendix 12 - Geotech, Environmental & Hazmat Investigation

SSD 9483
Prepared by PSM and JBS&G
For School Infrastructure NSW, Department of Education

Artists impression of upgrades to Chatswood Public School

Upgrades to Chatswood Public School and Chatswood High School

Results of Geotechnical, Environmental and Hazmat Investigation

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1 Introduction

This report presents the results of the geotechnical and contamination investigation undertaken by Pells Sullivan Meynink (PSM) at Chatswood High School and Chatswood Public School. The work has been undertaken in accordance with the Services Agreement (No.181204) dated 5 December 2018.

2 Background

To assist in the geotechnical investigation, we were provided with and reviewed the following documents:

- RFQ Services Brief (Ref. RFQ201809-131, dated 30/10/2018)
- Information documents including:
  - Concept Design Report – Option 3 (Ref. 3814 CD1001-1003 RevC dated 18.05.25, DC1009 RevA dated 12.06.18, CD10014-10015 RevF CD10018 RevD and CD10019RevC dated 13.07.18)
  - Douglas Partners Preliminary Geotechnical Report (Ref.86260.00.R.001.Rev1, dated 12/03/2018)
  - Site investigation area (Ref. App. A – site investigation Area.pdf)
  - Report on preliminary Site (Contamination) Investigation with Limited Sampling (Ref. 86260.01.R.001.Rev0.PSI, dated 16/04/2018)
  - AutoCAD plan drawings of both sites containing survey elevations (Ref. 11915Adetail 1, 17485detail 1)
  - A mark-up with proposed borehole locations by Wood and Grieve (Ref. 17485detail 1)
  - An Endorsed Revised Precinct Masterplan Prepared by Architectus.

We understand that the current proposed development includes:

- Upgrades to Chatswood Public School including the provision of:
  - 53 x homebases (comprising 25 existing and 28 new spaces)
  - 4 x special program classrooms (music, language etc)
  - 3 x special support unit classrooms
  - Increased quality active play spaces
  - Retaining Heritage buildings A and B
  - New hall
  - New car parking facilities, and
  - Associated site works and landscaping.
- Upgrades to Chatswood High School including the provision of:
  - 123 Classrooms (comprising 21 existing and 102 new spaces)
  - New administration and staff facilities
  - New hall, and
  - Associated site works and landscaping.

The project would involve primarily the following:

- Construction of three new buildings on the Pacific Highway site (Building P1, P2 and G) and three buildings on the Centennial Avenue site (Building Q, S and T)
- On grade carparks, landscaping and various sports fields and playgrounds.

3 Geotechnical Investigation

PSM have completed a geotechnical investigation for both sites. An environmental and hazardous material assessment has also been completed for both sites and are reported separately.

3.1 Fieldwork

The fieldwork for the geotechnical investigation at the Centenial Avenue site was undertaken on:

- 23 to 25 of January 2019
- 15 to 16 of April 2019

The fieldwork for the geotechnical invesitgaion at the Pacific Highway site was undertaken on:

- 16 to 17 of February 2019
- 10 to 12 of October 2019.

All work was conducted under the full-time supervision of a PSM geotechnical engineer, who undertook the following tasks:

- Directing the investigation locations
- Directing the reinstatement of concrete and asphalt surfaces where required
- Preparing engineering logs of the material encountered
- Collection of disturbed samples for laboratory testing
- Point load testing of recovered core samples.

Prior to testing, on-site service location “scans” were undertaken by a licenced service locator in the presence of a PSM geotechnical engineer to asses if the test locations were free from buried utilities.

Seventeen (17) boreholes (BH01 to BH17) were drilled at the Centnnial Avenue site on 23 to 25 of January and six (6) boreholes (BH18 to BH23) were drilled at the Pacific Highway site using a tracked geotechnical drill rig. A further five (5) boreholes (BH24 to BH28) were drilled at the Centennial Avenue site on 15 and 16 of April. A futher eleven (11) boreholes were drilled at the Pacfic Highway site on 10 to 12 October 2019.

The investigation locations were recorded with a hand-held GPS unit with a horizontal accuracy of approximately +/- 5 m. Figure 1A and 2 presents the test locations. Figure 1B presents a long section through the proposed buildings along the northern boundary of the Centennial Avenue site.

Boreholes were drilled to depths of bewteen 2.6 m and 9.0 m with augering through soils and low strength rock to refusal using a tungsten carbide bit (TC-bit) or a maximum of 8 m depth. Rock coring was undertaken for selected boreholes (BH06, BH07, BH18, BH19, BH26, BH28, BH33 and BH36). The geotechnical borehole logs together with explanation sheets are presented in Appendix A. The logs for augered only boreholes are presented in a tabulated form while cored boreholes are presented as geotechnical logs with core photos. Point load strength index testing was performed on the recovered core at approximately one metre intervals with results tabulated in Appendix B.

At the completion of the fieldwork, the boreholes were backilled with excavated spoil and lightly tamped with a shovel. Where the boreholes were drilled on hardstand surfaces, the surface was reinstated with cold-mix asphalt. Figures 3 and 4 present selected photos of the fieldwork.

3.2 Geotechnical Laboratory Testing

3.2.1 California Bearing Ratio (CBR)

Five (5) bulk soil samples from the Centennial Avenue site and seven (7) bulk soil samples from the Pacific Highway site were recovered for California Bearing Ratio (CBR) testing at an accredited geotechnical laboratory.

The following sample preparation was undertaken for the CBR testing:

- Compact to 98% standard MDD, at optimum moisture content (OMC);
- Four (4) day soaked sample; and
- 4.5 kg surcharge.

Table 1 presents a summary of the CBR test results. The test result sheets are included in Appendix C.

Table 1 – CBR Test Results

Sample ID (depth)	Material Description	Soaked CBR (%)	OMC (%)	Standard Maximum Dry Density (t/m3)	Swell (%)
CENTENNIAL AVENUE SITE					
BH02 (0.1 - 0.5 m)	SILTY CLAY	9.0*	13.4	1.83	0.5
Centre of Site (0.1 – 0.3 m)	SILTY CLAY	4.5*	15.6	1.73	1.0
BH05 (0.1 - 0.3 m)	SILTY CLAY	6.0**	17.5	1.65	0.5
BH07 (0.1 - 0.3 m)	SILTY CLAY	7.0**	18.0	1.59	0.0
BH10 (0.1 - 0.3 m)	CLAY	5.0**	19.4	2.05	0.5
PACIFIC HIGHWAY SITE					
BH18 (0.1 - 1.5 m)	SILTY CLAY	2.5*	12.9	1.74	3.0
BH19 (0.1 - 1.5 m)	SILTY CLAY	2.0*	12.9	1.79	1.5
BH21 (0.1 - 1.5 m)	CLAY	4.0*	20.0	1.69	1.5
BH29 (0.095 - 1.0 m)	CLAY	1.5*	16.5	1.76	3.0
BH30 (0.02 - 1.0 m)	CLAY with Sand and Gravel	2.0*	16.3	1.73	1.5
BH37 (0.5 - 1.5 m)	CLAY with some Gravel	2.0*	23.4	1.52	0.5
BH39 (0.5 - 1.5 m)	SANDY GRAVELLY CLAY	4.0**	21.8	1.62	0.5

Note: * Indicates Soaked CBR value at 2.5mm penetration

** Indicates Soaked CBR value at 5.0mm penetration

3.2.2 Atterberg Limits

Ten (10) soil samples from the Centennial Avenue site and five (5) from the Pacific Highway site were recovered for Atterberg limit tests. Table 2 presents a summary of the test results. The results all plot above the A-line on Cassagrande’s plasticity chart (Figure 5), ranging from low to high plasticity (i.e., CL to CH), with majority of the samples indicating medium to high plasticity. The test result sheets are included in Appendix D.

Table 2 – Summary of Atterberg Limits

Sample ID (depth)	Sample Description	Atterberg Limits		
		Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)
CENTENNIAL AVENUE SITE				
BH02 (1.5 m)	Brown Silty Clay	35	19	16
BH04 (1.0 m)	Grey Brown Sandy Gravelly Clay	31	17	14
BH05 (1.0 m)	Light Brown Gravelly Clay (Shale)	44	21	23
BH07 (1.7 m)	Light Brown Silty Clay	37	19	18
BH08 (1.5 m)	Brown Silty Clay	56	26	30
BH09 (1.0 m)	Brown Silty Clay	55	23	32
BH11 (0.2 - 0.5 m)	Grey Brown Silty Clay.	52	22	30
BH12 (1.0 m)	Grey Brown Gravelly Clay (Shale)	41	20	21
BH14 (2.1 m)	Grey Gravelly Silty Clay	33	19	14
BH16 (1.0 m)	Orange Brown Silty Clay	48	22	26
PACIFIC HIGHWAY SITE				
BH18 (1.5 m)	Brown Clay	46	20	26
BH19 (0.5 m)	Brown Clay	42	20	22
BH20 (0.5 m)	Brown Clay	41	20	21
BH22 (0.5 - 1.0 m)	Grey Brown Clay	43	21	22
BH23 (0.5 - 1.0 m)	Brown Clay	66	23	43

3.3 Analytical Laboratory Testing

Ten (10) and five (5) disturbed soil samples were retrieved at the Centennial Avenue and Pacific Highway sites, respectively, by a PSM Geotechnical Engineer for testing in an analytical laboratory. The disturbed soil samples were sent to a NATA accredited analytical laboratory and the following tests were undertaken:

- Cation Exchange Capacity (CEC) of calcium, magnesium, potassium and sodium
- Exchange sodium percentage
- Salinity (EC 1:5, one part soil to five parts water)
- Soil pH
- Chlorides
- Sulphates
- Moisture content.

Table 3 presents a summary of the results. The laboratory result sheets are presented in Appendix E.

Table 3 – Summary of Laboratory Analytical Testing Results

Sample ID	pH	Electrical Conductivity [µS/cm]	Moisture Content [%]	Chloride By Discrete Analyser [mg/kg]	Soluble Sulfate by icpaes [mg/kg]	Exchangeable Cations [meq/100g]					ESP [%]
						Ca	Mg	K	Na	CEC	
CENTENNIAL AVENUE SITE											
BH01 – 2.0m	4.8	92	7.2	70	70	1.3	1.2	0.3	0.4	3.2	11.4
BH03 - 2.0m	7.8	180	11.6	10	200	12.8	1.9	0.3	0.5	15.5	3.2
BH05 - 0.2m	4.7	75	16.7	40	100	1.9	0.8	0.2	0.2	3.5	7.9
BH07 - 2.5m	5.1	48	7.3	10	60	1.0	1.0	0.3	0.2	2.5	6.8
BH08 - 2.5m	5.8	19	6.0	<10	20	<0.1	0.9	0.3	0.2	1.5	14.8
BH09 - 0.5m	6.7	208	23.6	20	340	9.8	2.2	0.3	0.3	12.5	2.3
BH11 - 6.0m	6.0	51	32.6	40	70	<0.1	1.8	0.4	0.8	3.1	26.4
BH12 - 0.3 – 0.4m	4.9	83	13.5	60	110	2.5	1.8	0.3	0.4	5.0	7.9
BH14 - 0.1 – 1.0m	4.9	119	24.5	110	100	1.3	1.1	1.0	0.3	3.8	9.3
BH16 - 2.5m	4.9	106	5.8	90	100	<0.1	0.6	0.2	0.6	1.5	41.8
PACIFIC HIGHWAY SITE											
BH18 – 1.0m	5.3	90	18.3	20	140	15	1.4	0.6	0.5	17.4	2.6
BH19 – 2.6m	5.6	17	9.2	10	20	<0.1	1.3	0.3	0.9	2.6	33.7
BH20 – 7.0m	6.3	25	7.4	<10	20	4.4	4.5	0.2	0.7	9.8	6.9
BH21 – 0.5m	5.5	47	17.0	20	70	0.8	3.1	0.6	1.2	5.7	21.6
BH22 – 1.5m	5.0	58	10.1	<10	50	1.6	2.1	0.5	0.3	4.4	6.4

3.3.1 Soil Chemistry

The laboratory test results summarised in Table 3 indicates de following:

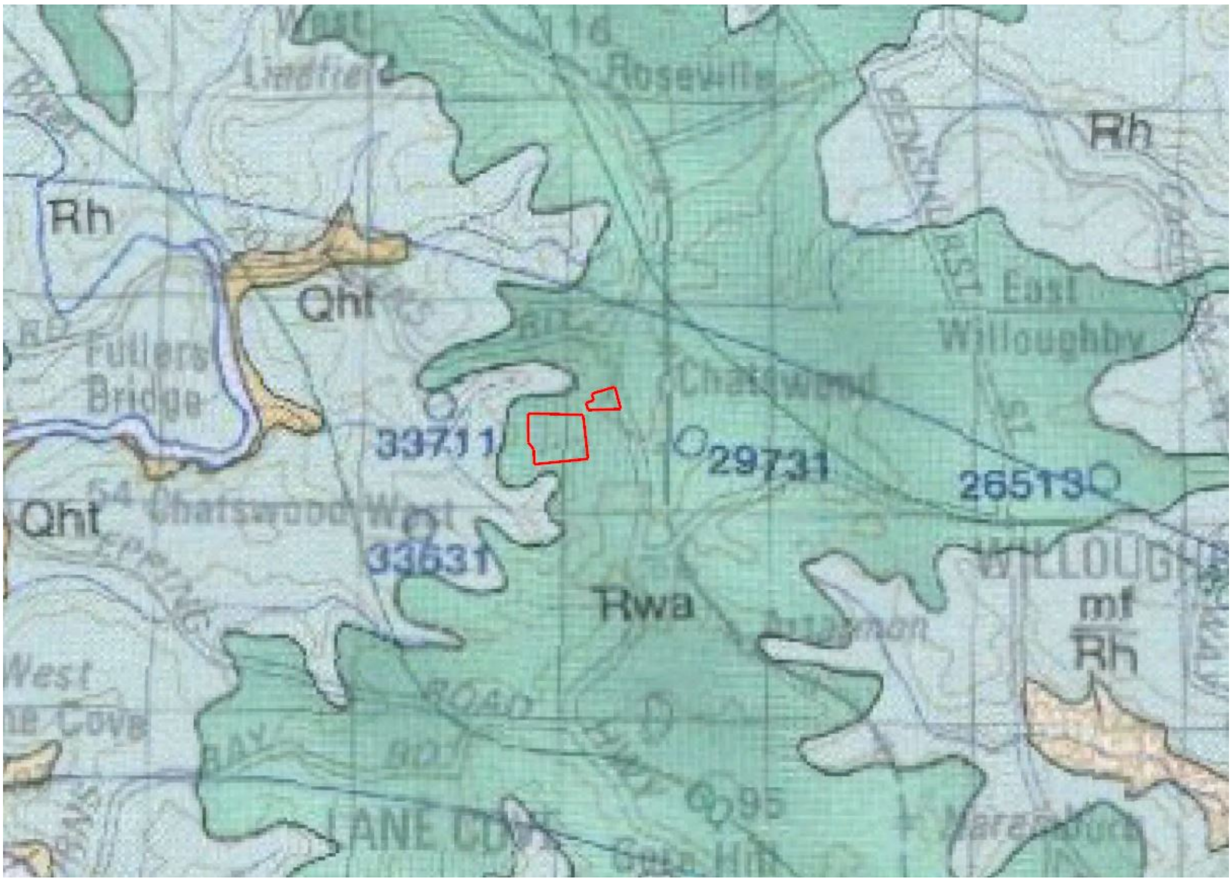
- pH of the soil samples analysed range from 4.7 to 7.8, with an average of 5.6
- The 1:5 soil to water extraction and subsequent electrical conductivity ($EC_{1:5}$) of the soil samples analysed range from 17 µS/cm to 208 µS/cm
- Concentrations of chlorides in samples analysed ranged from <10 mg/kg to 110 mg/kg
- Concentrations of soluble sulfate in samples analysed ranged from 20 mg/kg to 340 mg/kg
- Cation Exchange Capacity (CEC) in samples analysed ranged from 1.5 meq/100g to 17.4 meq/100g
- Exchange Sodium Percentage (ESP) in samples analysed ranged from 2.3% to 41.8%.

4 Site Conditions

4.1 Geological Setting

The 1:100,000 Sydney Geological Map indicates that both sites are underlain by Ashfield Shale of the Wianamatta group (Rwa) which consist of black to dark-grey shale and laminate.

Inset 1 presents the geological map of the site.



Inset 1: Sydney geological map indicating approximate site location

4.2 Surface Conditions

Both sites comprise a number of existing school buildings and facilities with concrete pathways, sealed bitumen surfaces and some grassed and landscaped areas. Some demountable buildings also occupy both sites.

The Centennial Avenue site is approximately 6.5 ha in area, and it is bound by Dardanelles Road and De Villiers Avenue to the west, Eddy Road to the south, Centennial Avenue to the north and residential buildings to the east.

This site has a gentle fall from the northern boundary towards the southwest corner and a steep fall from the Centennial Avenue to the Bush Campus along the eastern boundary.

At the time of the Centennial Avenue fieldwork, the surfaces were dry with minimal foot traffic on site. The majority of the boreholes were drilled through topsoil on the surface with the exception of seven boreholes drilled through concrete/asphalt driveway.

The Pacific Highway site is approximately 1.2 ha in area and is bound by Jenkins Street to the west, Centennial Avenue to the south, Pacific Highway to the east and residential and commercial buildings to the north. This site has a gentle fall from the eastern boundary towards the west. A gentle drop to the northwest corner is addressed with terracing and sports courts on separate levels.

On 16 and 17 February during the Pacific Highway fieldwork, the surfaces were dry with considerable foot traffic on site. PSM coordinated with members of the public using the school facilities to minise risk exposure. The majority of the boreholes were drilled through asphalt-paved areas with the exception of one borehole drilled through astroturf.

On 10 to 12 October during the Pacific Highway fieldwork, the surfaces were dry to moist due to rain events occuring during the fieldwork. The boreholes were drilled on asphalt-paved surfaces and through astroturf on the sports courts.

Inset 2 presents an aerial photo of both sites.

Inset 2: Aerial photograph of site (source: Nearmap, 27 December 2018)

4.3 Subsurface Conditions

The subsurface conditions encountered within the boreholes are summarised in Table 4 and Table 5. The Ashfield Shale bedrock unit has been classified using the system developed by Pells et al (1998).

Table 4 – Summary of inferred subsurface conditions encountered in the boreholes

Inferred Unit	Inferred top of unit depth below ground surface (m)	Description
CENTENNIAL AVENUE SITE		
Concrete/Asphalt	0.0	100 to 150 mm thick.
Topsoil	0.0	Silty CLAY; dark brown, non-plastic to low plasticity, trace of gravel up to 5 mm, sub-angular to angular, soft to stiff consistency, dry. Roots, rootlets, bark and grasses observed throughout.
Fill	0.0 to 0.2	CLAY; grey, orange/red, pale and dark brown, generally low to medium plasticity, with silt, trace of gravel up to 20 mm, sub-angular to angular, stiff to hard consistency, dry.
Residual Soil	1.0 to 6.0	CLAY; grey, red, orange and brown, generally medium to high plasticity, very stiff to hard consistency, mostly dry.
Bedrock	1.2 to 7.2	LAMINITE (Class IV/V); dark grey and grey with orange banding, fine grained sandstone, rock fabric faint with developed bedding. Extremely to highly weathered. Extremely low to very low strength.
	5.8 to 8.6	LAMINITE (Class III); black with occasional orange banding, fine grained sandstone, rock fabric visible with developed bedding. Moderately to slightly weathered. Low to high strength.
	3.4 to 9.4	SILTSTONE (Class IV/V); dark grey and brown with orange banding, rock fabric faint with poorly developed to developed bedding, extremely to slightly weathered, very low to low strength.
	7.2 to 8.6	SILTSTONE (Class III); dark grey and grey, bedding fabric visible with well developed bedding, slightly weathered, low to medium strength.
	9.5 to 11.5	Interbedded SILTSONE and SANDSTONE (Class III); fine to medium grained, thinly developed bedding, slightly weathered to fresh, medium to high strength.
PACIFIC HIGHWAY SITE		
Asphalt/Astroturf	0.0	10 to 200 mm thick

Inferred Unit	Inferred top of unit depth below ground surface (m)	Description
Fill	0.01 to 0.2	Silty CLAY; dark grey, orange, brown and pale brown, low to medium plasticity, trace of gravel up to 30 mm, sub-angular, dry and very stiff to hard consistency.
Residual Soil	0.1 to 1.6	CLAY; high plasticity, orange, yellow and red-brown, moist and stiff to very stiff consistency, some roots and weathered shale fragments observed as residual soil grades to bedrock.
Bedrock	1.0 to 2.5	SILTSTONE (Class IV/V); dark grey, pale grey with orange banding, thin fine-grained sandstone laminations observed, rock fabric faint with poorly developed bedding. Highly to slightly weathered. Very low to low strength.
	4.5 to 6.1	SILTSTONE (Class III); grey and dark grey with orange banding, thin fine-grained sandstone laminations observed. Moderately to slightly weathered. Low to medium strength.
	4.1 to 4.2	LAMINITE (Class III); dark grey with sandstone laminations, 70-80% siltstone, 20-30% fine grained sandstone, well to very well developed bedding fabric, distinct thinly laminated bedding, moderately weathered to fresh, typically medium to high strength. Note that there is a layer of Class V siltstone between depth of 5.2 m and 5.8 m in BH36. This layer underlies approximately 1 m thick Class III laminite.

Table 5 – Approximate depth to the top of inferred geotechnical units encountered in boreholes

Test ID	Approximate depth to top of inferred geotechnical units (m)							
	Concrete/ Asphalt	Topsoil	Fill	Residual Soil	Bedrock	Class V / IV Rock	Class III Rock	EOH
CENTENNIAL AVENUE SITE								
BH01	N/E	0.0	0.1	N/E	2.0	N/A	N/A	2.6
BH02	N/E	0.0	0.1	N/E	1.8	N/A	N/A	3.2
BH03	N/E	0.0	0.05	3.0	5.8	N/A	N/A	6.0
BH04	N/E	0.0	0.1	6.0	N/E	N/A	N/A	7.5
BH05	N/E	0.0	0.1	N/E	1.2	N/A	N/A	2.8
BH06	N/E	0.0	0.1	2.0	3.0	3.0	5.8	8.2
BH07	N/E	0.0	0.2	1.6	2.5	2.5	7.2	9.4
BH08	0.0	N/E	0.15	1.5	1.9	N/A	N/A	6.3
BH09	0.0	N/E	0.1	2.5	3.2	N/A	N/A	9.0
BH10	N/E	0.0	0.2	N/E	4.2	N/A	N/A	8.0
BH11	N/E	0.0	0.1	N/E	2.5	N/A	N/A	8.0
BH12	N/E	0.0	0.1	N/E	1.5	N/A	N/A	5.2
BH13	N/E	N/E	0.0	N/E	1.5	N/A	N/A	5.0
BH14	N/E	0.0	0.1	2.0	2.5	N/A	N/A	3.0
BH15	N/E	0.0	0.1	1.0	3.0	N/A	N/A	6.3
BH16	N/E	0.0	0.1	1.3	2.0	N/A	N/A	4.5
BH17	N/E	0.0	0.2	N/E	2.0	N/A	N/A	3.0
BH24	0.0	N/E	N/E	0.16	2.5	N/A	N/A	8.0
BH25	0.0	N/E	N/E	0.08	1.2	N/A	N/A	8.0
BH26	0.0	N/E	N/E	0.15	1.8	1.8	7.2	8.6
BH27	0.0	N/E	N/E	0.08	1.5	N/A	N/A	8.0
BH28	0.0	N/E	N/E	0.04	3.3	3.3	9.5	11.5
PACIFIC HIGHWAY SITE								
BH18	0.0	N/E	0.2	N/E	1.8	1.8	6.1	9.6
BH19	0.0	N/E	0.2	N/E	1.5	1.5	4.5	8.2
BH20	0.0	N/E	0.1	N/E	1.5	N/A	N/A	7.6
BH21	0.0	N/E	0.15	N/E	1.2	N/A	N/A	4.8
BH22	N/E	N/E	0.0	N/E	1.3	N/A	N/A	5.5
BH23	0.0	N/E	0.1	N/E	1.3	N/A	N/A	5.8
BH29	0.0	N/E	N/E	0.1	1.7	N/A	N/A	4.0

Test ID	Approximate depth to top of inferred geotechnical units (m)							
	Concrete/ Asphalt	Topsoil	Fill	Residual Soil	Bedrock	Class V / IV Rock	Class III Rock	EOH
BH30	N/E	N/E	0.0	0.7	1.6	N/A	N/A	4.0
BH31	0.0	N/E	0.1	0.8	3.0	N/A	N/A	4.0
BH32	N/E	N/E	0.0	1.5	3.2	N/A	N/A	4.0
BH33	0.0	N/E	0.04	0.9	2.5	2.5	4.1	8.2
BH34	N/E	N/E	0.0	0.5	1.7	N/A	N/A	4.0
BH35	0.0	N/E	0.05	N/E	0.5	N/A	N/A	4.0
BH36	0.0	N/E	0.03	0.6	1.0	1.0	4.2*	8.2
BH37	0.0	N/E	0.09	0.5	2.3	N/A	N/A	4.0
BH38	0.0	N/E	0.18	1.6	2.3	N/A	N/A	4.0
BH39	0.0	N/E	0.02	N/E	1.6	N/A	N/A	4.0

Note: *Note that there is a 0.6 m thick layer of Class V siltstone below the Class III laminite.
EOH = End of Hole
N/E = Not Encountered

4.4 Groundwater

No groundwater was observed within the boreholes during the investigation.

5 Discussion

5.1 Excavation Conditions

It is unclear at the time of the investigation if any basements are proposed. Depending on the required earthworks or excavations for the development and based on the geotechnical investigation, excavation may include Topsoil, Fill, Residual Soil and Bedrock units. Excavation in the Topsoil, Fill, Residual Soil and weathered Bedrock should be achievable using conventional earth moving equipment with minor rock breaking. Excavation of more competent Bedrock may require the use of hydraulic impact breakers, rock saws and/or rock grinders and must be undertaken by contractors with suitable experience in rock excavation close to existing structures. Please note that auger TC bit refusal was encountered in most boreholes.

Prospective contractors should make their own assessment of excavatability based on the borehole logs and their site inspection and experience. It is our experience that excavatability is heavily dependent on both the operator and the plant used. Heavy rock breaking equipment will generate vibrations that may impact on neighbouring structures. Where controls on vibrations are required, the contractor should consider the use of smaller hammers, rock saws and grinders to undertake the excavation. The contractor should recognise that there is a potential for damage to adjacent buildings or infrastructure (if any) and consider this in its planning.

5.2 Earthworks and Disposal of Excavated Material

We anticipate that some earthworks may be required as part of the redevelopment. We consider that topsoil is not suited for reuse as engineered fill (but could be potentially blended in small quantities) but may be reused for landscaping purposes. It is our opinion that most of the remaining cut material (i.e., Fill, Residual Soil and Bedrock) would be suitable for reuse on the site as engineered fill.

We envisage that the earthworks proposed at the site will require the preparation of a detailed fill specification developed following the guidelines in AS 3798 (2007), "*Guidelines on earthworks for commercial and residential* *developments*". Preparation of this fill specification is outside the scope of this report. We consider, however, that the fill specification should address at least the following:

1. Subgrade preparation and base geometry requirements.
2. Material requirements, including a clear definition of:
   a. Suitable and unsuitable material.
   b. Grading or maximum particle size requirements. We note that a conservative definition of maximum particle size may result in some of the materials on site being excluded from reuse as engineered fill. It is our opinion that this restriction may not significantly benefit fill performance.
3. Fill placement requirements, including a clear definition of compacted layer thickness, we suggest 300 mm.
4. Compaction requirements. We suggest that a minimum and maximum density ratio be adopted to control any potential shrink swell of the clayey fill material and to limit the effect of fill material variability on the fill performance, we suggest 98 to 102 % standard.
5. Moisture control requirements. We consider that control on placement moisture variation should be adopted to control any potential shrink swell of the clayey fill material, we suggest moisture variation of +- 2%.
6. Inspection and testing requirements, including a clear definition of:
   a. Level of control testing, e.g. Level 1 as per AS3798
   b. Lot testing, this is an important aspect of earthworks control but often ignored in acceptance of the works
   c. Testing methodology
   d. Testing frequency.
7. Responsibilities of the contractor. We envisage that such responsibilities would include:
   a. Undertake the earthworks in accordance with fill specification
   b. Seek approvals by the GITA as required by the fill specification, in particular prior to placing any new fill
   c. Responsibilities of the Geotechnical Inspection and Testing Authority (GITA). The fill specification should define:
   d. The inspection and testing responsibilities of the GITA
   e. The reporting responsibilities of the GITA
   f. The final certification responsibilities of the GITA. We note that the specification should require the GTA to certify that "all the earthworks have been documented and have been undertaken in accordance with the relevant fill specification". It is not adequate just to refer to AS3798 Level 1.

For disposal purposes, it is likely the Residual Soil and Bedrock units are able to be validated as Virgin Excvataed Natural Material (VENM). However, the Fill unit encountered can either be disposed as General Solid Waste or validated as Excavated Natural Material (ENM).

The most economical outcome would be to re-use the existing fill on site as much as possible and dispose the VENM off site. VENM verification would be required during construction for material disposal. Based on the Fill observed during the geotechnical investigation, we have not found attributes that can be assessed visually (e.g. rubber, plastic, bitumen, paper, cloth, paint and wood) that would preclude ENM validation. We consider it is likely that the existing fill will be able to be so validated but this can only be done once the material is stockpiled on site during construction. We note that the earthwork contractor should go to considerable extent to segregate different materials (eg Topsoil, Fill and Residual Soils).

5.3 Site Classification

Based on the field observations and the inferred geotechnical units from the boreholes, we recommend that structures within scope of AS2870 be designed for a site classification of Class "M" for both sites. This is due to the presence of clay fill layer deeper than 1.0 m over the majority of the sites. The site can be re-classified during the works for specific areas where required.

5.4 Permanent and Temporary Batters

The batter slope angles shown in Table 6 are recommended for the design of batters up to 5 m height subject to the following recommendations:

- The batters shall be protected from erosion. Permanent batters will need face support such as vegetation or shotcrete
- Permanent batters shall be drained for a distance behind the faces at least equal to the height
- Temporary batters shall not be left unsupported for more than 2 months without further advice, and inspection by a suitably experienced geotechnical engineer should be undertaken following significant rain events
- No buildings, surcharge loads or services should be located within 1 batter height of the crest.

If the conditions above cannot be met, further advice should be sought.

Where Fill is not engineered/controlled fill, batter slope angles should be assessed by a suitable experienced geotechnical engineer.

Exposed rock faces should be inspected by a geotechnical engineer or engineering geologist to assess the need for localised rock bolting to control adverse jointing in the Bedrock unit and shotcreting for overall face support and weather protection.

Table 6 – Batter Slope Angles

Unit	Temporary	Permanent
ENGINEERED FILL	2H : 1V	2.5H : 1V
RESIDUAL SOIL	1.5H : 1V	2H : 1V
BEDROCK	0.5H : 1V	1H : 1V

Steeper batters may be possibly subject to further advice, probably including inspection during construction and shortcreting and rock bolting etc.

5.5 Retaining Walls

Cuts in the Fill, Residual Soil and Bedrock units steeper than the recommended permanent batter slopes in Table 6 will need to be supported by some form of retaining structure.

The selection of the appropriate retention system is a matter of design. The designer should consider the following factors in making its selection:

- Technical factors
  - Performance
  - Ground conditions (this is addressed below with the design parameters)
  - Surcharge loading and
  - Proximity of structures, buildings and roads, etc.
- Non- technical factors
  - Cost (to build and to maintain)
  - Other constraints such as real estate, neighbouring site / boundary, aesthetics, legislation, etc.

The design of these structures should be based on the following geotechnical properties:

- Effective strength parameters in Table 7 when assessing the earth pressure on retaining structures
- A lateral pressure of 10 kPa for vertical cuts in the Bedrock units (Class III or better). This is to allow for blocks and rock wedges formed due to adverse defects that may exist within the unit
- Water pressure (depending on the type of structure).

Note that design of retention systems may be based on either K_a or K_o earth pressures. Design using active earth pressures provides the minimum lateral earth pressure that must be supported to avoid failure and requires a wall that can rotate or translate to allow the pressures to reduce to these values (vertical and lateral movements up to 2% of height may occur, typical movements will be much less).

Where the design is based on K_o pressures, construction should be carefully controlled to avoid unwanted effects. It should be noted that designing for K_o pressures do not, of themselves, ensure that movement does not occur. Movements are controlled by the construction method, especially sequence.

Both surface and sub-surface drainage needs to be designed and constructed properly to prevent pore water pressures from building up behind the retaining walls or appropriate water pressures must be included in the design.

Table 7 – Engineering Parameters of Inferred Geotechnical Units

Inferred Unit	Bulk Unit Weight (kN/m3)	Effective Strength Parameters		Ultimate Bearing Pressure under Vertical Centric Loading2 1 (kPa)	Allowable Bearing Pressure under Vertical Centric Loading (kPa)	Ultimate Shaft Adhesion (kPa)	Elastic Parameters	
		c' (kPa)	Φ' (deg)				Young's Modulus (MPa)	Poisson's Ratio
Engineered Fill	18	0	30	4001	1501	N.A.	Engineered Fill	18
Residual Soil	18	0	30	4001	1501	N.A.	Residual Soil	18
Siltstone/Laminite V/IV	22	10	30	30002	7003	50	Siltstone/ Laminite V/IV	22
Siltstone/Laminite / Interbedded siltstone and sandstone III	24	N.A.	N.A.	60002	20003	350	Siltstone/ Laminite/ Interbedded siltstone and sandstone III	24

Note:
1. Minimum plan dimension of 1.0 m and a minimum embedment depth of 0.5 m.
2. Ultimate bearing pressure for bedrock assumes a settlement of approximately 5% of the least footing dimension for footings in rock.
3. Allowable bearing pressure assumes a settlement of approximately 1% of the least footing dimension for footings in rock.

5.6 Foundations

5.6.1 Shallow Footings

Pad footings can be proportioned on the basis of an allowable bearing pressure (ABP) for centric vertical loads provided in Table 7.

We note that an allowable bearing pressure (ABP) is not a soil property. It depends on many factors such as the size of the footings, the embedment depth, the load direction and eccentricity, the stiffness of the footing, the adopted factor of safety (FOS), as well as the soil properties. As footings get bigger or deeper the capacity increases rapidly. As the load gains eccentricity or becomes inclined, the capacity reduces rapidly.

Settlements in the can be estimated using the elastic parameters provided in Table 7. When assessing the settlement of the shallow footings, the designer needs to consider the additional ground settlement due to the total building load on both shallow and deeper units. The differential settlement due to the building load shall also be assessed.

Foundations conditions at the proposed shallow pad footings locations should be inspected by a suitably qualified geotechnical engineer prior to the pouring of concrete.

5.6.2 Piles

We envisage that piles would be founded within the Bedrock unit.

Piles should be designed in accordance with the requirements in AS 2159 (2009), Piling – Design and Installation. The parameters provided in Table 7may be adopted in the design of piles founded in Bedrock unit.

The designer should note the following with regards to the pile design:

- The ABP needs to be confirmed by a geotechnical engineer through pile inspections prior to pouring concrete
- Under permanent load, the contribution of side adhesion for soils including Fill and Residual Soil should be ignored
- Deflection should be checked using the recommended elastic parameters in Table 7
- Where adjacent foundation details differ (e.g., pile and pad, differing loads or ground conditions), differential settlement should also be assessed.

The bearing capacities provided are contingent on piles or footings being vertically and centrally loaded. Further advice should be sought if the footings are not vertically centrically loaded. Should higher bearing capacities be required of the Bedrock, this may be available subject to further advice.

With regards to the pile design we recommend that:

- A geotechnical strength reduction factor, Φ_g = 0.60 (AS2159 CL. 4.3.2) be adopted for a high redundancy system for an assessed average risk rating (ARR) between 2.5 and 3.0. This should be reviewed to suit the specific design and appropriate pile testing proposed by the structural designers in accord with the requirements of AS2159
- It may be possible to increase the pile reduction factors, if the details of the proposed pile installation procedures indicate a high level of quality control with regards to concrete placement, base cleanliness, etc
- If a geotechnical strength reduction factor, Φ_g = 0.40 is adopted then no pile testing will be required (AS2159 Clause 8.2.4 (b)).

5.7 Pavements

Subgrade CBR for pavement design depends on the material at the finished subgrade levels. Based on the CBR tests undertaken by PSM (refer to Table 1) we recommend a design subgrade CBR of 2% be adopted for the pavement design at both sites. Should a higher design CBR be required, further testing at specific locations may be required and further advice should be sought.

6 Salinity and Aggressivity Assessment

6.1 Salinity

Site Investigations for Urban Salinity (DLWC 2002) classify soil salinity based on electrical conductivity (ECe). The method of conversion from EC1:5 to ECe (electrical conductivity of saturated extract) is based on DLWC (2002) and given by ECe = EC1:5 x M, where M is the multiplication factor based on “Soil Texture Group”.

The “Soil Texture Group” of the samples tested were assessed during our investigation. The salinity classification for the soil samples that were tested are presented in Table 8.

Table 8 – Salinity Classification

Sample ID	EC1:5 (dS/m)	Soil Type	M	ECe (dS/m)	Salinity Class
CENTENNIAL AVENUE SITE					
BH01 – 2.0m	0.092	Clay Loam	9	0.828	Non-saline
BH03 - 2.0m	0.180	Light Clay	8.5	1.53	Non-saline
BH05 - 0.2m	0.075	Light Clay	8.5	0.638	Non-saline
BH07 - 2.5m	0.048	Clay Loam	9	0.432	Non-saline

Sample ID	EC1:5 (dS/m)	Soil Type	M	ECe (dS/m)	Salinity Class
BH08 - 2.5m	0.019	Clay Loam	9	0.171	Non-saline
BH09 - 0.5m	0.208	Light Clay	8.5	1.768	Non-saline
BH11 - 6.0m	0.051	Clay Loam	9	0.459	Non-saline
BH12 - 0.3 – 0.4m	0.083	Medium Clay	7	0.581	Non-saline
BH14 - 0.1 – 1.0m	0.119	Light Clay	8.5	1.012	Non-saline
BH16 - 2.5m	0.106	Clay Loam	9	0.954	Non-saline
PACIFIC HIGHWAY SITE					
BH18 – 1.0m	0.090	Light Medium Clay	8	0.72	Non-saline
BH19 – 2.6m	0.017	Clay Loam	9	0.153	Non-saline
BH20 – 7.0m	0.025	Clay Loam	9	0.225	Non-saline
BH21 – 0.5m	0.047	Medium Clay	7	0.329	Non-saline
BH22 – 1.5m	0.058	Clay Loam	9	0.522	Non-saline

It is assessed that the soils on site are classified as “non-saline”. We have referred to Clause 4.8.2 of Australian Standard AS3600-2009 “Concrete Structures” and note that the assessed soil electrical conductivity (EC_e) is less than the upper limit of the “A2” exposure classification for both sites.

6.2 Corrosivity / Aggressivity

Table 6.4.2(C) of Australian Standard AS2159:2009, Piling – Design and Installation provides criteria for exposure classification for concrete piles based on sulfates in the soil and groundwater, soil and groundwater pH, and chlorides in groundwater. On the basis of the soil sulfates and pH testing completed we assess the exposure classification for concrete piles in the soil to be mild for both sites.

Table 6.5.2(C) of Australian Standard AS2159:2009, Piling – Design and Installation provides criteria for exposure classification for steel piles based on resistivity, soil and groundwater pH, and chlorides in soil and groundwater. On the basis of soil chlorides and pH testing completed we assess the exposure classification for steel piles in the soil to be non-aggressive for both sites.

6.3 Sodicity

Sodicity provides a measure of the likely dispersion on wetting and to shrink/swell properties of a soil. Soil sodicity is classified based on the Exchangeable Sodium Percentage (ESP) which is the amount of exchangeable sodium as a percentage of the Cation Exchange Capacity (DLWC, 2002).

The Exchangeable Sodium Percentages calculated from these laboratory results, ranging from 2.3% to 41.8%, indicates that the soils on both sites are highly sodic when compared to criteria listed in “Site Investigations for Urban Salinity”, DLWC (2002).

7 Environmental and Contamination Investigation

An environmental and contamination site investigation has been undertaken by JBS&G for both sites and the results of the investigation is presented in Appendix F. The main conclusions are extracted from the JBS&G report and presented below.

7.1 Chatswood High School

Based on the scope of works undertaken, and in accordance with the limitations outlined in Section 12 of the report in Appendix F1, it is considered that the site does not present any unacceptable risks to human and ecological health, pursuant to NEPC (2013), and is considered suitable for use as a primary and secondary school facility. JBS&G recommend the formulation of an Unexpected Finds Protocol (UFP) for the site to address any unexpected finds that may be encountered during the redevelopment of the site.

7.2 Chatswood Public School

Based on the scope of investigation undertaken, and in accordance with the limitations in Section 12 of the report in Appendix F2, the following conclusions are made:

- Potentially unacceptable concentrations of COPCs were identified within soils at the site, primarily associated with petroleum hydrocarbons and PAHs;
- Based on the current configuration and uses of the site, JBS&G do not consider there to be complete source-receptor pathways that would result in potentially unacceptable risk to current site users (i.e. concrete hardstand separates impacted soils from the ground surface);
- Should excavation works be required prior to the commencement of redevelopment activities at the site, JBS&G recommend the development of a CEMP, or similar, to ensure that the current site configuration that enables the site to be considered suitable under the current site uses, are maintained; and
- JBS&G recommend the development of a RAP to guide the required management of identified soil contamination during and after development such that the site can be considered suitable for the proposed educational land use.

8 Hazardous Materials Assessment

A hazardous materials (hazmat) assessment has been undertaken by JBS&G for both sites and the results of the assessment is presented in Appendix G. The main conclusions are extracted from the JBS&G report and presented below.

8.1 Chatswood High School

Based on the scope of this assessment and with reference to the limitations included in Section 6, the following conclusions are made with respect to the Hazardous Building Materials Survey completed at the Chatswood High School site.

8.1.1 Hazardous Materials

Identified and suspected hazardous materials were observed throughout the site as a result of visual identification and laboratory analysis. The following recommendations are made for the removal of the identified hazardous materials to potentially mitigate harmful effects as a result of the proposed works program. The person with management or control of the site, must ensure so far as is reasonably practicable that the identified hazardous materials are removed prior to the commencement of demolition and refurbishment works.

The identified and suspected hazardous materials are presented in the Hazardous Materials Register included in Appendix G1.

- Friable Asbestos Containing Dust: friable ACD has been identified at the site. Prior to the demolition of the structures it is recommended that the following work is undertaken:
  - A Class A (friable and non-friable) licensed asbestos removalist shall be engaged to remove all asbestos containing dust as identified in the Hazardous Materials Register, included in Appendix G1
  - SafeWork NSW is to be notified of all asbestos removal work with appropriate permits to remove friable asbestos obtained prior to works commencing. In addition, an asbestos removal control plan is to be developed by the engaged licensed asbestos removalist prior to the removal works outlining the specific control measures necessary to minimise any risk from exposure to asbestos. All removal and disposal of friable asbestos materials shall be conducted in accordance with Work Health and Safety Act (2011), Work Health and Safety Regulation (2017) and SWA2018a. The materials should be disposed of to an

appropriately licensed landfill in accordance with the Waste Classification Guidelines Part 1: Classifying Waste (NSW EPA, 2014)

  - Air monitoring is required to be conducted by an independent Licensed Asbestos Assessor (LAA) before and during the removal of the friable asbestos containing dust identified within Room R1007 in Building A, Room R1009 in Building B and Room R1005 in Building C. Air monitoring must also be conducted as part of the clearance inspection
  - Following removal works, a clearance inspection shall be undertaken by the appointed LAA to ensure that the friable ACD materials identified in the Asbestos Register have been removed to a satisfactory industry standard or have been maintained in a manner that does not present an exposure hazard to current or future site occupants. Following the completion of the clearance inspection, a clearance certificate shall be issued by the LAA to confirm that the friable ACD has been successfully removed and that the removal area is suitable for planned demolition works to commence.
- Non-Friable Asbestos Containing Materials: non-friable ACM has been identified at the site. Prior to the demolition and/or refurbishment of the structures it is recommended that the following work is undertaken:
  - A Class A or B licensed asbestos removalist shall be engaged to remove all asbestos containing materials as identified in the Hazardous Materials Register (Appendix G1). Removal and disposal of non-friable asbestos materials shall be undertaken in accordance with the Work Health and Safety Act (2011), Work Health and Safety Regulation (2017) and SWA2018a
  - While not mandatory during the removal of non-friable ACM, it is considered best practice and recommended that asbestos air monitoring is undertaken during any non-friable asbestos removal works
  - Following removal works, a clearance inspection shall be completed by a competent person or LAA to ensure that the asbestos materials identified at the site have been removed to a satisfactory standard. Following the completion of the clearance inspection, a clearance certificate shall be issued by the competent person or LAA to confirm that the ACM has been successfully removed and that the site is suitable for planned demolition works to commence.
- Lead Containing Dust: elevated levels of lead in dust above the adopted site criteria were identified at the site. A suitably experienced hazardous materials removal contractor should be engaged to remove the lead containing dust prior to the commencement of demolition and refurbishment works
- Lead Based Paints: lead based paints identified in Hazardous Materials Register (Appendix G1) should be managed in accordance with the AS4361.2-2017. If peeling or deteriorated they should be removed under controlled conditions by an experienced contractor prior to demolition and refurbishment. Stable lead based paints adhered to building fabric can be removed as general solid waste provided care is taken to minimise any potential for paint flakes to be dispersed onto ground surfaces
- Synthetic Mineral Fibres: the synthetic mineral fibres encountered during this inspection were generally contained and deemed to be low risk. These SMF materials can be removed with the building and demolition waste with care taken not to generate fibres. Appropriate PPE is recommended including the use of P2 respirator as minimum and appropriate removal methodology as outlined in [NOHSC: 1004(1990)] and [NOHSC: 2006(1990)]
- Polychlorinated Biphenyls: all old fluorescent light fittings throughout the site are to be treated as containing PCB capacitors unless further investigation confirms otherwise. These light fittings should be removed and disposed of as Scheduled Waste or re-inspected once isolated from the electrical system to confirm the presence or absence of PCB capacitors.

8.1.2 Inaccessible Areas

Areas inaccessible during the current HBMS should be inspected by a suitably qualified competent person prior to any works commencing. Suspected ACM should be sampled by a suitably qualified competent person prior to any works commencing.

8.1.3 Unexpected Finds

Any materials deemed to be consistent with those detailed in the Hazardous Materials Register that have not been previously identified should be assumed to have the same content and be treated accordingly. Should any additional suspected hazardous materials be observed during or prior to demolition works, works should cease until a suitably qualified occupational hygienist can assess the suspected hazardous material and provide appropriate recommendations for management and/or removal.

8.2 Chatswood Public School

Based on the scope of this assessment and with reference to the limitations included in Section 6, the following conclusions are made with respect to the Hazardous Building Materials Survey completed at the Chatswood Public School site.

8.2.1 Hazardous Materials

Identified and suspected hazardous materials were observed throughout the site as a result of visual identification and laboratory analysis. The following recommendations are made for the removal of the identified hazardous materials to potentially mitigate harmful effects as a result of the proposed works program. The person with management or control of the site, must ensure so far as is reasonably practicable that the identified hazardous materials are removed prior to the commencement of demolition and refurbishment works.

The identified and suspected hazardous materials are presented in the Hazardous Materials Register included in Appendix G2.

- Asbestos Containing Materials: non-friable ACM has been identified at the site. Prior to the demolition and/or refurbishment of the structures it is recommended that the following work is undertaken:
  - A Class A or B licensed asbestos removalist shall be engaged to remove all asbestos containing materials as identified in the Hazardous Materials Register (Appendix G2). Removal and disposal of non-friable asbestos materials shall be undertaken in accordance with the Work Health and Safety Act (2011), Work Health and Safety Regulation (2017) and SWA2018a
  - While not mandatory during the removal of non-friable ACM, it is considered best practice and recommended that asbestos air monitoring is undertaken during any non-friable asbestos removal works
  - Following removal works, a clearance inspection shall be completed by a competent person or licensed asbestos assessor to ensure that the asbestos materials identified at the site have been removed to a satisfactory standard. Following the completion of the clearance inspection, a clearance certificate shall be issued by the competent person or LAA to confirm that the ACM has been successfully removed and that the site is suitable for planned demolition works to commence.
- Lead Containing Dust: elevated levels of lead in dust above the adopted site criteria were identified at the site. A suitably experienced hazardous materials removal contractor should be engaged to remove the lead containing dust prior to the commencement of demolition and refurbishment works
- Lead Based Paints: lead based paints identified in Hazardous Materials Register (Appendix G2) should be managed in accordance with the AS4361.2-2017. If peeling or deteriorated they should be removed under controlled conditions by an experienced contractor prior to demolition and refurbishment. Stable lead based paints adhered to building fabric can be removed as general solid waste provided care is taken to minimise any potential for paint flakes to be dispersed onto ground surfaces
- Synthetic Mineral Fibres: the synthetic mineral fibres encountered during this inspection were generally contained and deemed to be low risk. These SMF materials can be removed with the building and demolition waste with care taken not to generate fibres. Appropriate PPE is recommended including the use of P2 respirator as minimum and appropriate removal methodology as outlined in [NOHSC: 1004(1990)] and [NOHSC: 2006(1990)]
- Polychlorinated Biphenyls: all old fluorescent light fittings throughout the site are to be treated as containing PCB capacitors unless further investigation confirms otherwise. These light fittings should be removed and disposed of as Scheduled Waste or re-inspected once isolated from the electrical system to confirm the presence or absence of PCB capacitors.

8.2.2 Inaccessible Areas

Areas inaccessible during the current HBMS should be inspected by a suitably qualified competent person prior to any works commencing. Suspected ACM should be sampled by a suitably qualified competent person prior to any works commencing.

8.2.3 Unexpected Finds

Any materials deemed to be consistent with those detailed in the Hazardous Materials Register that have not been previously identified should be assumed to have the same content and be treated accordingly. Should any additional suspected hazardous materials be observed during or prior to demolition works, works should cease until a suitably qualified occupational hygienist can assess the suspected hazardous material and provide appropriate recommendations for management and/or removal.

Should there be any queries, do not hesitate to contact the undersigned.

For and on behalf of
PELLS SULLIVAN MEYNINK

YUN BAI
SENIOR GEOTECHNICAL ENGINEER

BERNARD SHEN
PRINCIPAL

Encl.

Figure 1A	Test Locations (Centennial Avenue)
Figure 1B	Long Section View Along A'A'
Figure 2	Test Locations (Pacific Highway)
Figure 3	Selected Photos (1 of 2)
Figure 4	Selected Photos (2 of 2)
Figure 5	Atterberg Limits Graph
Appendix A	Geotechnical Engineering Borehole Logs
Appendix B	Point Load Test Results
Appendix C	CBR testing results
Appendix D	Atterberg Limit Test Results
Appendix E	Environmental testing results
Appendix F	JBS&G Environmental Assessment Report
Appendix G	JBS&G Hazardous Material Assessment Report

LEGEND

● PSM Auger Hole

● PSM Cored Hole

NOTES:

1. Borehole locations are approximate.

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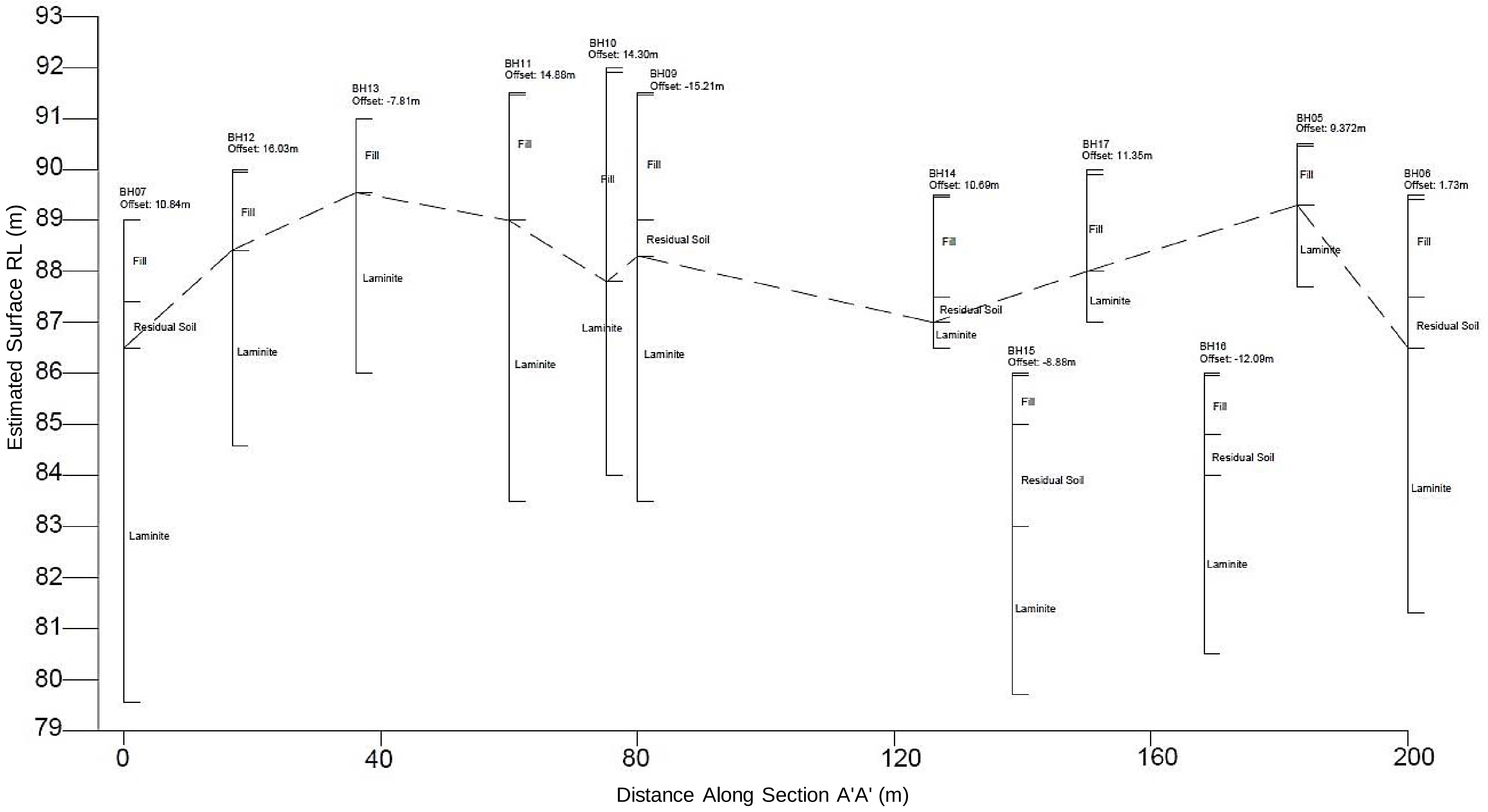
Chatswood Education Precinct

24 Centennial Avenue Chatswood

LOCALITY PLAN & BOREHOLE LOCATIONS

PSM3730-006R **Figure 1A**



NOTES

1. Borehole locations are approximate.
2. Boreholes 15 and 16 are located at the base of a steep slope.
3. The dashed line represents the inferred top of bedrock.

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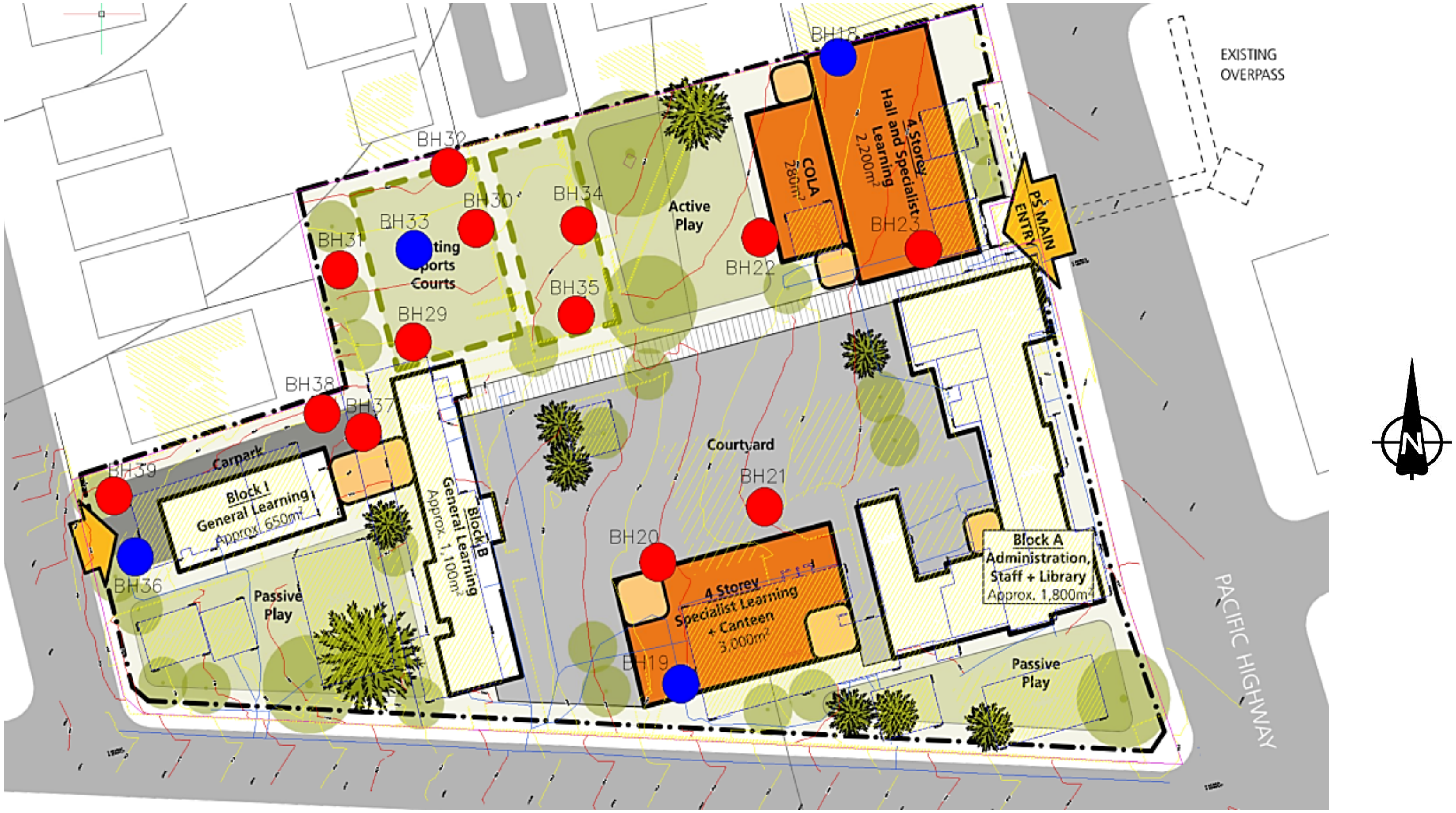
LONG SECTION VIEW ALONG A'A'

PSM3730-006R	**Figure 1B**



LEGEND

🔴 PSM Auger Hole

🔵 PSM Cored Hole

NOTES:

1. Borehole locations are approximate.

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LOCALITY PLAN & BOREHOLE LOCATIONS

PSM3730-006R	**Figure 2**

Photo 1: General site conditions - Centennial Avenue site facing South towards BH03

Photo 2: General site condtions - Centennial Avenue site facing East towards BH11

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5 & 24 Centennial Avenue Chatswood

SELECTED SITE PHOTOS (SHEET 1 OF 2)

PSM3730-006R	**Figure 3**

Photo 3: General site conditions - Pacific Highway site facing East towards BH19

Photo 4: Typical Rig Coring setup - Centennial Avenue site facing East towards BH07

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SELECTED SITE PHOTOS (SHEET 2 OF 2)

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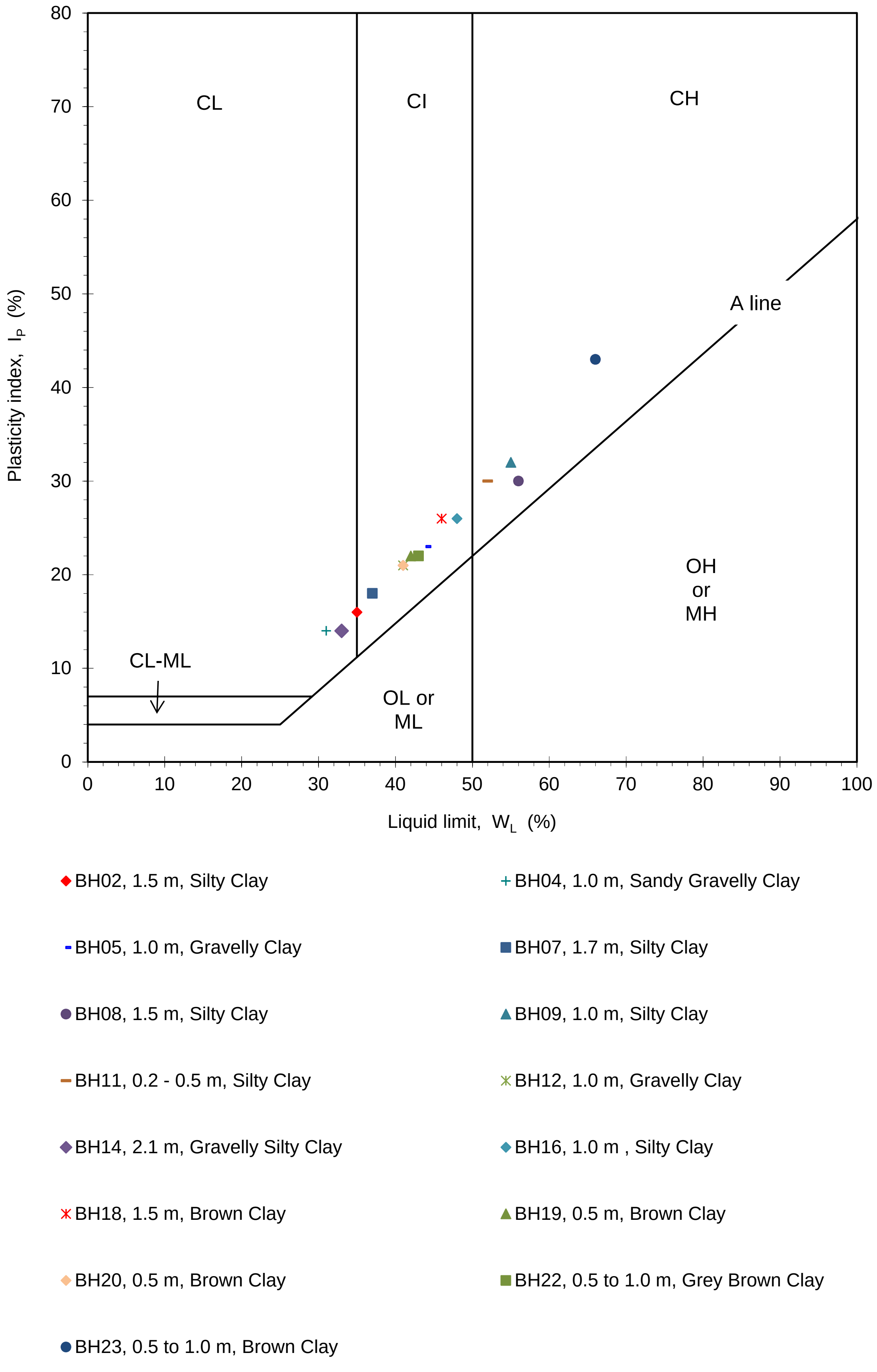
PSM3730-006R	**Figure 4**



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Chatswood Education Precinct
5 and 24 Centennial Avenue Chatswood
ATTERBERG LIMITS
PLASTICITY CHART

Pells Sullivan Meynink	**PSM3730-006R**	**Figure 5**

Appendix A
Geotechnical Engineering Borehole Logs

Centennial Avenue Site

Attachment A1: Tabulated Borehole Logs

Borehole ID (Estimated Surface RL)	Approximate Depth	Material Encountered	Notes
BH01 (RL 79.0m)	0 – 0.1 m	Silty CLAY; dark brown, low plasticity, dry and soft consistency, roots and rootlets present.	Topsoil
	0.1 – 2.0 m	Silty CLAY; dark brown, low plasticity, trace gravel up to 10 mm, sub-angular, dry and hard consistency. Becomes brown at 0.5 m.	Inferred Fill SPT at 1.5 m: 3, 35, 45, N = 80 ES collected at 2.0 m.
	2.0 – 2.6 m	LAMINITE; grey and dark grey, extremely low to low strength, extremely weathered. Sandstone laminations observed.	Inferred Bedrock Description based on drill cuttings.
	2.6 m	Hole terminated at 2.6 m.	TC-bit refusal.

Borehole ID (Estimated Surface RL)	Approximate Depth	Material Encountered	Notes
BH02 (RL 79.5m)	0 – 0.1 m	Silty CLAY; dark brown, low plasticity, moist, soft consistency, roots and rootlets present.	Topsoil CBR sample collected at 0.1 – 0.5m.
	0.1 – 1.8 m	Silty CLAY; brown, low plasticity, trace gravel up to 10 mm, sub-angular to angular, dry, hard consistency. Becomes pale brown at 1.0 m.	Inferred Fill SPT at 1.0 m: 10, 13, 27, N= 40 Atterberg sample collected at 1.5m.
	1.8 – 3.2 m	LAMINITE; grey and black, extremely low strength, extremely weathered. Sandstone laminations observed.	Inferred Bedrock Description based on drill cuttings. SPT at 2.5 m: Refusal.
	3.2 m	Hole terminated at 3.2 m.	TC-bit refusal.

Borehole ID (Estimated Surface RL)	Approximate Depth	Material Encountered	Notes
BH03 (RL 77.5m)	0 – 0.05 m	Silty CLAY; dark brown, low plasticity, moist and soft consistency, roots and rootlets present.	Topsoil
	0.05 – 1.0 m	Silty Sand; grey, medium grained sand, trace gravel up to 10mm, sub-angular to angular, dry and medium dense consistency.	Inferred Fill SPT at 1.0 m: 5, 18, 17, N = 35
	1.0 – 3.0 m	Silty CLAY; red and grey, low plasticity, with gravel up to 15mm, sub-angular, dry and very stiff consistency.	Inferred Fill ES collected at 2.0m. SPT at 2.5m: 5, 9, 15, N = 24
	3.0 – 5.8 m	CLAY; red and brown, medium to high plasticity, with gravel up to 10mm, angular, dry, very stiff to hard consistency.	Inferred Residual Soil SPT at 4.0m: 6, 10, 21, N = 31 SPT at 5.5m: Refusal.
	5.8 – 6.0 m	LAMINITE; grey, extremely low strength, extremely weathered. Sandstone laminations observed.	Inferred Bedrock Description based on drill cuttings.
	6.0 m	Hole terminated at 6.0 m.	TC-bit refusal.

Borehole ID (Estimated Surface RL)	Approximate Depth	Material Encountered	Notes
BH04 (RL 77.5m)	0 – 0.1 m	Silty CLAY; dark brown, low plasticity, moist and soft consistency, roots and rootlets present.	Topsoil
	0.1 – 6.0 m	CLAY; orange and brown, low to medium plasticity, with silt, trace gravel up to 5mm, sub-angular, moist and stiff consistency. Becomes dark brown at 2.0 m. Becomes dark brown and orange, stiff to very stiff at 3.0 m. Becomes hard at 5.5 m.	Inferred Fill SPT at 1.0 m: 2, 4, 8. N = 12 Atterberg sample collected at 1.0 m. Occasional gravel fill observed from 2.0 m. SPT at 2.5 m: 3, 5, 6, N = 11 SPT at 4.0 m: 3, 7, 13, N = 20 SPT at 5.5 m: 11, 14, 30, N= 44
	6.0 – 7.5 m	Sandy CLAY; grey, yellow and brown, medium plasticity, fine grained sand, dry to moist, hard consistency. Siltstone fragments encountered at 6.5 m.	Inferred Residual Soil
	7.5 m	Hole terminated at 7.5 m.	TC-bit refusal.

Borehole ID (Estimated Surface RL)	Approximate Depth	Material Encountered	Notes
BH05 (RL 90.5m)	0 – 0.1 m	Silty CLAY; dark brown, low plasticity, with gravel up to 2mm, sub-angular to angular, dry and soft consistency, roots and rootlets present.	Topsoil
	0.1 – 1.2 m	CLAY; dark brown, low plasticity, with silt, trace gravel up to 2mm, angular, dry and hard consistency. Becomes pale brown and grey at 1.0 m.	Inferred Fill CBR sample collected at 0.1 – 0.3 m. ES collected at 0.2 m. Atterberg sample collected at 1.0m SPT at 1.0 m: 4, 20, 32, N = 52
	1.2 – 2.8 m	LAMINITE; grey with yellow staining, extremely low strength, extremely weathered. Sandstone laminations observed. Increasing strength and decreasing weathering with depth. Becomes highly weathered at 2.5 m.	Inferred Bedrock Description based on drill cuttings.
	2.8 m	Hole terminated at 2.8 m.	TC-bit refusal.

Borehole ID
BH06
Page 1 of 3

Engineering Log - Non Cored Borehole

Project No.: PSM3730

Client:	SINSW	Commenced:	23/01/2019
Project Name:	Chatswood Education Precinct	Completed:	23/01/2019
Hole Location:	Chatswood High School BH06	Logged By:	MB
Hole Position:	331198.0 m E 6258628.0 m N	Checked By:	YB

Drill Model and Mounting:	Hanjin DB8 Track Mounted	Inclination:	-90°	RL Surface:	89.50 m		
Hole Diameter:	110 mm	Bearing:		Datum:	AHD	Operator:	BG Drilling

Drilling Information								Soil Description						Observations
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description SOIL NAME: Colour, structure, plasticity, additional	Moisture Condition	Consistency / Relative Density	Hand Penetrometer UCS (kPa) 100 200 300 400 500	Structure and Additional Observations
AD/T		N	Not Observed							Silty CLAY; dark brown, non-plastic, trace sand coarse-grained up to 2 mm, roots and rootlets observed.		St		0.00: Topsoil
										CLAY; orange and dark brown, low plasticity, with silt, with gravel up to 3 mm, sub-angular.				0.10: Inferred FILL
				SPT 1.00 - 1.45 m 2, 5, 12 N = 17		88.5	1					St to VSt		1.00: SPT recovered: 0.45 m.
										Becomes orange and red.				
						87.5	2		CL	Silty CLAY; pale brown and grey, low plasticity. Laminite fragments observed from 2.0 m.	D			2.00: Inferred residual soil.
				SPT 2.50 - 2.65 m 10, Refusal								H		2.50: SPT recovered: 0.15 m.
						86.5	3			LAMINITE; grey, orange and yellow, extremely low strength, extremely weathered.				3.00: Rock properties inferred from drill cuttings.
						85.5	4							
										Continued on cored borehole sheet				

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
SPT - Standard penetration test
PT - Push tube
AS - Auger Screwing

Penetration
No resistance through to refusal

Water
▷ Inflow
◁ Partial Loss
◀ Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
ES - Environmental Sample
TW - Thin Walled
LB - Large Disturbed Sample

Classification symbols and soil descriptions based on Unified Soil Classification System

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very soft
S - Soft
F - Firm
St - Stiff
VSt - Very stiff
H - Hard
VL - Very loose
L - Loose
MD - Medium dense
D - Dense
VD - Very dense
Ce - Cemented
C - Compact

See Explanatory Notes for details of abbreviations and basis of descriptions.

Engineering Log - Cored Borehole

Project No.: PSM3730

Client:	SINSW	Commenced:	23/01/2019
Project Name:	Chatswood Education Precinct	Completed:	23/01/2019
Hole Location:	Chatswood High School BH06	Logged By:	MB
Hole Position:	331198.0 m E 6258628.0 m N	Checked By:	YB

Drill Model and Mounting: Hanjin DB8 Track Mounted   Inclination: -90°   RL Surface: 89.50 m
Barrel Type and Length: Triple Tube 100mm   Bearing: Datum: AHD   Operator: BG Drilling

Drilling Information							Rock Substance					Rock Mass Defects	
Method	Water	TCR (%)	RQD (%)	SAMPLES & FIELD TESTS	RL (m)	Depth (m)	Graphic Log	Material Description ROCK TYPE: Colour, grain size, structure (texture, fabric, mineral composition, hardness, alteration, cementation, etc as applicable)	Weathering EW HW MW SW F	Strength Is(50) ● - Axial ○ - Diametral EL <0.03 VL 0.1 L 0.3 M 1 H 3 VH 10 EH		Defect Spacing (mm) <20 60 200 600 1000	Defect Descriptions / Comments Description, alpha/beta, infilling or coating, shape, roughness, thickness, other
					88.5	1							
					87.5	2							
					86.5	3							
					85.5	4		Continued from non-cored borehole sheet					
NMLC	Not Observed	67	24				☒	No core: 400 mm.					
								LAMINITE; dark grey with orange banding, bedding fabric faint, some hard clay.	EW / HW	VL		<20	SM 0° CL SN PR S 10 mm BP 0° FE SN IR S

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
HQ3- Wireline core (63.5 mm)
PQ3- Wireline core (85.0 mm)
SPT- Standard penetration test
PT - Push tube

Water
▷ Inflow
◁ Partial Loss
◀ Complete Loss

Graphic Log/Core Loss
Core recovered (hatching indicates material)
☒ No core recovery

Weathering
EW - Extremely Weathered
HW - Highly Weathered
MW - Moderately Weathered
SW - Slightly Weathered
F - Fresh

Strength
EL - Extremely Low
VL - Very Low
L - Low
M - Medium
H - High
VH - Very High
EH - Extremely High

Defect Type
FT - Fault
SS - Shear Surface
SZ - Shear Zone
BP - Bedding parting
SM - Seam
IS - Infilled Seam
JT - Joint
CO - Contact
CZ - Crushed Zone
VN - Vein
FZ - Fracture Zone
BSH - Bedding Shear
DB - Drilling Break

Infilling/Coating
CN - Clean
SN - Stain
VN - Veneer
CO - Coating
RF - Rock fragments
G - Gravel
S - Sand
Z - Silt
CA - Calcite
CL - Clay
FE - Iron
QZ - Quartz
X - Carbonaceous

Roughness
SL - Slickensided
POL - Polished
S - Smooth
RF - Rough
VR - Very Rough

Shape
PR - Planar
CU - Curved
UN - Undulating
ST - Stepped
IR - Irregular

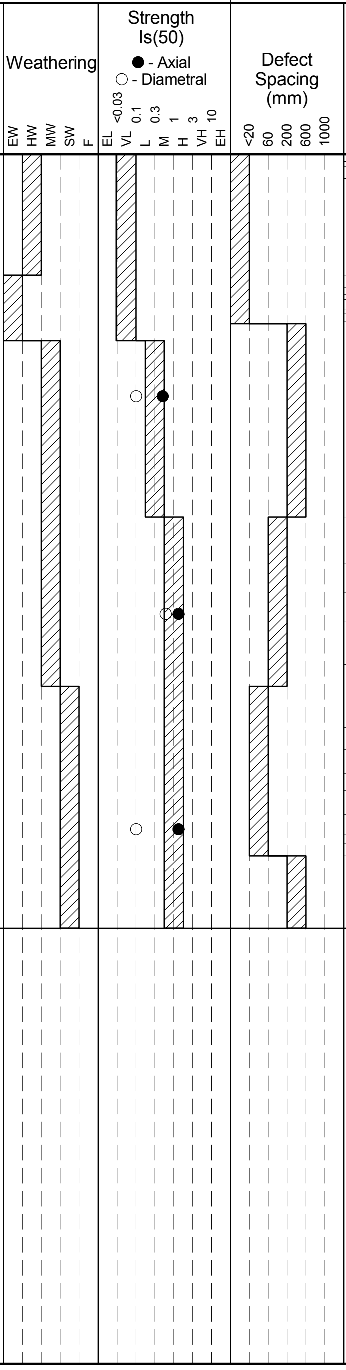
See Explanatory Notes for details of abbreviations and basis of descriptions.

Engineering Log - Cored Borehole

Project No.: PSM3730

Client:	SINSW	Commenced:	23/01/2019
Project Name:	Chatswood Education Precinct	Completed:	23/01/2019
Hole Location:	Chatswood High School BH06	Logged By:	MB
Hole Position:	331198.0 m E 6258628.0 m N	Checked By:	YB

Drill Model and Mounting:	Hanjin DB8 Track Mounted	Inclination:	-90°	RL Surface:	89.50 m		
Barrel Type and Length:	Triple Tube 100mm	Bearing:		Datum:	AHD	Operator:	BG Drilling



Method	Water	TCR (%)	RQD (%)	SAMPLES & FIELD TESTS	RL (m)	Depth (m)	Graphic Log	Material Description ROCK TYPE: Colour, grain size, structure (texture, fabric, mineral composition, hardness, alteration, cementation, etc as applicable)	Defect Descriptions / Comments Description, alpha/beta, infilling or coating, shape, roughness, thickness, other
NMLC	Not Observed	67	24					LAMINITE; dark grey with orange banding, bedding fabric faint, some hard clay.*(continued)*	BP 3° FE SN ST RF BP 1° FE SN PR S BP 0° FE SN PR S BP 0° FE SN PR S 3 mm Heavily fractured along bedding planes. BP 0° FE SN PR S BP 0° FE SN CU RF DB BP 0° FE SN PR S BP 0° FE SN PR S BP 5° CL PR S 3 mm
		100	66	6.00m 01 Is(50) d=0.1 a=0.5 MPa	83.5	6		Becoming black with occasional orange banding, rock fabric visible, thin fine-grained sandstone laminations developing, spaced 5 - 30 mm.	JT 65° FE SN UN RF BP 0° FE SN PR S
				6.90m 02 Is(50) d=0.6 a=1.3 MPa	82.5	7			BP 0° CN ST RF BP 0° CN ST RF BP 0° CN ST RF BP 3° FE SN PR S BP 3° FE SN PR S BP 3° FE SN PR S BP 3° FE SN PR S
				7.79m 03 Is(50) d=0.1 a=1.3 MPa	81.5	8			BP 3° FE SN PR S BP 3° FE SN PR S BP 3° FE SN PR S JT 70° FE SN PR S
					80.5	9		Hole Terminated at 8.20 m	

Method

AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
HQ3- Wireline core (63.5 mm)
PQ3- Wireline core (85.0 mm)
SPT- Standard penetration test
PT - Push tube

Water

▷ Inflow
◁ Partial Loss
◀ Complete Loss

Graphic Log/Core Loss

Core recovered (hatching indicates material)
☒ No core recovery

Weathering

EW - Extremely Weathered
HW - Highly Weathered
MW - Moderately Weathered
SW - Slightly Weathered
F - Fresh

Strength

EL - Extremely Low
VL - Very Low
L - Low
M - Medium
H - High
VH - Very High
EH - Extremely High

Defect Type

FT - Fault
SS - Shear Surface
SZ - Shear Zone
BP - Bedding parting
SM - Seam
IS - Infilled Seam
JT - Joint
CO - Contact
CZ - Crushed Zone
VN - Vein
FZ - Fracture Zone
BSH - Bedding Shear
DB - Drilling Break

Infilling/Coating

CN - Clean
SN - Stain
VN - Veneer
CO - Coating
RF - Rock fragments
G - Gravel
S - Sand
Z - Silt
CA - Calcite
CL - Clay
FE - Iron
QZ - Quartz
X - Carbonaceous

Roughness

SL - Slickensided
POL - Polished
S - Smooth
RF - Rough
VR - Very Rough

Shape

PR - Planar
CU - Curved
UN - Undulating
ST - Stepped
IR - Irregular

See Explanatory Notes for details of abbreviations and basis of descriptions.

JOB No.: PSM 3730

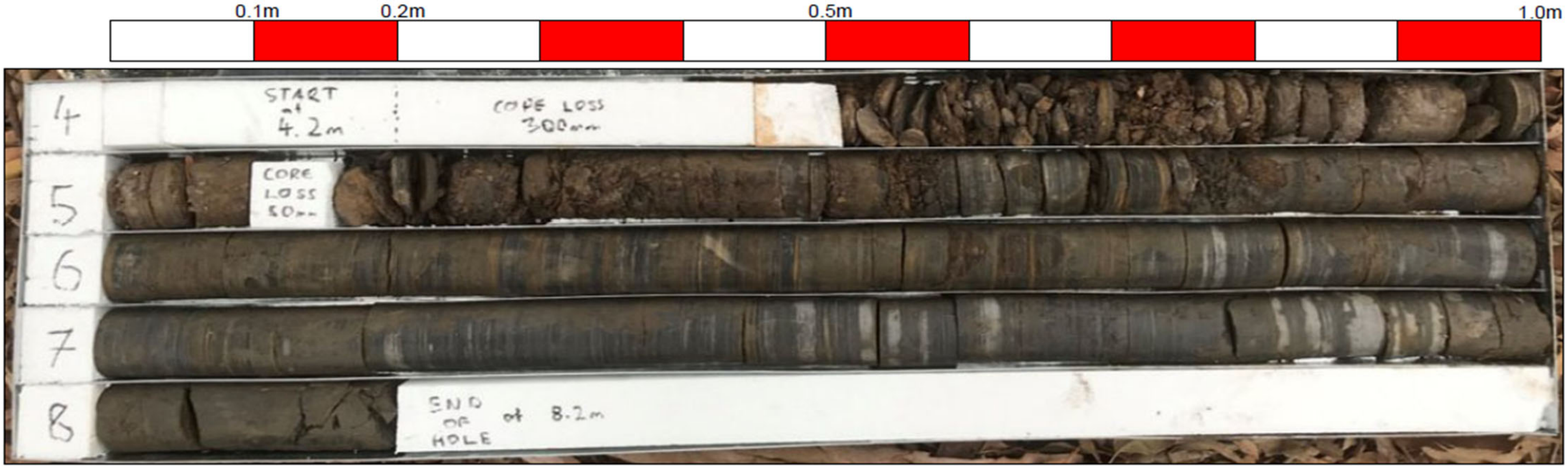
BH ID: BH 06

PROJECT: Chatswood Education Precinct

LOCATION: Chatswood High

FROM: 4.2m TO: 8.2m

DATE: 23/1/19



SCHOOL INFRASTRUCTURE NSW
Chatswood Education Precinct
Chatswood High School Centennial Avenue
CORE PHOTOS BH06
(SHEET 1 OF 1)

Pells Sullivan Meynink

PSM3730-006R	**Figure 1**

Engineering Log - Non Cored Borehole

Project No.: PSM3730

Client:	SINSW	Commenced:	24/01/2019
Project Name:	Chatswood Education Precinct	Completed:	24/01/2019
Hole Location:	Chatswood High School BH07	Logged By:	MB
Hole Position:	330982.0 m E 6258641.0 m N	Checked By:	YB

Drill Model and Mounting: Hanjin DB8 Track Mounted
Inclination: -90°
RL Surface: 89.00 m
Hole Diameter: 100 mm
Bearing:
Datum: AHD
Operator: BG Drilling

Drilling Information | **Soil Description** | **Observations**

Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description SOIL NAME: Colour, structure, plasticity, additional	Moisture Condition	Consistency / Relative Density	Hand Penetrometer UCS (kPa) 100 200 300 400 500	Structure and Additional Observations
AD/V		N	Not Observed	CBR 0.10-0.30 m						Silty CLAY; pale brown, non-plastic, with gravel up to 3 mm, sub-angular to angular, roots and rootlets observed. Becoming dark brown.	D	St		0.00: Topsoil 0.20: FILL
				SPT: 1.00 - 1.45 m 2, 5, 8 N = 13		88.0	1			Silty CLAY; grey, orange and yellow, low plasticity.				1.00: SPT recovered: 0.45 m.
				D 1.70 m					CI-CH	Silty CLAY; pale brown, medium to high plasticity. Laminite fragments observed from 2.0 m.		VSt		1.60: Inferred residual soil. 1.80: V-bit Refusal.
AD/T		N				87.0	2							
				ES 2.50 m						LAMINITE; grey, black and orange, extremely low strength, extremely weathered.				2.50: Rock properties inferred from drill cuttings.
				SPT 3.00 - 3.10 Refusal		86.0	3							3.00: SPT recovered: 0.10 m.
						85.0	4							

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
SPT - Standard penetration test
PT - Push tube
AS - Auger Screwing

Penetration
No resistance through to refusal

Water
▷ Inflow
◁ Partial Loss
◀ Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
ES - Environmental Sample
TW - Thin Walled
LB - Large Disturbed Sample

Classification symbols and soil descriptions based on Unified Soil Classification System

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very soft
S - Soft
F - Firm
St - Stiff
VSt - Very stiff
H - Hard
VL - Very loose
L - Loose
MD - Medium dense
D - Dense
VD - Very dense
Ce - Cemented
C - Compact

See Explanatory Notes for details of abbreviations and basis of descriptions.

Engineering Log - Non Cored Borehole

Project No.: PSM3730

Client:	SINSW	Commenced:	24/01/2019
Project Name:	Chatswood Education Precinct	Completed:	24/01/2019
Hole Location:	Chatswood High School BH07	Logged By:	MB
Hole Position:	330982.0 m E 6258641.0 m N	Checked By:	YB

Drill Model and Mounting: Hanjin DB8 Track Mounted   Inclination: -90°   RL Surface: 89.00 m
Hole Diameter: 100 mm   Bearing: Datum: AHD   Operator: BG Drilling

Drilling Information								*Soil Description*						*Observations*
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description SOIL NAME: Colour, structure, plasticity, additional	Moisture Condition	Consistency / Relative Density	Hand Penetrometer UCS (kPa) 100 200 300 400 500	Structure and Additional Observations
AD/T	▨	N								LAMINITE; grey, black and orange, extremely low strength, extremely weathered. *(continued)*	D			
										Continued on cored borehole sheet				
						83.0	6							
						82.0	7							
						81.0	8							
						80.0	9							

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
SPT - Standard penetration test
PT - Push tube
AS - Auger Screwing

Penetration
▨ No resistance through to refusal

Water
▷ Inflow
◁ Partial Loss
◀ Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
ES - Environmental Sample
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LB - Large Disturbed Sample

Classification symbols and soil descriptions based on Unified Soil Classification System

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very soft
S - Soft
F - Firm
St - Stiff
VSt - Very stiff
H - Hard
VL - Very loose
L - Loose
MD - Medium dense
D - Dense
VD - Very dense
Ce - Cemented
C - Compact

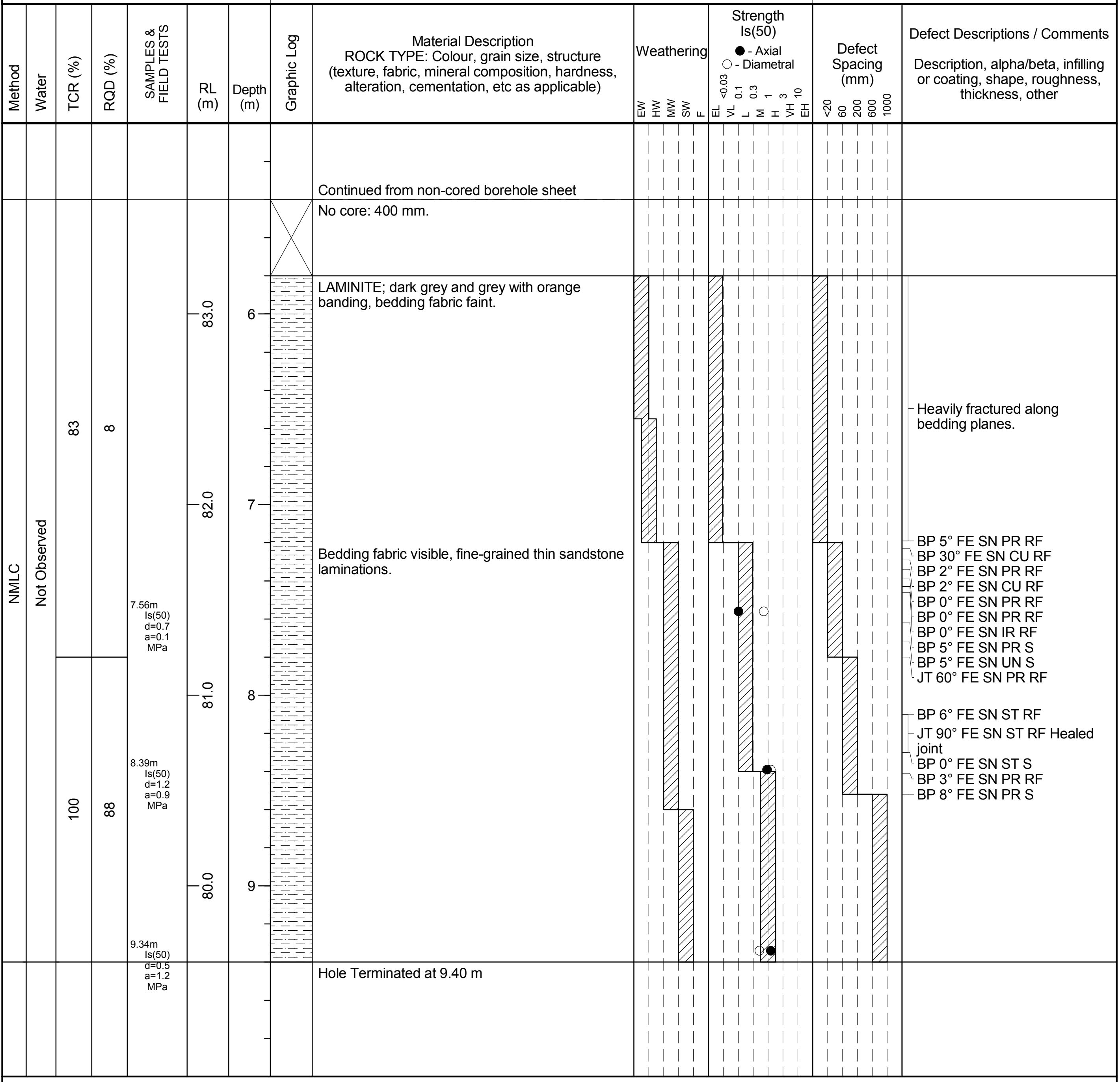
See Explanatory Notes for details of abbreviations and basis of descriptions.

Engineering Log - Cored Borehole

Project No.: PSM3730

Client:	SINSW	Commenced:	24/01/2019
Project Name:	Chatswood Education Precinct	Completed:	24/01/2019
Hole Location:	Chatswood High School BH07	Logged By:	MB
Hole Position:	330982.0 m E 6258641.0 m N	Checked By:	YB

Drill Model and Mounting:	Hanjin DB8 Track Mounted	Inclination:	-90°	RL Surface:	89.00 m		
Barrel Type and Length:	Triple Tube 100mm	Bearing:		Datum:	AHD	Operator:	BG Drilling



Continued from non-cored borehole sheet

No core: 400 mm.

LAMINITE; dark grey and grey with orange banding, bedding fabric faint.

Bedding fabric visible, fine-grained thin sandstone laminations.

Hole Terminated at 9.40 m

7.56m Is(50) d=0.7 a=0.1 MPa

8.39m Is(50) d=1.2 a=0.9 MPa

9.34m Is(50) d=0.5 a=1.2 MPa

Heavily fractured along bedding planes.

BP 5° FE SN PR RF
BP 30° FE SN CU RF
BP 2° FE SN PR RF
BP 2° FE SN CU RF
BP 0° FE SN PR RF
BP 0° FE SN PR RF
BP 0° FE SN IR RF
BP 5° FE SN PR S
BP 5° FE SN UN S
JT 60° FE SN PR RF
BP 6° FE SN ST RF
JT 90° FE SN ST RF Healed joint
BP 0° FE SN ST S
BP 3° FE SN PR RF
BP 8° FE SN PR S

Method

AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
HQ3- Wireline core (63.5 mm)
PQ3- Wireline core (85.0 mm)
SPT- Standard penetration test
PT - Push tube

Water

▷ Inflow
◁ Partial Loss
◀ Complete Loss

Graphic Log/Core Loss

▨ Core recovered (hatching indicates material)
☒ No core recovery

Weathering

EW - Extremely Weathered
HW - Highly Weathered
MW - Moderately Weathered
SW - Slightly Weathered
F - Fresh

Strength

EL - Extremely Low
VL - Very Low
L - Low
M - Medium
H - High
VH - Very High
EH - Extremely High

Defect Type

FT - Fault
SS - Shear Surface
SZ - Shear Zone
BP - Bedding parting
SM - Seam
IS - Infilled Seam
JT - Joint
CO - Contact
CZ - Crushed Zone
VN - Vein
FZ - Fracture Zone
BSH - Bedding Shear
DB - Drilling Break

Infilling/Coating

CN - Clean
SN - Stain
VN - Veneer
CO - Coating
RF - Rock fragments
G - Gravel
S - Sand
Z - Silt
CA - Calcite
CL - Clay
FE - Iron
QZ - Quartz
X - Carbonaceous

Roughness

SL - Slickensided
POL - Polished
S - Smooth
RF - Rough
VR - Very Rough

Shape

PR - Planar
CU - Curved
UN - Undulating
ST - Stepped
IR - Irregular

See Explanatory Notes for details of abbreviations and basis of descriptions.

JOB No.: PSM 3730

BH ID: BH 07

PROJECT: Chatswood Education Precinct

LOCATION: Chatswood High

FROM: 5.4m TO: 9.4m

DATE: 24/1/19

SCHOOL INFRASTRUCTURE NSW

Chatswood Education Precinct

Chatswood High School Centennial Avenue

CORE PHOTOS BH07

(SHEET 1 OF 1)

Pells Sullivan Meynink

PSM3730-006R	**Figure 1**

Borehole ID (Estimated Surface RL)	Approximate Depth	Material Encountered	Notes
BH08 (RL 89.0m)	0 – 0.15 m	ASPHALT; 150 mm thick.	
	0.15 – 0.25 m	SAND; orange, medium to coarse grained, with sandstone gravel up to 20mm, sub-angular to angular, dry compacted consistency. Becomes brown at 0.5 m.	Inferred Fill
	0.25 – 1.5 m	Silty CLAY; dark brown, low plasticity, trace gravel up to 5mm, sub-angular, moist, stiff consistency. Becomes pale brown and grey at 1.0m.	Inferred Fill SPT at 1.0 m: 3, 4, 6, N = 10. Atterberg sample collected at 1.5 m.
	1.5 – 1.9 m	CLAY; orange, brown and grey, high plasticity, moist and stiff consistency. Organic material and siltstone fragments encountered at 1.6 m.	Inferred Residual Soil V-bit refusal at 1.9 m.
	1.9 – 6.3 m	LAMINITE; grey-brown, extremely low strength, extremely weathered. Sandstone laminations observed. Increasing strength and decreasing weathering with depth. Becomes dark grey at 5.0 m.	Inferred Bedrock Description based on drill cuttings. ES collected at 2.5 m.
	6.3 m	Hole terminated at 6.3 m.	TC-bit refusal.

Borehole ID (Estimated Surface RL)	Approximate Depth	Material Encountered	Notes
BH09 (RL 91.5m)	0 – 0.1 m	Concrete, 100 mm thick.	
	0.1 – 0.5 m	CLAY; dark brown, low plasticity, with gravel up to 10 mm, angular, moist, compacted. Becomes brown at 0.5 m.	Inferred Fill ES collected at 0.5 m.
	0.5 – 1.5 m	CLAY; orange-brown, low to medium plasticity, trace gravel up to 8mm, angular, ironstone gravels, moist and stiff consistency. Becomes mottled grey and orange at 1.5m.	Inferred Fill Atterberg sample collected at 0.5 – 1.0 m. SPT at 1.0 m: 3, 4, 7, N = 11
	1.5 – 2.5 m	Silty Gravelly CLAY; red and brown, low to medium plasticity, sub-angular gravel up to 5 mm, dry, very stiff consistency.	Inferred Fill SPT at 2.5 m: 3, 10, 17, N = 27
	2.5 – 3.2 m	CLAY; grey and red, low to medium plasticity, dry and very stiff consistency.	Inferred Residual Soil V-bit refusal at 3.2 m.
	3.2 – 9.0 m	LAMINITE; grey, extremely low strength, extremely weathered. Sandstone laminations observed. Increasing strength and decreasing weathering with depth. Becomes dark grey from 4.5 m.	Inferred Bedrock Description based on drill cuttings. SPT at 4.0 m: 18, Refusal.
	9.0 m	Hole terminated at 9.0 m.	TC-bit auger did not refuse.

Borehole ID (Estimated Surface RL)	Approximate Depth	Material Encountered	Notes
BH10 (RL 92.0m)	0 – 0.2 m	Silty CLAY; dark brown, low plasticity, dry, soft consistency, roots and rootlets observed.	Topsoil CBR sample collected at 0.1 - 0.3 m.
	0.2 – 4.2 m	CLAY; red and brown, low plasticity, trace gravel up to 5mm, angular, dry and very stiff consistency. With silt, dark brown and red at 1.0 m. Becomes grey and red at 1.5 m. Becomes mostly red at 2.5 m.	Inferred Fill SPT at 1.0 m: 3, 10, 19, N = 29 V-bit refusal at 2.3 m. SPT at 2.5 m: Refusal.
	4.2 – 8.0 m	LAMINITE; grey, extremely low strength, extremely weathered. Sandstone laminations observed. Increasing strength and decreasing weathering with depth.	Inferred Bedrock Description based on drill cuttings.
	8.0 m	Hole terminated at 8.0 m.	Maximum depth reached. Auger did not refuse.

Borehole ID (Estimated Surface RL)	Approximate Depth	Material Encountered	Notes
BH11 (RL 91.5m)	0 – 0.1 m	Silty CLAY; dark brown, low plasticity, dry, soft consistency, bark observed.	Topsoil
	0.1 – 2.5 m	Silty CLAY; red and grey, medium plasticity, dry and very stiff consistency. Angular ironstone gravels up to 2mm at 1.5 m. Mostly red with siltstone fragments at 2.0 m.	Inferred Fill Atterberg sample at 0.2 – 0.5 m. V-bit refusal at 0.5 m. SPT at 1.0 m: 2, 7, 23, N = 30 SPT at 2.5 m: 20, Refusal.
	2.5 – 8.0 m	LAMINITE; grey and red, extremely low strength, extremely weathered. Sandstone laminations observed. Increasing strength and decreasing weathering with depth.	Inferred Bedrock Description based on drill cuttings. ES collected at 6.0 m.
	8.0 m	Hole terminated at 8.0 m.	Maximum depth reached. Auger did not refuse.

Borehole ID (Estimated Surface RL)	Approximate Depth	Material Encountered	Notes
BH12 (RL 90.0m)	0 – 0.1 m	Silty CLAY; dark brown, low plasticity, dry, soft consistency, roots and rootlets observed.	Topsoil
	0.1 – 1.5 m	Silty CLAY; pale brown, medium plasticity, trace gravel, dry and hard consistency.	Inferred Fill ES collected at 0.4 m. V-bit refusal at 0.5 m on possible tree root. Atterberg sample collected at 1.0m. SPT at 1.0 m: 4, 24, 39, N = 63
	1.5 – 5.2 m	LAMINITE; grey, extremely low strength, extremely weathered. Sandstone laminations observed. Increasing strength and decreasing weathering with depth.	Inferred Bedrock Description based on drill cuttings.
	5.2 m	Hole terminated at 5.2 m.	TC-bit refusal.

Borehole ID (Estimated Surface RL)	Approximate Depth	Material Encountered	Notes
BH13 (RL 91.0m)	0 – 1.5 m	Silty CLAY; grey and red, low plasticity, dry and very stiff consistency, roots and rootlets present. Laminite fragments observed from surface. Becomes pale brown at 1.0 m.	Inferred Fill V-bit refusal at 0.3 m. SPT at 1.0 m: 3, 19, 26, N = 45
	1.5 – 5.0 m	LAMINITE; grey, extremely low strength, extremely weathered. Sandstone laminations observed. Increasing strength and decreasing weathering with depth. Becomes slightly red at 2.0 m. Becomes dark grey at 3.0 m.	Inferred Bedrock Description based on drill cuttings.
	5.0 m	Hole terminated at 5.0 m.	TC-bit refusal.

Borehole ID (Estimated Surface RL)	Approximate Depth	Material Encountered	Notes
BH14 (RL 89.5m)	0 – 0.1 m	Silty CLAY; dark brown, low plasticity, trace gravel up to 10mm, sub-angular, dry, soft consistency, roots and rootlets present.	Topsoil
	0.1 – 1.5 m	Silty CLAY; dark brown, low plasticity, dry, soft to firm consistency, roots and rootlets present.	Inferred Fill ES collected at 0.5 – 1.0 m. SPT at 1.5 m: 6, 12, 33, N= 45
	1.5 – 2.0 m	CLAY; pale brown, high plasticity, with silt, dry and very stiff consistency.	Inferred Fill
	2.0 – 2.5 m	CLAY; grey, medium to high plasticity, dry and hard consistency.	Inferred Residual Soil V-bit refusal at 2.1 m. Atterberg sample collected at 2.1m.
	2.5 – 3.0 m	LAMINITE; grey, extremely low strength, extremely weathered.	Inferred Bedrock Description based on drill cuttings. SPT at 3.0 m: Refusal.
	3.0 m	Hole terminated at 3.0 m.	TC-bit refusal.

Borehole ID (Estimated Surface RL)	Approximate Depth	Material Encountered	Notes
BH15 (RL 86.0m)	0 – 0.1 m	CLAY; dark brown, low plasticity, trace gravel up to 5 mm, sub-angular, dry, soft consistency, roots and rootlets observed.	Topsoil
	0.1 – 1.0 m	Silty CLAY; grey and pale brown, low plasticity, dry and stiff consistency.	Inferred Fill SPT at 1.0 m: 2, 9, 12, N = 21
	1.0 – 3.0 m	CLAY; orange and dark brown, low plasticity, dry and very stiff consistency. Becomes grey and medium plasticity at 2.5 m.	Inferred Residual Soil V-bit refusal at 2.6 m.
	3.0 – 6.3 m	LAMINITE; pale brown, extremely low strength, extremely weathered. Sandstone laminations observed. Increasing strength and decreasing weathering with depth. Becomes grey at 4.5 m.	Inferred Bedrock Description based on drill cuttings. SPT at 4.0 m: 2, 25, Refusal.
	6.3 m	Hole terminated at 6.3 m.	TC-bit refusal.

Borehole ID (Estimated Surface RL)	Approximate Depth	Material Encountered	Notes
BH16 (RL 86.0m)	0 – 0.1 m	Silty CLAY; pale brown, low plasticity, trace gravel up to 10mm, sub-angular, dry and soft consistency, roots and rootlets present.	Topsoil
	0.1 – 1.3 m	CLAY; orange-brown, low plasticity, with silt, dry and very stiff consistency. Becomes brown at 0.5 m.	Inferred Fill Atterberg sample collected at 1.0 m SPT at 1.0 m: 2, 10, 17, N = 27
	1.3 – 2.0 m	CLAY; grey and brown, medium plasticity, dry and very stiff consistency. Siltstone fragments observed at 1.5 m.	Inferred Residual Soil V-bit refusal at 1.8 m.
	2.0 – 4.5 m	LAMINITE; grey, extremely to low strength, extremely weathered.	Inferred Bedrock Description based on drill cuttings. ES collected at 2.5 m. SPT at 2.5 m: 2, 19, Refusal.
	4.5 m	Hole terminated at 4.5 m.	TC-bit refusal.

Borehole ID (Estimated Surface RL)	Approximate Depth	Material Encountered	Notes
BH17 (RL 90.0m)	0 – 0.2 m	Silty CLAY; dark brown, low plasticity, trace gravel up to 10mm, sub-angular, dry and soft consistency, roots and rootlets present.	Topsoil
	0.2 – 2.0 m	CLAY; orange and dark brown, low plasticity, dry and very stiff consistency. Becomes mottled grey and brown at 1.0 m.	Inferred Fill SPT at 1.0 m: 4, 8, 12, N = 20
	2.0 – 3.0 m	LAMINITE; grey, extremely low strength, extremely weathered.	Inferred Bedrock Description based on drill cuttings. V-bit refusal at 2.6 m. SPT at 2.5 m: 2, 3, Refusal.
	3.0 m	Hole terminated at 3.0 m.	TC-bit refusal.

Borehole ID (Estimated Surface RL)	Approximate Depth	Material Encountered	Notes
BH24 (RL 90.3m)	0 – 0.16 m	Concrete; 160 mm thick.	
	0.16 – 0.4 m	CLAY; orange-brown and grey, high plasticity, moist and stiff consistency.	Inferred Residual Soil SPT at 1.0 m: 7, 8, 11, N = 19 SPT at 2.0 m: 19, Refusal. Roots observed at 2.0 m.
	0.4 – 1.0 m	CLAY; grey and red-brown, medium plasticity, trace of ironstone gravel, sub-angular, up to 13 mm moist and stiff consistency.	
	1.0 – 2.5 m	CLAY; grey and yellow-brown, medium to high plasticity, moist, very stiff consistency.	
	2.5 – 8.0 m	LAMINITE; dark grey, very low strength, extremely to highly weathered.	Inferred Bedrock Description based on drill cuttings.
	8.0 m	Hole terminated at 8.0 m.	Maximum depth reached. V-bit auger did not refuse.

Borehole ID (Estimated Surface RL)	Approximate Depth	Material Encountered	Notes
BH25 (RL 89.5m)	0 – 0.08 m	Concrete; 80 mm thick.	
	0.08 – 1.2 m	CLAY; grey, medium to high plasticity, moist and stiff consistency. Trace of ironstone gravel, sub-angular up to 10 mm observed at 1.0 m.	Inferred Residual Soil SPT at 1.0 m: 8, 13, 12, N = 25
	1.2 – 8.0 m	LAMINITE; dark grey, very low strength, highly weathered. Increasing strength with depth. Becomes dark grey and red-brown from 2.0 m. Increased drill resistance from 5.0 m. Becomes dark grey from 7.0 m.	Inferred Bedrock Description based on drill cuttings. Roots observed at 1.4 m. SPT at 2.0 m: 20, Refusal.
	8.0 m	Hole terminated at 8.0 m.	Maximum depth reached. V-bit auger did not refuse.

Borehole ID
BH26
Page 1 of 3

Engineering Log - Non Cored Borehole

Project No.: PSM3730

Client:	SINSW	Commenced:	15/04/2019
Project Name:	Chatswood Education Precinct	Completed:	15/04/2019
Hole Location:	Chatswood High School	Logged By:	MB
Hole Position:	331032.0 m E 6258551.0 m N	Checked By:	BS

Drill Model and Mounting:	Rig 8 Track Mounted	Inclination:	-90°	RL Surface:	88.50 m		
Hole Diameter:	120 mm	Bearing:		Datum:	AHD	Operator:	BG Drilling

Drilling Information								*Soil Description*						*Observations*
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description SOIL NAME: Colour, structure, plasticity, additional	Moisture Condition	Consistency / Relative Density	Hand Penetrometer UCS (kPa) 100 200 300 400 500	Structure, Zoning, Origin, Additional Observations
DT		N								CONCRETE: 145 mm thick.				
AD/V		N	Not Observed						CH	CLAY: high plasticity, grey and pale brown.	M	St		0.15: Inferred residual soil.
				SPT: 1.00 - 1.45 m 3, 5, 7 N = 12		87.5	1			Becomes dark grey and orange-brown.				1.00: SPT recovered: 450 mm.
										Shale fragments observed.				
										SILTSTONE: dark grey and orange-brown, very low strength, extremely to highly weathered.	D			1.80: Inferred bedrock. Rock properties inferred from drill cuttings.
				SPT: 2.00 - 2.14 m 20,Refusal		86.5	2							2.00: SPT recovered: 140 mm.
										Continued on cored borehole sheet				
						85.5	3							
						84.5	4							

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
SPT - Standard penetration test
PT - Push tube
AS - Auger Screwing

Penetration
No resistance through to refusal

Water
▷ Inflow
◁ Partial Loss
◀ Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
ES - Environmental Sample
TW - Thin Walled
LB - Large Disturbed Sample

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very soft
S - Soft
F - Firm
St - Stiff
VSt - Very stiff
H - Hard
VL - Very loose
L - Loose
MD - Medium dense
D - Dense
VD - Very dense
Ce - Cemented
C - Compact

See Explanatory Notes for details of abbreviations and basis of descriptions.

Soil and rock descriptions in accordance with AS 1726:2017

Borehole ID
BH26

Engineering Log - Cored Borehole

Project No.: PSM3730

Client:	SINSW	Commenced:	15/04/2019
Project Name:	Chatswood Education Precinct	Completed:	15/04/2019
Hole Location:	Chatswood High School	Logged By:	MB
Hole Position:	331032.0 m E 6258551.0 m N	Checked By:	BS

Drill Model and Mounting: Rig 8 Track Mounted
Inclination: -90°
RL Surface: 88.50 m
Barrel Type and Length: NMLC
Bearing:
Datum: AHD
Operator: BG Drilling

Material Description
ROCK TYPE: Colour, grain size, structure (texture, fabric, mineral composition, hardness, alteration, cementation, etc as applicable), inclusions and minor components

Continued from non-cored borehole sheet

SILTSTONE: dark brown, poorly developed bedding, some hard clay.

LAMINITE: dark grey and grey, white and orange bands, Thinly Laminated, developed bedding, fine grained sandstone laminations, 70% siltstone, 30% sandstone.

LAMINITE: dark grey, white and orange bands, Thinly Laminated, well developed bedding, fine grained sandstone laminations, 80% siltstone, 20% sandstone.

Samples & Field Tests

2.41m
C Is(50)
d=0.1
a=0.7
MPa

3.32m
C Is(50)
d=0.3
a=0.4
MPa

4.43m
C Is(50)
d=0.1
a=0.4
MPa

Defect Descriptions / Comments
Description, alpha/beta, infilling or coating, shape, roughness, thickness, other

SM, 2°, CL, PR, S, 10 mm
BP, 0°, FE SN, PR, S
BP, 0°, FE SN, IR, RF
BP, 1°, FE SN, PR, S
SM, 5°, CL, PR, S, 15 mm
BP, 10°, FE SN, ST, RF, 1 mm
BP, 5°, KL, PR, S
BP, 0°, FE SN, CU, S
BP, 20°, FE SN, UN, S
BP, 0°, FE SN, PR
JT, 70°, FE SN, ST, RF
BP, 0°, FE SN, PR, S
SM, 0°, CL, PR, S, 10 mm
BP, 0°, FE SN, PR, RF
BP, 0°, FE SN, ST, RF
BP, 0°, FE SN, UN, RF
Healed joint
SM, 5°, Fe & Clay SN, UN, RF, 2 mm
BP, 2°, FE SN, UN, RF
BP, 2°, CL, PR, S, 1 mm
BP, 2°, FE SN, PR, RF
BP, 1°, FE SN, PR, RF
BP, 0°, FE SN, PR, RF
SM, 0°, CL, IR, S, 10 mm
BP, 0°, FE SN, PR, RF
BP, 3°, Fe & Clay SN, PR, RF
BP, 0°, FE SN, PR, VR
BP, 1°, FE SN, PR, S
BP, 0°, FE SN, PR, S

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
HQ3- Wireline core (63.5 mm)
PQ3- Wireline core (85.0 mm)
SPT- Standard penetration test
PT - Push tube

Water
▷ Inflow
◁ Partial Loss
◀ Complete Loss

Graphic Log/Core Loss
Core recovered (hatching indicates material)
☒ No core recovery

Weathering
XW - Extremely Weathered
HW - Highly Weathered
MW - Moderately Weathered
SW - Slightly Weathered
FR - Fresh

Strength
VL - Very Low
L - Low
M - Medium
H - High
VH - Very High
EH - Extremely High

Defect Type
FT - Fault
SS - Shear Surface
SZ - Shear Zone
BP - Bedding parting
SM - Seam
IS - Infilled Seam
JT - Joint
CO - Contact
CZ - Crushed Zone
VN - Vein
FZ - Fracture Zone
BSH - Bedding Shear
DB - Drilling Break

Infilling/Coating
CN - Clean
SN - Stain
VN - Veneer
CO - Coating
RF - Rock fragments
G - Gravel
S - Sand
Z - Silt
CA - Calcite
CL - Clay
FE - Iron
QZ - Quartz
X - Carbonaceous

Roughness
SL - Slickensided
POL - Polished
S - Smooth
RF - Rough
VR - Very Rough

Shape
PR - Planar
CU - Curved
UN - Undulating
ST - Stepped
IR - Irregular

See Explanatory Notes for details of abbreviations and basis of descriptions.

Engineering Log - Cored Borehole

Project No.: PSM3730

Client:	SINSW	Commenced:	15/04/2019
Project Name:	Chatswood Education Precinct	Completed:	15/04/2019
Hole Location:	Chatswood High School	Logged By:	MB
Hole Position:	331032.0 m E 6258551.0 m N	Checked By:	BS

Drill Model and Mounting: Rig 8 Track Mounted
Inclination: -90°
RL Surface: 88.50 m
Barrel Type and Length: NMLC
Bearing:
Datum: AHD
Operator: BG Drilling

Drilling Information

Method	Water	RQD (%)	SAMPLES & FIELD TESTS	WPT (Lugeons)	RL (m)	Depth (m)
NMLC	Not Observed	52				
		46	5.35m C Is(50) d=0.1 a=0.6 MPa			
		70			82.5	6
			6.35m C Is(50) d=0.1 a=0.3 MPa			
					81.5	7
			7.12m C Is(50) d=0.1 a=0.5 MPa			
					80.5	8
			8.09m C Is(50) d=1 a=0.4 MPa			
					79.5	9

Rock Substance

Material Description
ROCK TYPE: Colour, grain size, structure (texture, fabric, mineral composition, hardness, alteration, cementation, etc as applicable), inclusions and minor components

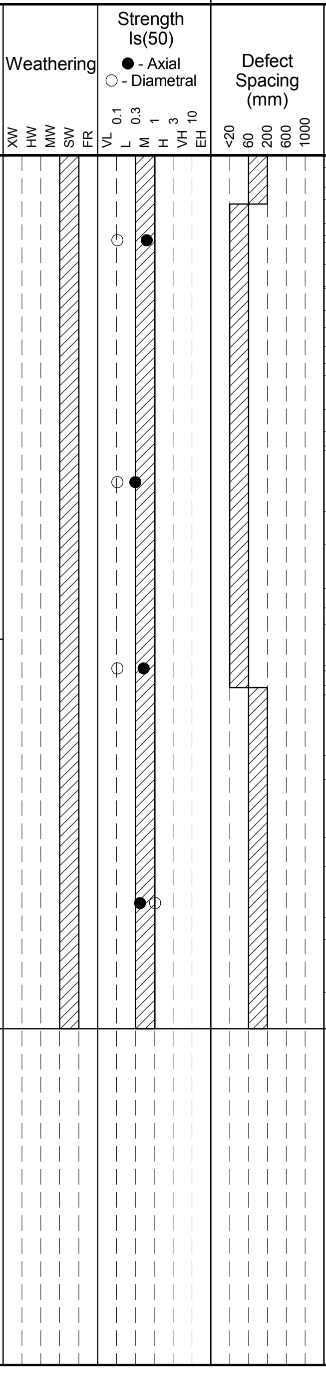
LAMINITE: dark grey, white and orange bands, Thinly Laminated, well developed bedding, fine grained sandstone laminations, 80% siltstone, 20% sandstone.*(continued)*

Laminations inclined up to 30°.

SILTSTONE: dark grey and grey, Thinly Laminated, well developed bedding, Laminations inclined up to 30°.

Laminations inclined up to 10°.

Hole Terminated at 8.61 m



Rock Mass Defects

Defect Descriptions / Comments
Description, alpha/beta, infilling or coating, shape, roughness, thickness, other

- BP, 0°, FE SN, PR, RF
- BP, 3°, FE SN, UN, RF, 1 mm
- BP, 3°, FE SN, UN, S
- BP, 5°, FE SN, PR, S
- BP, 2°, FE SN, PR, S
- BP, 1°, FE SN, PR, S
- BP, 0°, FE SN, PR, S
- BP, 0°, FE SN, IR, RF
- BP, 0°, FE SN, PR, S
- BP, 0°, FE SN, PR, RF
- BP, 0°, FE SN, PR, S
- BP, 0°, FE SN, PR, S
- SM, 15°, CL, IR, S, 20 mm
- SM, 15°, CL, IR, S, 10 mm
- BP, 1°, FE SN, UN, RF
- BP, 30°, CL, PR, S, 1 mm
- JT, 0°, RF, PR, RF, 1 mm
- BP, 30°, CL, PR, S, 1 mm
- BP, 15°, Fe & Clay SN, PR, S
- BP, 3°, FE SN, PR, RF
- BP, 0°, FE SN, CU, RF
- JT, 10°, FE SN, CU, RF
- BP, 10°, FE SN, PR, RF
- JT, 30°, FE SN, PR, RF
- BP, 5°, FE SN, IR, RF
- BP, 0°, FE SN, PR, RF
- BP, 5°, FE SN, PR, RF
- BP, 3°, FE SN, PR, S
- Healed joint.
- JT, 40°, FE SN, PR, RF
- BP, 10°, FE SN, PR, RF
- BP, 15°, FE SN, PR, S
- BP, 13°, FE SN, PR, S
- BP, 45°, FE SN, PR, S

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
HQ3- Wireline core (63.5 mm)
PQ3- Wireline core (85.0 mm)
SPT- Standard penetration test
PT - Push tube

Water
▷ Inflow
◁ Partial Loss
◀ Complete Loss

Graphic Log/Core Loss
▨ Core recovered (hatching indicates material)
☒ No core recovery

Weathering
XW - Extremely Weathered
HW - Highly Weathered
MW - Moderately Weathered
SW - Slightly Weathered
FR - Fresh

Strength
VL - Very Low
L - Low
M - Medium
H - High
VH - Very High
EH - Extremely High

Defect Type
FT - Fault
SS - Shear Surface
SZ - Shear Zone
BP - Bedding parting
SM - Seam
IS - Infilled Seam
JT - Joint
CO - Contact
CZ - Crushed Zone
VN - Vein
FZ - Fracture Zone
BSH - Bedding Shear
DB - Drilling Break

Infilling/Coating
CN - Clean
SN - Stain
VN - Veneer
CO - Coating
RF - Rock fragments
G - Gravel
S - Sand
Z - Silt
CA - Calcite
CL - Clay
FE - Iron
QZ - Quartz
X - Carbonaceous

Roughness
SL - Slickensided
POL - Polished
S - Smooth
RF - Rough
VR - Very Rough

Shape
PR - Planar
CU - Curved
UN - Undulating
ST - Stepped
IR - Irregular

See Explanatory Notes for details of abbreviations and basis of descriptions.

JOB No.: PSM 3730

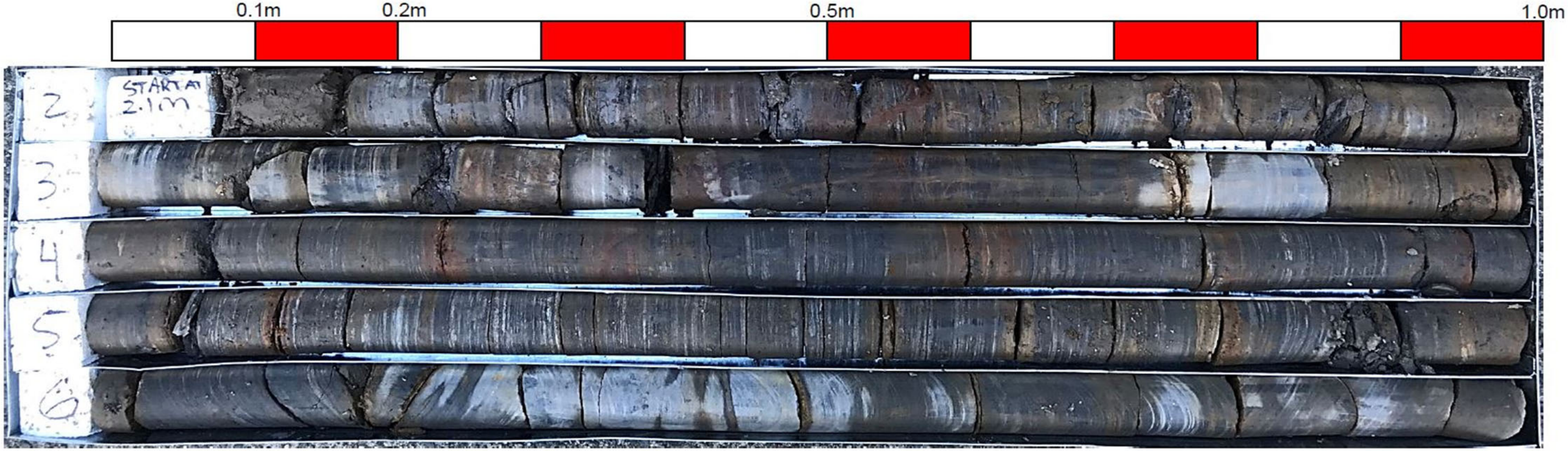
BH ID: BH 26

PROJECT: Chatswood Education Precinct

LOCATION: Chatswood High

FROM: 2.1m TO: 7.0m

DATE: 15/4/19



SCHOOL INFRASTRUCTURE NSW

Chatswood Education Precinct

Chatswood High School Centennial Avenue

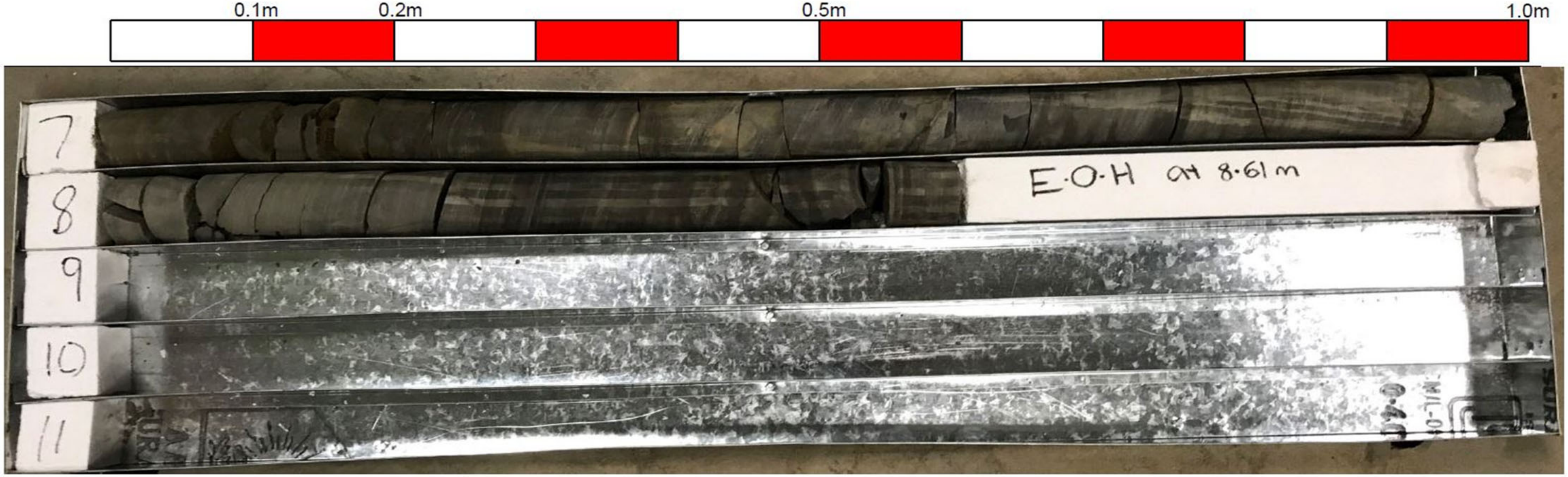
CORE PHOTOS BH26

(SHEET 1 OF 2)

Pells Sullivan Meynink

PSM3730-006R	**Figure 1**

JOB No.: PSM 3730
BH ID: BH 26
PROJECT: Chatswood Education Precinct
LOCATION: Chatswood High
FROM: 7.0m TO: 8.61m
DATE: 15/4/19



SCHOOL INFRASTRUCTURE NSW
Chatswood Education Precinct
Chatswood High School Centennial Avenue
CORE PHOTOS BH26
(SHEET 2 OF 2)

Pells Sullivan Meynink

PSM3730-006R	**Figure 1**

Borehole ID (Estimated Surface RL)	Approximate Depth	Material Encountered	Notes
BH27 (RL 80.0m)	0 – 0.08 m	Asphalt; 80 mm thick.	
	0.08 – 1.5 m	Silty CLAY; non-plastic, pale brown, with some gravel, sub-angular up to 10 mm, dry and compact consistency.	Inferred Fill. SPT at 1.0 m: Refusal.
	1.5 – 8.0 m	LAMINITE; pale brown, very low strength, extremely weathered. Increasing strength with depth. Becomes grey from 5.0 m. Increased drill resistance from 6.0 m. Becomes dark grey from 7.5 m.	Inferred Bedrock Description based on drill cuttings.
	8.0 m	Hole terminated at 8.0 m.	Maximum depth reached. V-bit auger did not refuse.

Borehole ID
BH28
Page 1 of 4

Engineering Log - Non Cored Borehole

Project No.: PSM3730

Client:	SINSW	Commenced:	16/04/2019
Project Name:	Chatswood Education Precinct	Completed:	16/04/2019
Hole Location:	Chatswood High School	Logged By:	MB
Hole Position:	331153.0 m E 6258580.0 m N	Checked By:	BS

Drill Model and Mounting:	Rig 8 Track Mounted	Inclination:	-90°	RL Surface:	83.00 m		
Hole Diameter:	120 mm	Bearing:		Datum:	AHD	Operator:	BG Drilling

Drilling Information								Soil Description						Observations
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description SOIL NAME: Colour, structure, plasticity, additional	Moisture Condition	Consistency / Relative Density	Hand Penetrometer UCS (kPa) 100 200 300 400 500	Structure, Zoning, Origin, Additional Observations
AD/T		N					0.00			ASPHALT: 40 mm thick.				0.04: Inferred FILL.
							0.04			Gravelly SAND: medium to coarse grained, dark brown; gravel angular, up to 5 mm.		C		
AD/V		N	Not Observed				0.30		CH	CLAY: high plasticity, dark brown, grey and red.	M	F		0.30: Inferred residual soil.
				SPT: 1.00 - 1.45 m 2, 3, 4 N = 7		82.0	1							1.00: SPT recovered: 450 mm. 1.20: Roots observed.
												St		
				SPT: 2.00 - 2.45 m 6, 9, 10 N = 19		81.0	2			Becomes red-brown and grey.		VSt		2.00: SPT recovered: 450 mm.
				SPT: 3.00 - 3.45 m 8, 14, 25 N = 39		80.0	3					H		3.00: SPT recovered: 450 mm.
							3.30			SILTSTONE: grey, red and yellow-brown, low strength, extremely weathered.	D			3.30: Inferred bedrock. Rock properties inferred from drill cuttings.
										Continued on cored borehole sheet				
						79.0	4							

Method	Penetration	Water	Samples and Tests	Moisture Condition	Consistency/Relative Density
AD/T - Auger drilling TC bit AD/V - Auger drilling V bit WB - Washbore SPT - Standard penetration test PT - Push tube AS - Auger Screwing	No resistance through to refusal	▷ Inflow ◁ Partial Loss ◀ Complete Loss	U - Undisturbed Sample D - Disturbed Sample SPT - Standard Penetration Test ES - Environmental Sample TW - Thin Walled LB - Large Disturbed Sample	D - Dry M - Moist W - Wet	VS - Very soft S - Soft F - Firm St - Stiff VSt - Very stiff H - Hard VL - Very loose L - Loose MD - Medium dense D - Dense VD - Very dense Ce - Cemented C - Compact

See Explanatory Notes for details of abbreviations and basis of descriptions.

Soil and rock descriptions in accordance with AS 1726:2017

Borehole ID
BH28
Page 2 of 4

Engineering Log - Cored Borehole

Project No.: PSM3730

Client: SINSW
Project Name: Chatswood Education Precinct
Hole Location: Chatswood High School
Hole Position: 331153.0 m E 6258580.0 m N
Commenced: 16/04/2019
Completed: 16/04/2019
Logged By: MB
Checked By: BS

Drill Model and Mounting: Rig 8 Track Mounted
Barrel Type and Length: NMLC
Inclination: -90°
Bearing:
RL Surface: 83.00 m
Datum: AHD
Operator: BG Drilling

Drilling Information							Rock Substance				Rock Mass Defects	
Method	Water	RQD (%)	SAMPLES & FIELD TESTS	WPT (Lugeons)	RL (m)	Depth (m)	Graphic Log	Material Description ROCK TYPE: Colour, grain size, structure (texture, fabric, mineral composition, hardness, alteration, cementation, etc as applicable), inclusions and minor components	Weathering XW HW MW SW FR	Strength Is(50) ● - Axial ○ - Diametral VL 0.1 L 0.3 M 1 H 3 VH 10 EH	Defect Spacing (mm) <20 60 200 600 1000	Defect Descriptions / Comments Description, alpha/beta, infilling or coating, shape, roughness, thickness, other
					82.0	1						
					81.0	2						
					80.0	3						
								Continued from non-cored borehole sheet				
NMLC	Not Observed	28						SILTSTONE: orange-brown, poorly developed bedding, hard clay observed throughout.	XW	VL	<20	
			3.90m C Is(50) d=0.1 a=0.1 MPa		79.0	4		SILTSTONE: dark grey, orange brown and pale grey, poorly developed to developed bedding, some hard clay.	XW HW	VL ●	<20	SM, 0°, CL, PR, S, 20 mm SM, 0°, CL, PR, S, 10 mm BP, 0°, FE SN, PR, S SM, 0°, CL, PR, S, 20 mm SM, 0°, CL, PR, S, 90 mm SM, 0°, CL, PR, S, 10 mm SM, 0°, CL, PR, S, 40 mm
								NO CORE: 172 mm.				
		35	4.78m C Is(50) d=0.7 a=1.1 MPa					SILTSTONE: dark grey, developed bedding.	SW	M ○●	60	JT, 85°, CL, ST, S, 1 mm
								NO CORE: 110 mm.				SM, 0°, CL, PR, S, 100 mm

Method
- AD/T - Auger drilling TC bit
- AD/V - Auger drilling V bit
- WB - Washbore
- HQ3- Wireline core (63.5 mm)
- PQ3- Wireline core (85.0 mm)
- SPT- Standard penetration test
- PT - Push tube

Water
- ▷ Inflow
- ◁ Partial Loss
- ◀ Complete Loss

Graphic Log/Core Loss
- Core recovered (hatching indicates material)
- ☒ No core recovery

Weathering
- XW - Extremely Weathered
- HW - Highly Weathered
- MW - Moderately Weathered
- SW - Slightly Weathered
- FR - Fresh

Strength
- VL - Very Low
- L - Low
- M - Medium
- H - High
- VH - Very High
- EH - Extremely High

Defect Type
- FT - Fault
- SS - Shear Surface
- SZ - Shear Zone
- BP - Bedding parting
- SM - Seam
- IS - Infilled Seam
- JT - Joint
- CO - Contact
- CZ - Crushed Zone
- VN - Vein
- FZ - Fracture Zone
- BSH - Bedding Shear
- DB - Drilling Break

Infilling/Coating
- CN - Clean
- SN - Stain
- VN - Veneer
- CO - Coating
- RF - Rock fragments
- G - Gravel
- S - Sand
- Z - Silt
- CA - Calcite
- CL - Clay
- FE - Iron
- QZ - Quartz
- X - Carbonaceous

Roughness
- SL - Slickensided
- POL - Polished
- S - Smooth
- RF - Rough
- VR - Very Rough

Shape
- PR - Planar
- CU - Curved
- UN - Undulating
- ST - Stepped
- IR - Irregular

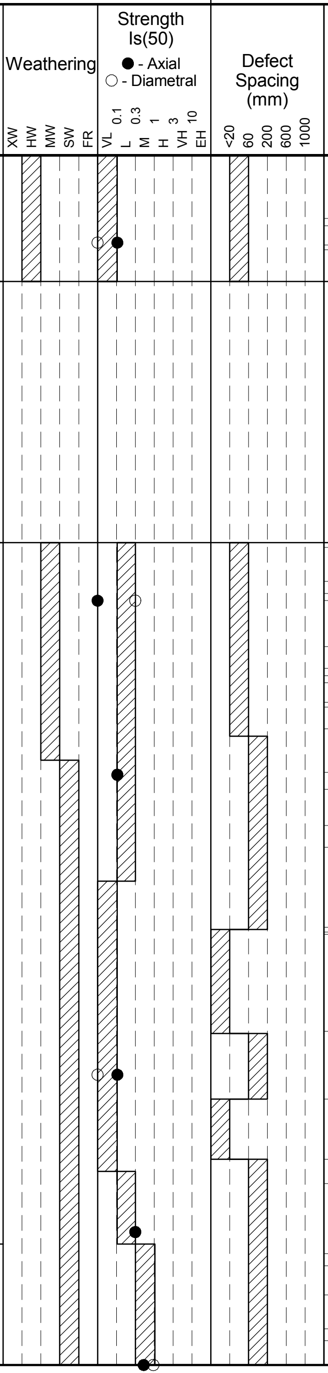
See Explanatory Notes for details of abbreviations and basis of descriptions.

Engineering Log - Cored Borehole

Project No.: PSM3730

Client:	SINSW	Commenced:	16/04/2019
Project Name:	Chatswood Education Precinct	Completed:	16/04/2019
Hole Location:	Chatswood High School	Logged By:	MB
Hole Position:	331153.0 m E 6258580.0 m N	Checked By:	BS

Drill Model and Mounting: Rig 8 Track Mounted
Inclination: -90°
RL Surface: 83.00 m
Barrel Type and Length: NMLC
Bearing:
Datum: AHD
Operator: BG Drilling



Drilling Information							Rock Substance	Rock Mass Defects
Method	Water	RQD (%)	SAMPLES & FIELD TESTS	WPT (Lugeons)	RL (m)	Depth (m)	Material Description ROCK TYPE: Colour, grain size, structure (texture, fabric, mineral composition, hardness, alteration, cementation, etc as applicable), inclusions and minor components	Defect Descriptions / Comments Description, alpha/beta, infilling or coating, shape, roughness, thickness, other
NMLC	Not Observed	35	5.36m C Is(50) d=0.01 a=0.1 MPa				SILTSTONE: dark grey and brown, poorly developed to developed bedding, some hard clay.*(continued)*	SM, 0°, CL, PR, S, 13 mm SM, 0°, CL, PR, S, 5 mm SM, 0°, CL, PR, S, 10 mm BP, 20°, FE SN, CU, S
		32			77.0	6	NO CORE: 1080 mm.	
			6.84m C Is(50) d=0.3 a=0.01 MPa 7.56m C Is(50) d=0.1 a=0.1 MPa		76.0 75.0	7 8	SILTSTONE: dark grey with orange bands, Thinly Laminated, developed bedding.	SM, 0°, CL, PR, S, 20 mm BP, 4°, FE SN, PR, RF BP, 5°, FE SN, PR, S BP, 2°, Fe & Clay SN, ST, S SM, 0°, CL, PR, S, 25 mm SM, 0°, CL, PR, S, 5 mm BP, 0°, FE SN, CU, S JT, 70°, FE SN, PR, S BP, 10°, FE SN, PR, S SM, 0°, CL, PR, S, 20 mm BP, 7°, Fe & Clay SN, PR, S, <1 mm BP, 0°, FE SN, PR, RF BP, 3°, FE SN, PR, S BP, 2°, FE SN, PR, RF 30°, Healed joint. JT, 40°, FE SN, PR, S JT, 40°, FE SN, PR, S FZ, G, Highly fractured.
		58	8.80m C Is(50) d=0.01 a=0.1 MPa		74.0	9		FZ, G, Highly fractured. SM, 0°, CL, PR, S, 3 mm
		89	9.45m C Is(50) d=0.3 a=0.3 MPa				Becomes dark grey.	JT, 30°, FE SN, PR, RF
			10.00m				INTERBEDDED SILTSTONE AND SANDSTONE: fine to medium grained, dark grey and grey, Thinly Laminated, developed bedding, 50% sandstone, 50% siltstone.	BP, 0°, FE SN, IR, RF BP, 0°, FE SN, PR, S BP, 10°, FE SN, UN, RF SM, 3°, CL, PR, S, 2 mm BP, 4°, FE SN, IR, RF

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
HQ3- Wireline core (63.5 mm)
PQ3- Wireline core (85.0 mm)
SPT- Standard penetration test
PT - Push tube

Water
▷ Inflow
◁ Partial Loss
◀ Complete Loss

Graphic Log/Core Loss
▨ Core recovered (hatching indicates material)
☒ No core recovery

Weathering
XW - Extremely Weathered
HW - Highly Weathered
MW - Moderately Weathered
SW - Slightly Weathered
FR - Fresh

Strength
VL - Very Low
L - Low
M - Medium
H - High
VH - Very High
EH - Extremely High

Defect Type
FT - Fault
SS - Shear Surface
SZ - Shear Zone
BP - Bedding parting
SM - Seam
IS - Infilled Seam
JT - Joint
CO - Contact
CZ - Crushed Zone
VN - Vein
FZ - Fracture Zone
BSH - Bedding Shear
DB - Drilling Break

Infilling/Coating
CN - Clean
SN - Stain
VN - Veneer
CO - Coating
RF - Rock fragments
G - Gravel
S - Sand
Z - Silt
CA - Calcite
CL - Clay
FE - Iron
QZ - Quartz
X - Carbonaceous

Roughness
SL - Slickensided
POL - Polished
S - Smooth
RF - Rough
VR - Very Rough

Shape
PR - Planar
CU - Curved
UN - Undulating
ST - Stepped
IR - Irregular

See Explanatory Notes for details of abbreviations and basis of descriptions.

Borehole ID
BH28
Page 4 of 4

Engineering Log - Cored Borehole

Project No.: PSM3730

Client:	SINSW	Commenced:	16/04/2019
Project Name:	Chatswood Education Precinct	Completed:	16/04/2019
Hole Location:	Chatswood High School	Logged By:	MB
Hole Position:	331153.0 m E 6258580.0 m N	Checked By:	BS

Drill Model and Mounting:	Rig 8 Track Mounted	Inclination:	-90°	RL Surface:	83.00 m		
Barrel Type and Length:	NMLC	Bearing:		Datum:	AHD	Operator:	BG Drilling

Drilling Information							***Rock Substance***		***Rock Mass Defects***
Method	Water	RQD (%)	SAMPLES & FIELD TESTS	WPT (Lugeons)	RL (m)	Depth (m)	Material Description ROCK TYPE: Colour, grain size, structure (texture, fabric, mineral composition, hardness, alteration, cementation, etc as applicable), inclusions and minor components	Weathering XW HW MW SW FR / Strength Is(50) ● - Axial ○ - Diametral VL 0.1 L 0.3 M 1 H 3 VH 10 EH / Defect Spacing (mm) <20 60 200 600 1000	Defect Descriptions / Comments Description, alpha/beta, infilling or coating, shape, roughness, thickness, other
NMLC	Not Observed	89	C Is(50) d=0.9 a=0.5 MPa				INTERBEDDED SILTSTONE AND SANDSTONE: fine to medium grained, dark grey and grey, Thinly Laminated, developed bedding, 50% sandstone, 50% siltstone.*(continued)* Becomes well developed.		
							Becomes 80% sandstone and 20% siltstone.		BP, 0°, CL, IR, RF, <1 mm
									SM, 0°, CL, PR, S, 20 mm
					72.0	11			BP, 0°, CL, PR, S, <1 mm
			11.22m C Is(50) d=1.8 a=2.7 MPa						
									BP, 0°, S, PR, RF, <1 mm
							Hole Terminated at 11.52 m		
					71.0	12			
					70.0	13			
					69.0	14			

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
HQ3- Wireline core (63.5 mm)
PQ3- Wireline core (85.0 mm)
SPT- Standard penetration test
PT - Push tube

Water
▷ Inflow
◁ Partial Loss
◀ Complete Loss

Graphic Log/Core Loss
Core recovered (hatching indicates material)
No core recovery

Weathering
XW - Extremely Weathered
HW - Highly Weathered
MW - Moderately Weathered
SW - Slightly Weathered
FR - Fresh

Strength
VL - Very Low
L - Low
M - Medium
H - High
VH - Very High
EH - Extremely High

Defect Type
FT - Fault
SS - Shear Surface
SZ - Shear Zone
BP - Bedding parting
SM - Seam
IS - Infilled Seam
JT - Joint
CO - Contact
CZ - Crushed Zone
VN - Vein
FZ - Fracture Zone
BSH - Bedding Shear
DB - Drilling Break

Infilling/Coating
CN - Clean
SN - Stain
VN - Veneer
CO - Coating
RF - Rock fragments
G - Gravel
S - Sand
Z - Silt
CA - Calcite
CL - Clay
FE - Iron
QZ - Quartz
X - Carbonaceous

Roughness
SL - Slickensided
POL - Polished
S - Smooth
RF - Rough
VR - Very Rough

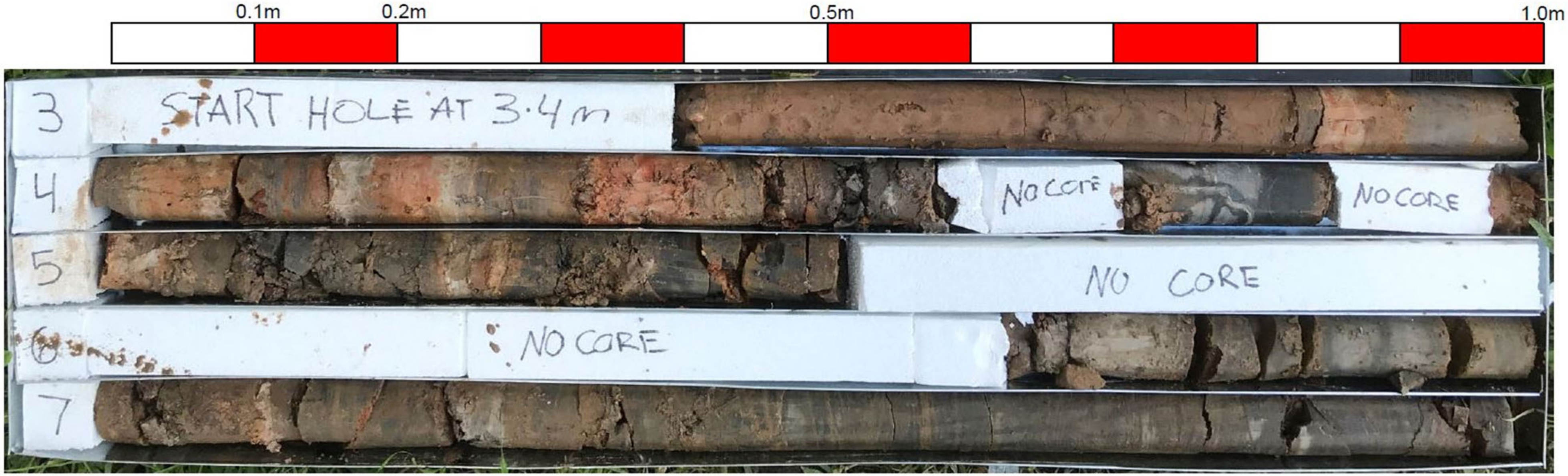
Shape
PR - Planar
CU - Curved
UN - Undulating
ST - Stepped
IR - Irregular

See Explanatory Notes for details of abbreviations and basis of descriptions.

JOB No.: PSM 3730
PROJECT: Chatswood Education Precinct
LOCATION: Chatswood High
FROM: 3.4m TO: 8.0m

BH ID: BH 28

DATE: 16/4/19



SCHOOL INFRASTRUCTURE NSW
Chatswood Education Precinct
Chatswood High School Centennial Avenue
CORE PHOTOS BH28
(SHEET 1 OF 2)

Pells Sullivan Meynink

PSM3730-006R	**Figure 1**

JOB No.: PSM 3730

BH ID: BH 28

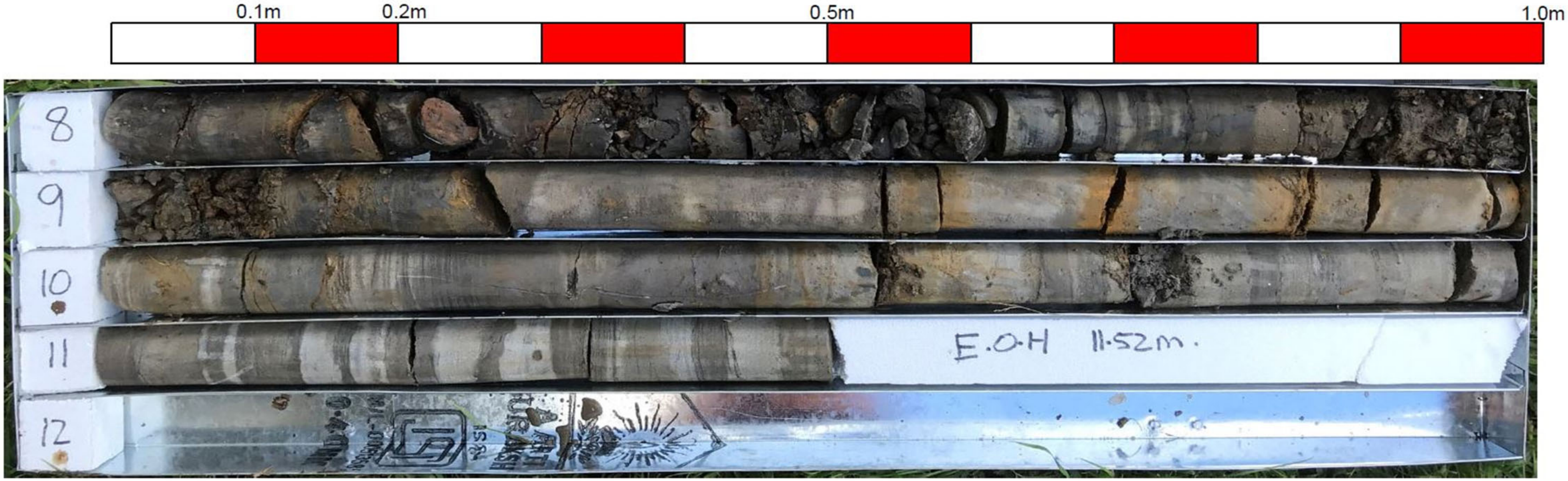
PROJECT: Chatswood Education Precinct

LOCATION: Chatswood High

FROM: 8.0m

TO: 11.52m

DATE: 16/4/19



SCHOOL INFRASTRUCTURE NSW

Chatswood Education Precinct

Chatswood High School Centennial Avenue

CORE PHOTOS BH28

(SHEET 2 OF 2)

Pells Sullivan Meynink

PSM3730-006R	**Figure 1**

Pacific Highway Site

Borehole ID

BH18

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Engineering Log - Non Cored Borehole

Project No.: PSM3730

Client:	SINSW	Commenced:	16/02/2019
Project Name:	Chatswood Education Precinct	Completed:	16/02/2019
Hole Location:	Chatswood Primary School BH18	Logged By:	MB
Hole Position:	331321.0 m E 6258757.0 m N	Checked By:	YB

Drill Model and Mounting:	Hanjin DB8 Track Mounted	Inclination:	-90°	RL Surface:	106.00 m		
Hole Diameter:	110 mm	Bearing:		Datum:	AHD	Operator:	BG Drilling

Method	Support	Water	Samples Tests Remarks	RL (m)	Depth (m)	Material Description SOIL NAME: Colour, structure, plasticity, additional	Moisture Condition	Consistency / Relative Density	Structure and Additional Observations
AD/T	N	Not Observed				ASPHALT; 200 mm thick.	D		
AD/V	N		CBR 0.20-1.50 m			Silty CLAY; dark brown, orange and grey, low to medium plasticity.			0.20: Inferred FILL
			ES 1.00 m SPT 1.00 - 1.45 m 4, 10, 14 N = 24	105.0	1			VSt	1.00: SPT recovered: 0.45 m.
			D 1.50 m						
AD/T	N					SILTSTONE; grey, orange and red, extremely low strength, extremely weathered.			1.80: V-bit refusal. Rock properties inferred from drill cuttings.
				104.0	2				
			SPT 2.50 - 2.95 m 4, 12, 25 N = 37						2.50: SPT recovered: 0.45 m.
				103.0	3				
			SPT 4.00 - 4.45 m 11, 20, 27 N = 47	102.0	4				4.00: SPT recovered: 0.45 m.
						Becoming red and grey.			

Hand Penetrometer UCS (kPa): 100 200 300 400 500

Method
- AD/T - Auger drilling TC bit
- AD/V - Auger drilling V bit
- WB - Washbore
- SPT - Standard penetration test
- PT - Push tube
- AS - Auger Screwing

Penetration

▨ No resistance through to refusal

Water
- ▷ Inflow
- ◁ Partial Loss
- ◀ Complete Loss

Samples and Tests
- U - Undisturbed Sample
- D - Disturbed Sample
- SPT - Standard Penetration Test
- ES - Environmental Sample
- TW - Thin Walled
- LB - Large Disturbed Sample

Classification symbols and soil descriptions based on Unified Soil Classification System

Moisture Condition
- D - Dry
- M - Moist
- W - Wet

Consistency/Relative Density
- VS - Very soft
- S - Soft
- F - Firm
- St - Stiff
- VSt - Very stiff
- H - Hard
- VL - Very loose
- L - Loose
- MD - Medium dense
- D - Dense
- VD - Very dense
- Ce - Cemented
- C - Compact

See Explanatory Notes for details of abbreviations and basis of descriptions.

Borehole ID

BH18

Page 2 of 3

Engineering Log - Non Cored Borehole

Project No.: PSM3730

Client:	SINSW	Commenced:	16/02/2019
Project Name:	Chatswood Education Precinct	Completed:	16/02/2019
Hole Location:	Chatswood Primary School BH18	Logged By:	MB
Hole Position:	331321.0 m E 6258757.0 m N	Checked By:	YB

Drill Model and Mounting:	Hanjin DB8 Track Mounted	Inclination:	-90°	RL Surface:	106.00 m		
Hole Diameter:	110 mm	Bearing:		Datum:	AHD	Operator:	BG Drilling

Drilling Information								**Soil Description**						**Observations**
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description SOIL NAME: Colour, structure, plasticity, additional	Moisture Condition	Consistency / Relative Density	Hand Penetrometer UCS (kPa) 100 200 300 400 500	Structure and Additional Observations
AD/T	▨	N	Not Observed	SPT 5.50 - 5.65 m 14, Refusal	▨					SILTSTONE; grey, orange and red, extremely low strength, extremely weathered. *(continued)*	D			5.50: SPT recovered: 0.15 m.
						100.0	6							
										Continued on cored borehole sheet				
						99.0	7							
						98.0	8							
						97.0	9							

Method
- AD/T - Auger drilling TC bit
- AD/V - Auger drilling V bit
- WB - Washbore
- SPT - Standard penetration test
- PT - Push tube
- AS - Auger Screwing

Penetration

▨ No resistance through to refusal

Water
- ▷ Inflow
- ◁ Partial Loss
- ◀ Complete Loss

Samples and Tests
- U - Undisturbed Sample
- D - Disturbed Sample
- SPT - Standard Penetration Test
- ES - Environmental Sample
- TW - Thin Walled
- LB - Large Disturbed Sample

Classification symbols and soil descriptions based on Unified Soil Classification System

Moisture Condition
- D - Dry
- M - Moist
- W - Wet

Consistency/Relative Density
- VS - Very soft
- S - Soft
- F - Firm
- St - Stiff
- VSt - Very stiff
- H - Hard
- VL - Very loose
- L - Loose
- MD - Medium dense
- D - Dense
- VD - Very dense
- Ce - Cemented
- C - Compact

See Explanatory Notes for details of abbreviations and basis of descriptions.

Borehole ID

BH18

Page 3 of 3

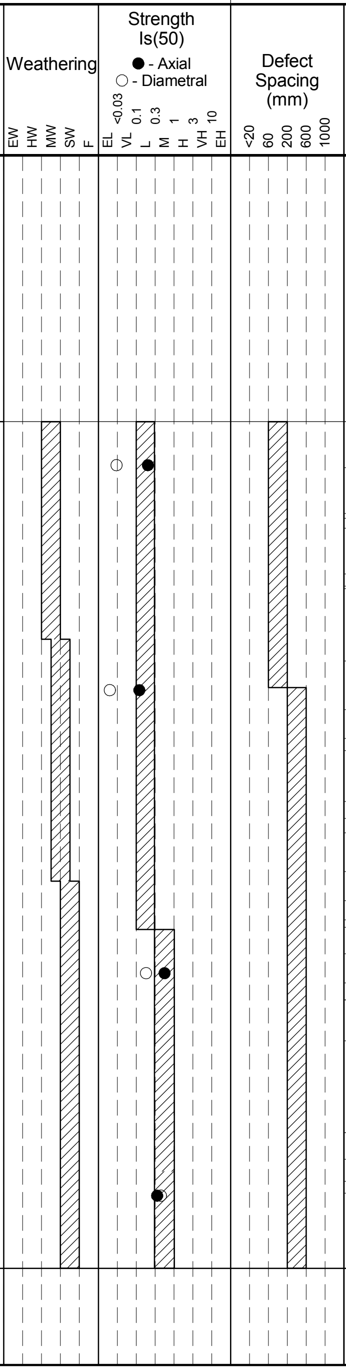
Engineering Log - Cored Borehole

Project No.: PSM3730

Client:	SINSW	Commenced:	16/02/2019
Project Name:	Chatswood Education Precinct	Completed:	16/02/2019
Hole Location:	Chatswood Primary School BH18	Logged By:	MB
Hole Position:	331321.0 m E 6258757.0 m N	Checked By:	YB

Drill Model and Mounting: Hanjin DB8 Track Mounted
Inclination: -90°
RL Surface: 106.00 m
Barrel Type and Length: Triple Tube 100mm
Bearing:
Datum: AHD
Operator: BG Drilling

Drilling Information							*Rock Substance*	*Rock Mass Defects*
Method	Water	TCR (%)	RQD (%)	SAMPLES & FIELD TESTS	RL (m)	Depth (m)	Material Description ROCK TYPE: Colour, grain size, structure (texture, fabric, mineral composition, hardness, alteration, cementation, etc as applicable)	Defect Descriptions / Comments Description, alpha/beta, infilling or coating, shape, roughness, thickness, other
					100.0	6	Continued from non-cored borehole sheet	
NMLC	Not Observed	100	83	6.28m 01 Is(50) d=0.03 a=0.2 MPa			SILTSTONE; dark grey with orange banding, developed bedding, distinct thin fine-grained sandstone laminations.	BP 0° Fe & Clay SN UN S BP 0° FE SN PR S JT 90° FE SN PR S BP 2° FE SN UN S BP 10° FE SN PR S SM 0° CL PR S 19 mm
					99.0	7		BP 0° FE SN PR S
		100	77	7.21m 02 Is(50) d=0.02 a=0.12 MPa			Becoming well developed.	BP 0° Fe & Clay SN UN S 1 mm BP 0° FE SN UN S BP 0° CN PR S BP 0° Fe & Clay SN PR S 1 mm BP 0° FE SN PR S BP 0° Fe & Clay SN PR S BP 0° CN PR S
					98.0	8		JT 70° CN UN RF JT 50° CL UN S
				8.38m 03 Is(50) d=0.18 a=0.55 MPa				BP 0° FE SN PR S BP 0° FE SN PR S JT 70° S & CL UN RF
					97.0	9		BP 0° FE SN PR RF JT 70° CN UN S SM CL 10 mm JT 60° CN UN S
				9.30m 04 Is(50) d=0.44 a=0.35 MPa				
							Hole Terminated at 9.60 m	



Method
- AD/T - Auger drilling TC bit
- AD/V - Auger drilling V bit
- WB - Washbore
- HQ3- Wireline core (63.5 mm)
- PQ3- Wireline core (85.0 mm)
- SPT- Standard penetration test
- PT - Push tube

Water
- ▷ Inflow
- ◁ Partial Loss
- ◀ Complete Loss

Graphic Log/Core Loss
- Core recovered (hatching indicates material)
- ☒ No core recovery

Weathering
- EW - Extremely Weathered
- HW - Highly Weathered
- MW - Moderately Weathered
- SW - Slightly Weathered
- F - Fresh

Strength
- EL - Extremely Low
- VL - Very Low
- L - Low
- M - Medium
- H - High
- VH - Very High
- EH - Extremely High

Defect Type
- FT - Fault
- SS - Shear Surface
- SZ - Shear Zone
- BP - Bedding parting
- SM - Seam
- IS - Infilled Seam
- JT - Joint
- CO - Contact
- CZ - Crushed Zone
- VN - Vein
- FZ - Fracture Zone
- BSH - Bedding Shear
- DB - Drilling Break

Infilling/Coating
- CN - Clean
- SN - Stain
- VN - Veneer
- CO - Coating
- RF - Rock fragments
- G - Gravel
- S - Sand
- Z - Silt
- CA - Calcite
- CL - Clay
- FE - Iron
- QZ - Quartz
- X - Carbonaceous

Roughness
- SL - Slickensided
- POL - Polished
- S - Smooth
- RF - Rough
- VR - Very Rough

Shape
- PR - Planar
- CU - Curved
- UN - Undulating
- ST - Stepped
- IR - Irregular

See Explanatory Notes for details of abbreviations and basis of descriptions.

JOB No.: PSM 3730

BH ID: BH 18

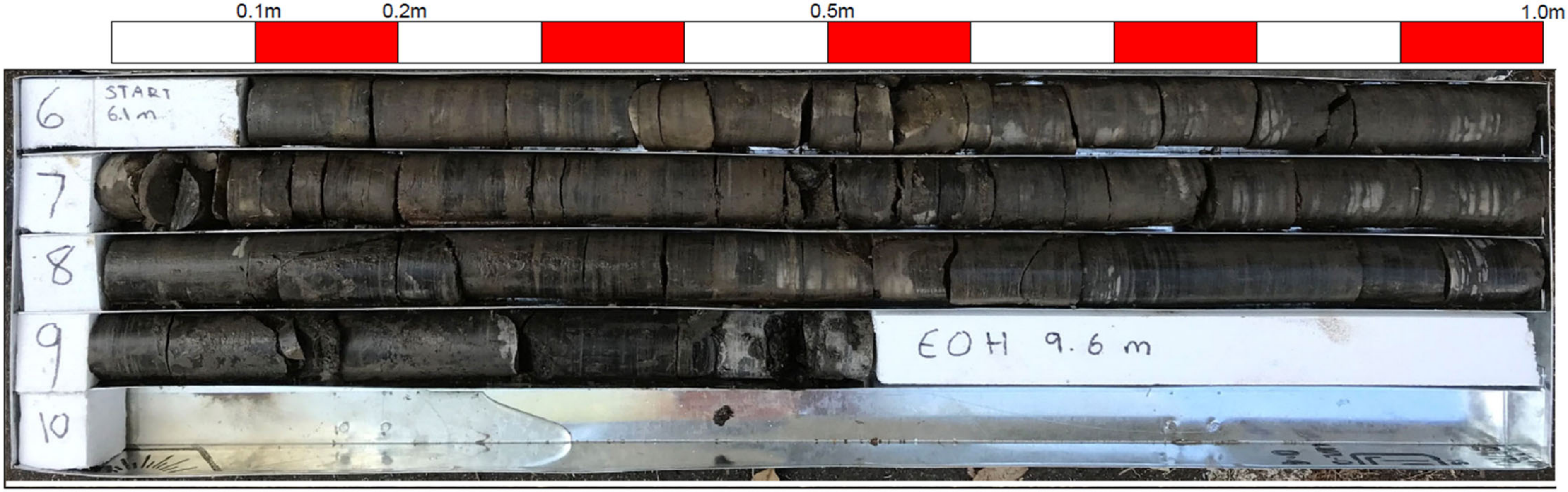
PROJECT: Chatswood Education Precinct

LOCATION: Chatswood Primary

FROM: 6.1m

TO: 9.6m

DATE: 16/02/19



Pells Sullivan Meynink

SCHOOL INFRASTRUCTURE NSW
Chatswood Education Precinct
Chatswood Primary School
CORE PHOTO BH18
(SHEET 1 OF 1)

PSM3730-006R	**Figure 1**

Borehole ID

BH19

Page 1 of 3

Engineering Log - Non Cored Borehole

Project No.: PSM3730

Client: SINSW
Project Name: Chatswood Education Precinct
Hole Location: Chatswood Primary School BH19
Hole Position: 331294.0 m E 6258692.0 m N

Commenced: 16/02/2019
Completed: 16/02/2019
Logged By: MB
Checked By: YB

Drill Model and Mounting: Hanjin DB8 Track Mounted
Hole Diameter: 110 mm
Inclination: -90°
Bearing:
RL Surface: 103.00 m
Datum: AHD
Operator: BG Drilling

Drilling Information								Soil Description						Observations
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description SOIL NAME: Colour, structure, plasticity, additional	Moisture Condition	Consistency / Relative Density	Hand Penetrometer UCS (kPa) 100 200 300 400 500	Structure and Additional Observations
AD/T		N	Not Observed							ASPHALT; 200 mm thick.				
AD/V		N		CBR 0.20-1.50 m D 0.50 m SPT: 1.00 - 1.45 m 3, 16, 23 N = 39		102.0	1			Silty CLAY; grey and light brown, low to medium plasticity.	D	H		0.20: Inferred Fill 0.50: Small siltstone fragments observed. 1.00: SPT recovered: 0.45 m.
AD/T		N		SPT 2.5 - 2.65 11, Refusal ES 2.60 m		101.0	2			SILTSTONE; pale grey, red and orange, extremely low strength, extremely weathered. Becoming grey.				1.30: V-bit Refusal. Rock properties inferred from drill cuttings. 2.50: SPT recovered: 0.15 m.
						100.0 99.0	3 4			Continued on cored borehole sheet				

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
SPT - Standard penetration test
PT - Push tube
AS - Auger Screwing

Penetration
No resistance through to refusal

Water
▷ Inflow
◁ Partial Loss
◀ Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
ES - Environmental Sample
TW - Thin Walled
LB - Large Disturbed Sample

Classification symbols and soil descriptions based on Unified Soil Classification System

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very soft
S - Soft
F - Firm
St - Stiff
VSt - Very stiff
H - Hard
VL - Very loose
L - Loose
MD - Medium dense
D - Dense
VD - Very dense
Ce - Cemented
C - Compact

See Explanatory Notes for details of abbreviations and basis of descriptions.

PSM

Borehole ID
BH19
Page 2 of 3

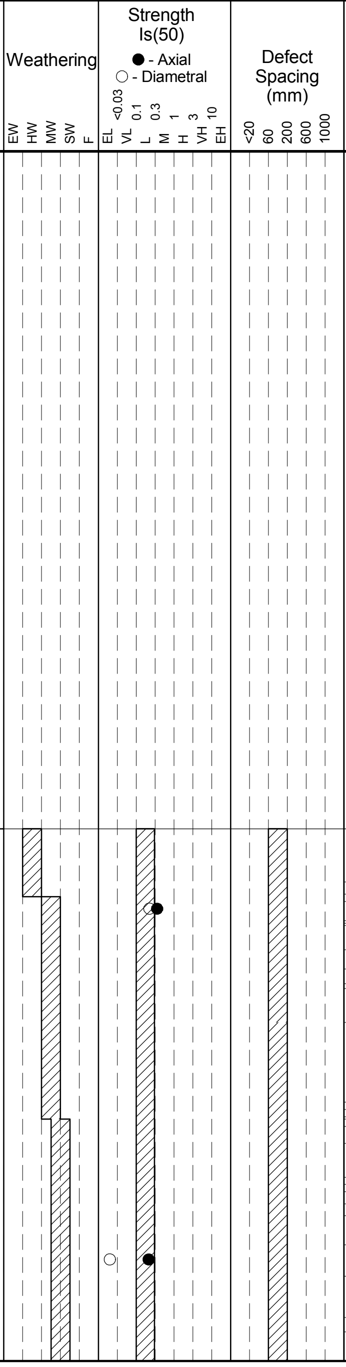
Engineering Log - Cored Borehole

Project No.: PSM3730

Client:	SINSW	Commenced:	16/02/2019
Project Name:	Chatswood Education Precinct	Completed:	16/02/2019
Hole Location:	Chatswood Primary School BH19	Logged By:	MB
Hole Position:	331294.0 m E 6258692.0 m N	Checked By:	YB

Drill Model and Mounting: Hanjin DB8 Track Mounted
Barrel Type and Length: Triple Tube 100mm
Inclination: -90°
Bearing:
RL Surface: 103.00 m
Datum: AHD
Operator: BG Drilling

Method	Water	TCR (%)	RQD (%)	SAMPLES & FIELD TESTS	RL (m)	Depth (m)	Material Description ROCK TYPE: Colour, grain size, structure (texture, fabric, mineral composition, hardness, alteration, cementation, etc as applicable)	Defect Descriptions / Comments Description, alpha/beta, infilling or coating, shape, roughness, thickness, other
					102.0	1		
					101.0	2	Continued from non-cored borehole sheet	
NMLC	Not Observed	100	59	3.13m Is(50) d=0.22 a=0.35 MPa	100.0	3	SILTSTONE; dark grey, pale grey with orange banding, bedding fabric faint, poorly developed bedding, distinct thin sandstone laminations. Some clay infilled seams.	FZ SM CL S 20 mm JT 70° FE SN PR S BP 0° FE SN PR S BP 0° FE SN PR S BP 0° FE SN ST RF BP 0° FE SN IR S BP 0° FE SN IR S BP 0° FE SN CU S Heavily fractured along bedding planes.
		100	56	4.58m Is(50) d=0.02 a=0.21 MPa	99.0	4	Bedding becomes developed.	BP 3° FE SN PR S BP 0° Fe & Clay SN IR S 2 mm BP 0° FE SN UN S BP 4° FE SN ST S BP 0° Fe & Clay SN PR S 1 mm BP 5° FE SN IR S SM CL 10 mm JT 75° Fe & Clay SN PR S 1 mm SM CL 5 mm BP 1° FE SN ST RF



Method	Water	Weathering	Defect Type	Infilling/Coating	Roughness
AD/T - Auger drilling TC bit	▷ Inflow	EW - Extremely Weathered	FT - Fault	CN - Clean	SL - Slickensided
AD/V - Auger drilling V bit	◁ Partial Loss	HW - Highly Weathered	SS - Shear Surface	SN - Stain	POL - Polished
WB - Washbore	◀ Complete Loss	MW - Moderately Weathered	SZ - Shear Zone	VN - Veneer	S - Smooth
HQ3- Wireline core (63.5 mm)		SW - Slightly Weathered	BP - Bedding parting	CO - Coating	RF - Rough
PQ3- Wireline core (85.0 mm)		F - Fresh	SM - Seam	RF - Rock fragments	VR - Very Rough
SPT- Standard penetration test	**Graphic Log/Core Loss**	**Strength**	IS - Infilled Seam	G - Gravel	**Shape**
PT - Push tube	▨ Core recovered (hatching indicates material)	EL - Extremely Low	JT - Joint	S - Sand	PR - Planar
	☒ No core recovery	VL - Very Low	CO - Contact	Z - Silt	CU - Curved
		L - Low	CZ - Crushed Zone	CA - Calcite	UN - Undulating
		M - Medium	VN - Vein	CL - Clay	ST - Stepped
		H - High	FZ - Fracture Zone	FE - Iron	IR - Irregular
		VH - Very High	BSH - Bedding Shear	QZ - Quartz	
		EH - Extremely High	DB - Drilling Break	X - Carbonaceous	

See Explanatory Notes for details of abbreviations and basis of descriptions.

Engineering Log - Cored Borehole

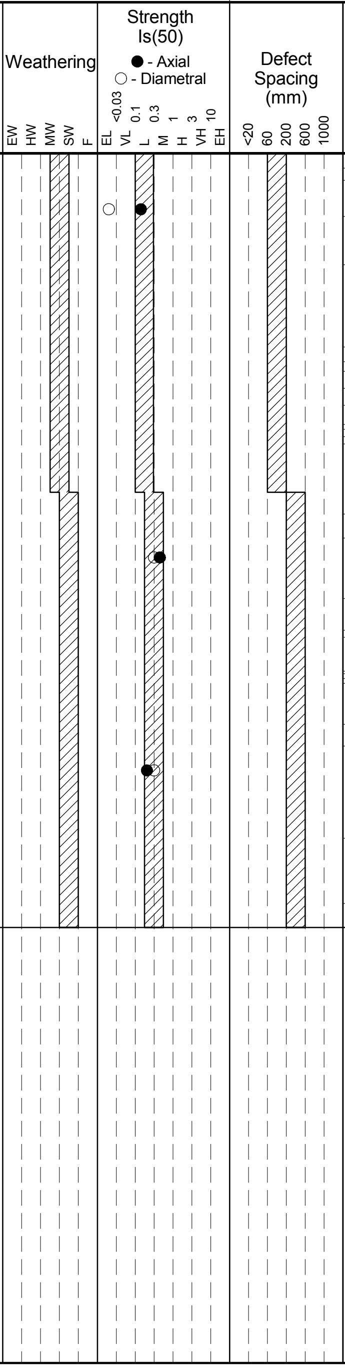
Project No.: PSM3730

Client:	SINSW	Commenced:	16/02/2019
Project Name:	Chatswood Education Precinct	Completed:	16/02/2019
Hole Location:	Chatswood Primary School BH19	Logged By:	MB
Hole Position:	331294.0 m E 6258692.0 m N	Checked By:	YB

Drill Model and Mounting:	Hanjin DB8 Track Mounted	Inclination:	-90°	RL Surface:	103.00 m		
Barrel Type and Length:	Triple Tube 100mm	Bearing:		Datum:	AHD	Operator:	BG Drilling

Drilling Information | ***Rock Substance*** | ***Rock Mass Defects***

Method	Water	TCR (%)	RQD (%)	SAMPLES & FIELD TESTS	RL (m)	Depth (m)	Material Description ROCK TYPE: Colour, grain size, structure (texture, fabric, mineral composition, hardness, alteration, cementation, etc as applicable)	Defect Descriptions / Comments Description, alpha/beta, infilling or coating, shape, roughness, thickness, other
NMLC	Not Observed	100	56	5.23m Is(50) d=0.02 a=0.14 MPa	97.0	6	SILTSTONE; dark grey, pale grey with orange banding, bedding fabric faint, poorly developed bedding, distinct thin sandstone laminations. Some clay infilled seams.*(continued)* Fine-grained sandstone laminations observed.	BP 0° FE SN PR RF 1 mm SM 9° CL 8 mm BP 5° FE SN PR RF 2 mm BP 0° FE SN PR S BP 0° FE SN PR S BP 0° FE SN PR S BP 3° FE SN PR S JT 85° FE SN PR S FZ G 20 mm BP 3° FE SN PR S BP 3° FE SN PR S JT 50° FE SN PR S JT 40° FE SN PR S BP 0° FE SN PR S
		100	88	6.67m Is(50) d=0.31 a=0.44 MPa 7.55m Is(50) d=0.31 a=0.2 MPa	96.0 95.0	7 8	Becomes grey and dark grey.	BP 0° FE SN PR S BP 0° FE SN PR S BP 0° FE SN PR S 2 mm BP 0° FE SN PR S BP 0° FE SN PR S BP 0° FE SN PR S BP 0° FE SN PR S BP 0° FE SN PR S SM CL 4 mm JT 80° FE SN IR RF BP 15° Fe & Clay SN PR S 2 mm JT 70° FE SN UN S
					94.0	9	Hole Terminated at 8.20 m	



Method
- AD/T - Auger drilling TC bit
- AD/V - Auger drilling V bit
- WB - Washbore
- HQ3- Wireline core (63.5 mm)
- PQ3- Wireline core (85.0 mm)
- SPT- Standard penetration test
- PT - Push tube

Water
- ▷ Inflow
- ◁ Partial Loss
- ◀ Complete Loss

Graphic Log/Core Loss
- Core recovered (hatching indicates material)
- No core recovery

Weathering
- EW - Extremely Weathered
- HW - Highly Weathered
- MW - Moderately Weathered
- SW - Slightly Weathered
- F - Fresh

Strength
- EL - Extremely Low
- VL - Very Low
- L - Low
- M - Medium
- H - High
- VH - Very High
- EH - Extremely High

Defect Type
- FT - Fault
- SS - Shear Surface
- SZ - Shear Zone
- BP - Bedding parting
- SM - Seam
- IS - Infilled Seam
- JT - Joint
- CO - Contact
- CZ - Crushed Zone
- VN - Vein
- FZ - Fracture Zone
- BSH - Bedding Shear
- DB - Drilling Break

Infilling/Coating
- CN - Clean
- SN - Stain
- VN - Veneer
- CO - Coating
- RF - Rock fragments
- G - Gravel
- S - Sand
- Z - Silt
- CA - Calcite
- CL - Clay
- FE - Iron
- QZ - Quartz
- X - Carbonaceous

Roughness
- SL - Slickensided
- POL - Polished
- S - Smooth
- RF - Rough
- VR - Very Rough

Shape
- PR - Planar
- CU - Curved
- UN - Undulating
- ST - Stepped
- IR - Irregular

See Explanatory Notes for details of abbreviations and basis of descriptions.

JOB No.: PSM 3730

BH ID: BH 19

PROJECT: Chatswood Education Precinct

LOCATION: Chatswood Primary

FROM: 2.8m TO: 7.0m

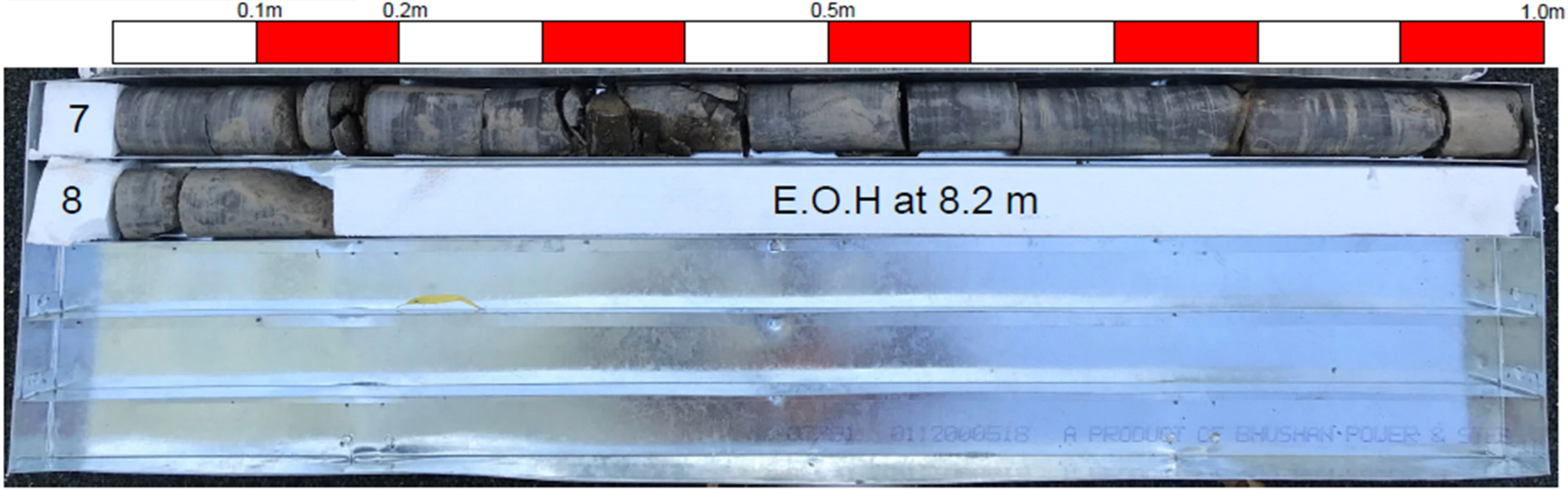
DATE: 16/02/19

Pells Sullivan Meynink

SCHOOL INFRASTRUCTURE NSW
Chatswood Education Precinct
Chatswood Primary School
CORE PHOTO BH19
(SHEET 1 OF 2)

PSM3730-006R	**Figure 1**

JOB No.: PSM 3730 BH ID: BH 19
PROJECT: Chatswood Education Precinct
LOCATION: Chatswood Primary
FROM: 7.0m TO: 8.2m DATE: 16/02/19



SCHOOL INFRASTRUCTURE NSW
Chatswood Education Precinct
Chatswood Primary School
CORE PHOTO BH19
(SHEET 2 OF 2)

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PSM3730-006R	**Figure 2**

Borehole ID (Estimated Surface RL)	Approximate Depth	Material Encountered	Notes
BH20 (RL 104.5m)	0 – 0.1 m	ASPHALT; 100 mm thick.	
	0.1 – 0.5 m	CLAY; dark grey and brown, low plasticity, with silt, dry and very stiff consistency.	Inferred Fill Atterberg sample collected at 0.5 m.
	0.5 – 1.5 m	Silty CLAY; pale brown, medium plasticity, dry and hard consistency.	SPT at 1.0 m: 5, 18, Refusal.
	1.5 – 7.6 m	SILTSTONE; grey, orange and brown, extremely low strength, extremely weathered. Sandstone laminations observed. Increasing strength and decreasing weathering with depth. Becomes dark brown at 2.5 m. Becomes dark grey at 6.5 m.	Inferred Bedrock Description based on drill cuttings. V-bit refusal at 2.0 m. SPT at 2.5 m: 11, Refusal. ES collected at 7.0 m.
	7.6 m	Hole terminated at 7.6 m.	TC-bit refusal.

Borehole ID (Estimated Surface RL)	**Approximate Depth**	**Material Encountered**	**Notes**
BH21 (RL 106.0m)	0 – 0.15 m	ASPHALT; 150 mm thick.	
	0.15 – 1.0 m	CLAY; mottled grey and red, medium to high plasticity, trace of gravel up to 3mm, angular, dry and stiff to very stiff consistency.	Inferred Fill CBR sample collected at 0.2 – 1.2 m. ES collected at 0.5 m
	1.0 – 1.2 m	Silty CLAY; pale red and brown, medium plasticity, dry and very stiff to hard consistency.	SPT at 1.0 m: 14, Refusal. V-bit refusal at 1.2 m.
	1.2 – 4.8 m	SILTSTONE; grey, orange and brown, extremely low strength, extremely weathered. Sandstone laminations observed. Increasing strength and decreasing weathering with depth. Becomes grey at 2.5 m.	Inferred Bedrock Description based on drill cuttings. SPT at 2.5 m: 13, Refusal.
	4.8 m	Hole terminated at 4.8 m.	TC-bit refusal.

Borehole ID (Estimated Surface RL)	Approximate Depth	Material Encountered	Notes
BH22 (RL 105.0m)	0 – 0.01 m	ASTROTURF; 10 mm thick.	
	0.01 – 1.3 m	Silty CLAY; dark brown, low plasticity, trace of gravel up to 3mm, sub-angular, dry and very stiff consistency. Gravel content and size increases up to 30mm at 0.5 m. Becomes hard consistency at 1.0 m.	Inferred Fill Atterberg sample collected at 0.5 to 1.0 m. SPT at 1.0 m: 5, 19, Refusal.
	1.3 – 5.5 m	SILTSTONE; pale grey and orange, extremely low strength, extremely weathered. Sandstone laminations observed. Increasing strength and decreasing weathering with depth. Becomes grey and dark brown at 3.0 m.	Inferred Bedrock Description based on drill cuttings. ES collected at 1.5 m. V-bit refusal at 1.9 m. SPT at 2.5 m: 12, Refusal.
	5.5 m	Hole terminated at 5.5 m.	TC-bit refusal.

Borehole ID (Estimated Surface RL)	Approximate Depth	Material Encountered	Notes
BH23 (RL 107.0m)	0 – 0.1 m	ASPHALT; 100 mm thick.	
	0.1 – 1.3 m	CLAY; dark brown, orange and grey, low plasticity, with silt, dry and very stiff consistency.	Inferred Fill Atterberg sample collected at 0.5 to 1.0 m. SPT at 1.0 m: 4, 11, Refusal.
	1.3 – 5.8 m	SILTSTONE; grey, orange and red, extremely low strength, extremely weathered. Sandstone laminations observed. Increasing strength and decreasing weathering with depth. Becomes grey at 3.0 m.	Inferred Bedrock Description based on drill cuttings. V-bit refusal at 1.4 m. SPT at 2.5 m: 12, Refusal.
	5.8 m	Hole terminated at 5.8 m.	TC-bit refusal.

Borehole ID (Estimated Surface RL)	Approximate Depth	Material Encountered	Notes
BH29 (RL 95.5 m)	0 – 0.015 m	ASTROTURF; 15 mm thick, some sand, medium grained, yellow-brown.	
	0.015 – 0.095 m	ASPHALT; 80 mm thick.	
	0.095 – 1.7 m	CLAY; high plasticity, dark grey & red-brown, dry to moist and stiff to very stiff consistency. Becomes orange, grey & red-brown at 0.8 m. Minor siltstone fragments observed at 1.0 m. Roots observed at 1.5 m.	Inferred Residual Soil SPT at 0.5 m: 5, 9, 12, N = 21 CBR sample collected at 0.095 – 1.0 m. SPT at 1.5 m: 5, 12, 14, N = 26
	1.7 – 4.0 m	SILTSTONE; red-brown & grey, very low strength, extremely to highly weathered.	Inferred Bedrock Rock description based on drill cuttings.
	4.0 m	Hole terminated at 4.0 m.	

Borehole ID (Estimated Surface RL)	Approximate Depth	Material Encountered	Notes
BH30 (RL 94.6 m)	0 – 0.015 m	ASTROTURF; 15 mm thick.	
	0.015 – 0.7 m	CLAY with sand and gravel; medium to high plasticity, dark grey & brown, medium to coarse grained sand, sub-angular to angular gravel, up to 30 mm, moist and stiff consistency. Some sandstone gravels observed.	Inferred FILL CBR sample collected at 0.02 – 1.0 m. SPT at 0.5 m: 2, 3, 6, N = 9
	0.7 – 1.6 m	CLAY; high plasticity, grey and red-brown, moist, stiff to very stiff consistency, roots and rootlets present, highly weathered siltstone fragments observed.	Inferred Residual Soil. SPT at 1.5 m: 4, 8, 8, N = 16
	1.6 – 4.0 m	SILTSTONE; grey, red-brown and yellow, highly to extremely weathered, and very low strength.	Inferred Bedrock Rock description based on drill cuttings.
	4.0 m	Hole terminated at 4.0 m.	

Borehole ID (Estimated Surface RL)	Approximate Depth	Material Encountered	Notes
BH31 (RL 94.5 m)	0 – 0.015 m	ASTROTURF; 15 mm thick.	
	0.015 – 0.095 m	ASPHALT; 80 mm thick.	
	0.095 – 0.8 m	CLAY trace gravel; high plasticity, dark brown, red and grey, angular gravel, up to 5 mm, moist and stiff consistency.	Inferred FILL SPT at 0.5 m: 1, 4, 5, N = 9
	0.8 – 3.0 m	CLAY; high plasticity, orange-brown and red, moist, stiff consistency, roots and rootlets present, weathered siltstone fragments observed. Becomes grey and yellow-brown at 1.5 m.	Inferred Residual Soil SPT at 1.5 m: 2, 4, 7, N = 11
	3.0 – 4.0 m	SILTSTONE; dark grey, extremely weathered, very low strength.	Inferred Bedrock Rock description based on drill cuttings.
	4.0 m	Hole terminated at 4.0 m.	

Borehole ID (Estimated Surface RL)	Approximate Depth	Material Encountered	Notes
BH32 (RL 94.0 m)	0 – 0.015 m	ASTROTURF; 15 mm thick.	
	0.015 – 0.5 m	Sandy CLAY with some gravel; low to medium plasticity, dark brown and pale grey, medium grained sand, sub-angular gravel, up to 10 mm, moist and stiff consistency.	Inferred FILL
	0.5 – 1.5 m	CLAY with some gravel; medium plasticity, orange and dark brown, sub-angular gravel, up to 5 mm, moist, firm to stiff consistency, roots and rootlets observed.	Inferred FILL SPT at 0.5 m: 3, 4, 5, N = 9
	1.5 – 3.2 m	CLAY; high plasticity, grey, orange and red-brown, moist, firm to very stiff consistency, stiffness increases with depth, roots present and weathered siltstone fragments observed.	Inferred Residual Soil SPT at 1.5 m: 3, 4, 5, N = 9 SPT at 3.0 m: 5, 10, 15, N = 25
	3.2 – 4.0 m	SILTSTONE; dark grey and red-brown, extremely weathered, very low strength.	Inferred Bedrock Rock description based on drill cuttings.
	4.0 m	Hole terminated at 4.0 m.	

Borehole ID
BH33
Page 1 of 3

Engineering Log - Non Cored Borehole

Project No.: PSM3730

Client:	SINSW	Commenced:	10/10/2019
Project Name:	Chatswood Education Precinct	Completed:	10/10/2019
Hole Location:	Chatswood Primary School	Logged By:	MB
Hole Position:	321259.0 m E 6258737.0 m N	Checked By:	YB

Drill Model and Mounting:	Christie Rig - Track Mounted	Inclination:	-90°	RL Surface:	94.70 m		
Hole Diameter:	85 mm	Bearing:		Datum:	AHD	Operator:	BG Drilling

Drilling Information								*Soil Description*						*Observations*
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description SOIL NAME: Plasticity, behaviour or particle characteristics of primary component, colour, secondary components, additional observations	Moisture Condition	Consistency / Relative Density	Hand Penetrometer UCS (kPa) 100 200 300 400 500	Structure, Zoning, Origin, Additional Observations
DT		N								ASTROTURF - 15 mm thick				
										ASPAHLT - 25 mm thick.				
AD/T		N	Not Observed							CLAY trace gravel: high plasticity, red-brown and grey; gravel sub-angular, up to 3 mm.	M	F		0.04: Inferred FILL.
				SPT: 0.5 - 0.95 m 1, 3, 3 N = 6										0.50: SPT recovered: 0.3 m.
									CH	CLAY: high plasticity, grey and yellow-brown; some roots observed.				0.90: Inferred Residual Soil.
						93.7	1							
				SPT: 1.50 - 1.95 m 5, 4, 8 N = 12						Becomes grey and red-brown with weathered shale fragments.		St		1.50: SPT recovered: 0.35 m.
						92.7	2							
										SILTSTONE: red-brown, extremely weathered and very low strength.				2.50: Inferred Bedrock.
										Continued on cored borehole sheet				
						91.7	3							
						90.7	4							

Method
- AD/T - Auger drilling TC bit
- AD/V - Auger drilling V bit
- WB - Washbore
- SPT - Standard penetration test
- PT - Push tube
- AS - Auger Screwing

Penetration
- No resistance
- Refusal

Water
- ▷ Inflow
- ◁ Partial Loss
- ◀ Complete Loss

Samples and Tests
- U - Undisturbed Sample
- D - Disturbed Sample
- SPT - Standard Penetration Test
- ES - Environmental Sample
- TW - Thin Walled
- LB - Large Disturbed Sample

Moisture Condition
- D - Dry
- M - Moist
- W - Wet

Consistency/Relative Density
- VS - Very soft
- S - Soft
- F - Firm
- St - Stiff
- VSt - Very stiff
- H - Hard
- VL - Very loose
- L - Loose
- MD - Medium dense
- D - Dense
- VD - Very dense
- Ce - Cemented
- C - Compact

Logged in accordance with AS 1726:2017 Geotechnical site investigations

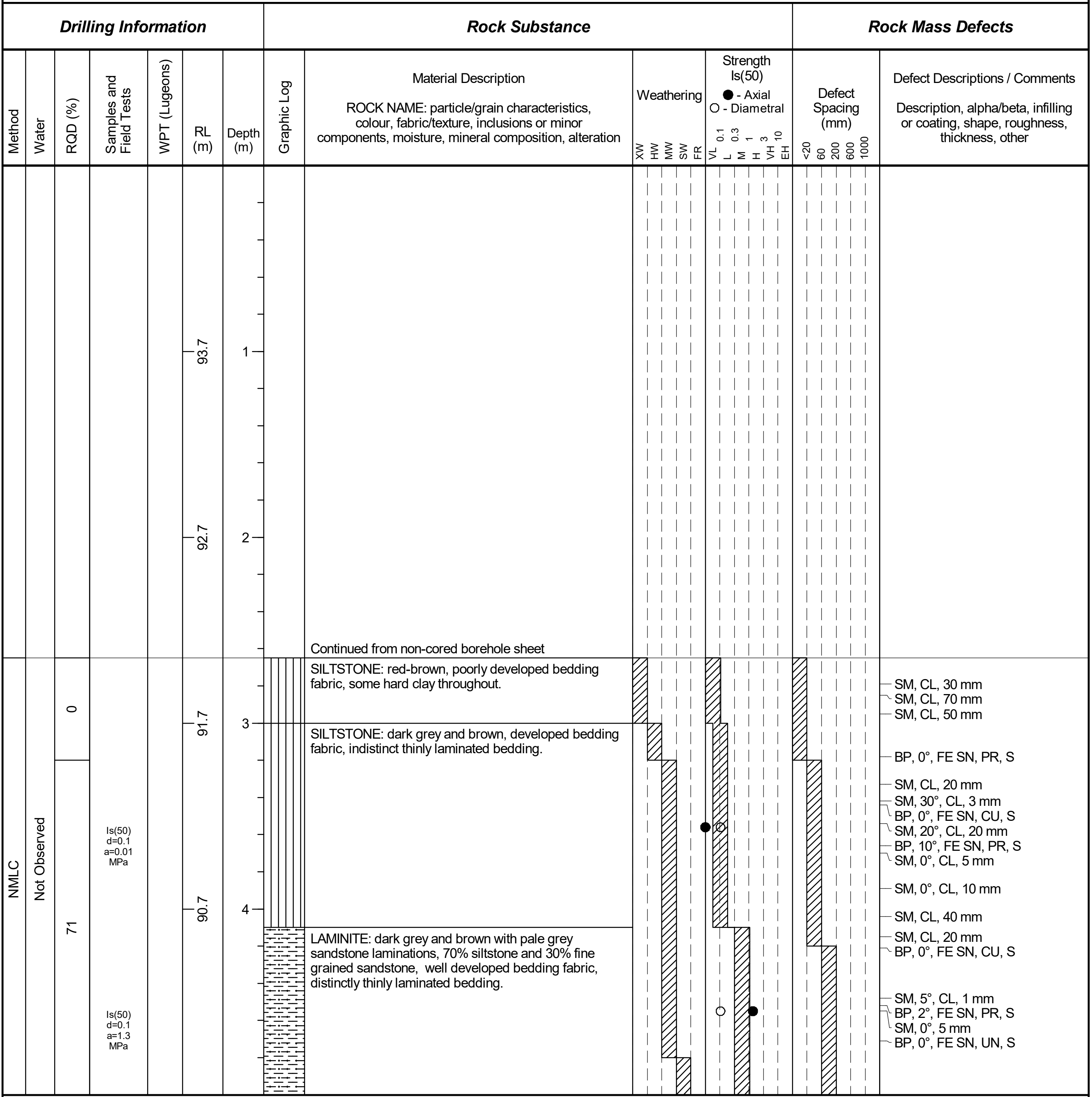
Borehole ID
BH33
Page 2 of 3

Engineering Log - Cored Borehole

Project No.: PSM3730

Client:	SINSW	Commenced:	10/10/2019
Project Name:	Chatswood Education Precinct	Completed:	10/10/2019
Hole Location:	Chatswood Primary School	Logged By:	MB
Hole Position:	321259.0 m E 6258737.0 m N	Checked By:	YB

Drill Model and Mounting: Christie Rig - Track Mounted   Inclination: -90°   RL Surface: 94.70 m
Barrel Type and Length: 3.2 m - NMLC   Bearing: Datum: AHD   Operator: BG Drilling



Continued from non-cored borehole sheet

SILTSTONE: red-brown, poorly developed bedding fabric, some hard clay throughout.

SILTSTONE: dark grey and brown, developed bedding fabric, indistinct thinly laminated bedding.

LAMINITE: dark grey and brown with pale grey sandstone laminations, 70% siltstone and 30% fine grained sandstone, well developed bedding fabric, distinctly thinly laminated bedding.

SM, CL, 30 mm
SM, CL, 70 mm
SM, CL, 50 mm
BP, 0°, FE SN, PR, S
SM, CL, 20 mm
SM, 30°, CL, 3 mm
BP, 0°, FE SN, CU, S
SM, 20°, CL, 20 mm
BP, 10°, FE SN, PR, S
SM, 0°, CL, 5 mm
SM, 0°, CL, 10 mm
SM, CL, 40 mm
SM, CL, 20 mm
BP, 0°, FE SN, CU, S
SM, 5°, CL, 1 mm
BP, 2°, FE SN, PR, S
SM, 0°, 5 mm
BP, 0°, FE SN, UN, S

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
HQ3- Wireline core (63.5 mm)
PQ3- Wireline core (85.0 mm)
SPT- Standard penetration test
PT - Push tube

WPT - Water pressure test

Water
▷ Inflow
◁ Partial Loss
◀ Complete Loss

Graphic Log/Core Loss
▨ Core recovered (hatching indicates material)
☒ No core recovery

Weathering
XW - Extremely Weathered
HW - Highly Weathered
MW - Moderately Weathered
SW - Slightly Weathered
FR - Fresh

Strength
VL - Very Low
L - Low
M - Medium
H - High
VH - Very High
EH - Extremely High

Defect Type
FT - Fault
SS - Shear Surface
SZ - Shear Zone
BP - Bedding parting
SM - Seam
IS - Infilled Seam
JT - Joint
CO - Contact
CZ - Crushed Zone
VN - Vein
FZ - Fracture Zone
BSH - Bedding Shear
DB - Drilling Break

Infilling/Coating
CN - Clean
SN - Stain
VN - Veneer
CO - Coating
RF - Rock fragments
G - Gravel
S - Sand
Z - Silt
CA - Calcite
CL - Clay
FE - Iron
QZ - Quartz
X - Carbonaceous

Roughness
SL - Slickensided
POL - Polished
S - Smooth
RF - Rough
VR - Very Rough

Shape
PR - Planar
CU - Curved
UN - Undulating
ST - Stepped
IR - Irregular

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Engineering Log - Cored Borehole

Project No.: PSM3730

Client:	SINSW	Commenced:	10/10/2019
Project Name:	Chatswood Education Precinct	Completed:	10/10/2019
Hole Location:	Chatswood Primary School	Logged By:	MB
Hole Position:	321259.0 m E 6258737.0 m N	Checked By:	YB

Drill Model and Mounting: Christie Rig - Track Mounted Inclination: -90° RL Surface: 94.70 m
Barrel Type and Length: 3.2 m - NMLC Bearing: Datum: AHD Operator: BG Drilling

LAMINITE: dark grey and brown with pale grey sandstone laminations, 70% siltstone and 30% fine grained sandstone, well developed bedding fabric, distinctly thinly laminated bedding.*(continued)*

Bedding fabric becomes very well developed.

Hole Terminated at 8.23 m

BP, 0°, FE SN, UN, S
BP, 2°, FE SN, UN, S
BP, 2°, FE SN, UN, S
SM, 0°, CL, 3 mm
BP, 10°, FE SN, CU, S
BP, 0°, FE SN, PR, S
JT, 45°, Healed Joint
BP, 0°, FE SN, PR, S
SM, 0°, CL, 10 mm
JT, 45°, Healed Joint
BP, 0°, FE SN, CU, S
BP, 0°, FE SN, PR, S
JT, 50°, CN, UN, RF
BP, 0°, FE SN, IR, S
BP, 0°, FE SN, IR, S
BP, 0°, FE SN, ST, S
BP, 0°, FE SN, PR, S

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
HQ3- Wireline core (63.5 mm)
PQ3- Wireline core (85.0 mm)
SPT- Standard penetration test
PT - Push tube

WPT - Water pressure test

Water
▷ Inflow
◁ Partial Loss
◀ Complete Loss

Graphic Log/Core Loss
Core recovered (hatching indicates material)
No core recovery

Weathering
XW - Extremely Weathered
HW - Highly Weathered
MW - Moderately Weathered
SW - Slightly Weathered
FR - Fresh

Strength
VL - Very Low
L - Low
M - Medium
H - High
VH - Very High
EH - Extremely High

Defect Type
FT - Fault
SS - Shear Surface
SZ - Shear Zone
BP - Bedding parting
SM - Seam
IS - Infilled Seam
JT - Joint
CO - Contact
CZ - Crushed Zone
VN - Vein
FZ - Fracture Zone
BSH - Bedding Shear
DB - Drilling Break

Infilling/Coating
CN - Clean
SN - Stain
VN - Veneer
CO - Coating
RF - Rock fragments
G - Gravel
S - Sand
Z - Silt
CA - Calcite
CL - Clay
FE - Iron
QZ - Quartz
X - Carbonaceous

Roughness
SL - Slickensided
POL - Polished
S - Smooth
RF - Rough
VR - Very Rough

Shape
PR - Planar
CU - Curved
UN - Undulating
ST - Stepped
IR - Irregular

Logged in accordance with AS 1726:2017 Geotechnical site investigations

JOB No.: PSM 3730

BH ID: BH 33

PROJECT: Chatswood Education Precinct

LOCATION: Chatswood Primary

FROM: 2.65m

TO: 7.0 m

DATE: 10/10/19

SCHOOL INFRASTRUCTURE NSW

Chatswood Education Precinct

Chatswood Primary School

CORE PHOTOS BH33

(SHEET 1 OF 2)

Pells Sullivan Meynink

PSM3730-006R	Figure 1

JOB No.: PSM 3730

BH ID: BH 33

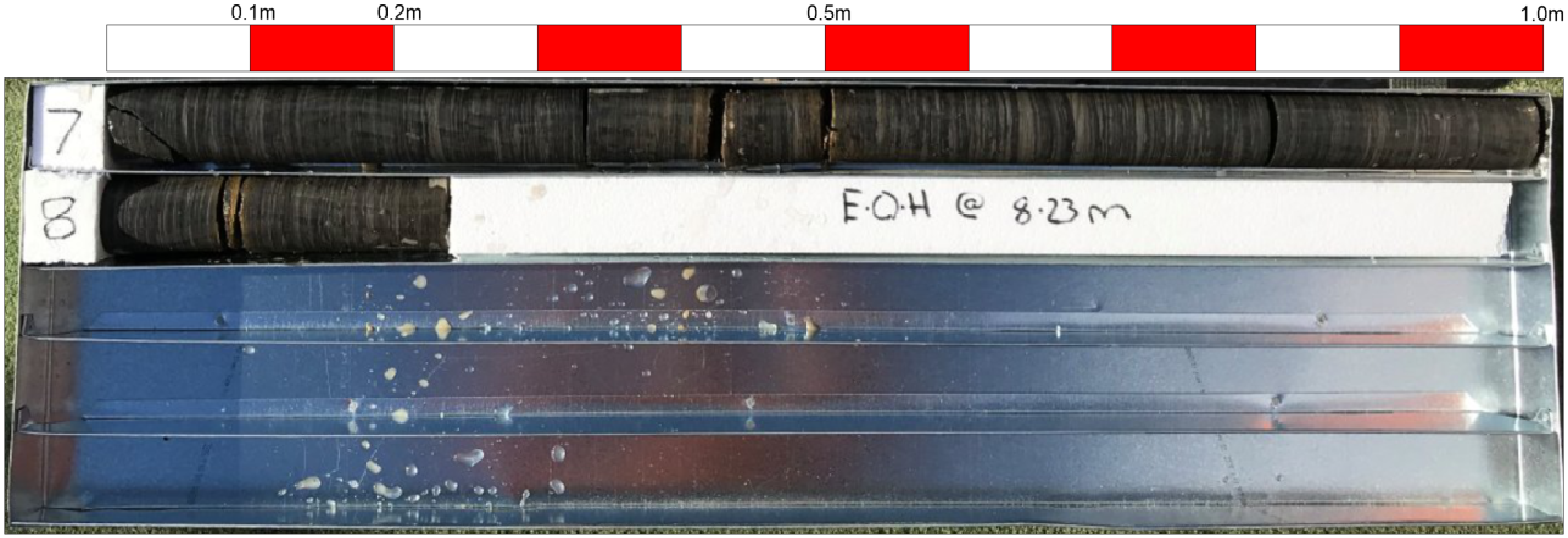
PROJECT: Chatswood Education Precinct

LOCATION: Chatswood Primary

FROM: 7.0 m

TO: 8.23 m

DATE: 10/10/19



Pells Sullivan Meynink

SCHOOL INFRASTRUCTURE NSW

Chatswood Education Precinct

Chatswood Primary School

CORE PHOTOS BH33

(SHEET 2 OF 2)

PSM3730-006R	**Figure 1**

Borehole ID (Estimated Surface RL)	Approximate Depth	Material Encountered	Notes
BH34 (RL 98.0 m)	0 – 0.015 m	ASTROTURF; 15 mm thick.	
	0.015 – 0.2 m	Sandy CLAY with gravel; medium plasticity, grey-brown and yellow-brown, medium grained sand, sub-angular gravel, up to 10 mm, moist and stiff consistency.	Inferred FILL
	0.2 – 0.5 m	CLAY trace gravel; medium plasticity, red-brown, sub-angular gravel, up to 3 mm, moist and firm consistency.	Inferred FILL SPT at 0.5 m: 2, 4, 5, N = 9
	0.5 – 1.7 m	CLAY; high plasticity, red-brown and yellow, moist, stiff consistency, and traces of weathered siltstone observed.	Inferred Residual Soil SPT at 1.5 m: 7, 8, 11, N = 19
	1.7 – 4.0 m	SILSTONE; dark grey and red-brown, highly to extremely weathered and very low strength.	Inferred Bedrock Rock description based on drill cuttings.
	4.0 m	Hole terminated at 4.0 m.	

Borehole ID (Estimated Surface RL)	Approximate Depth	Material Encountered	Notes
BH35 (RL 98.5 m)	0 – 0.015 m	ASTROTURF; 15 mm thick.	
	0.015 – 0.045 m	ASPHALT; 30 mm thick.	
	0.045 - 0.5 m	CLAY with gravel; low plasticity, light brown, sub-angular gravel, up to 5 mm, moist and stiff consistency.	Inferred FILL
	0.5 – 4.0 m	SILTSTONE; dark grey and red-brown, highly to extremely weathered, very low strength.	Inferred Bedrock Rock description based on drill cuttings. SPT at 0.5 m: 5, 8, 8, N = 16
	4.0 m	Hole terminated at 4.0 m.	

PSM

Borehole ID
BH36
Page 1 of 3

Engineering Log - Non Cored Borehole

Project No.: PSM3730

Client:	SINSW	Commenced:	11/10/2019
Project Name:	Chatswood Education Precinct	Completed:	11/10/2019
Hole Location:	Chatswood Primary School	Logged By:	MB
Hole Position:	331216.0 m E 6258692.0 m N	Checked By:	YB

Drill Model and Mounting:	Christie Rig - Track Mounted	Inclination:	-90°	RL Surface:	97.00 m		
Hole Diameter:	85 mm	Bearing:		Datum:	AHD	Operator:	BG Drilling

Method	Support	Water	Samples Tests Remarks	RL (m)	Depth (m)	Classification Symbol	Material Description SOIL NAME: Plasticity, behaviour or particle characteristics of primary component, colour, secondary components, additional observations	Moisture Condition	Consistency / Relative Density	Structure, Zoning, Origin, Additional Observations
D	N						ASPHALT: 30 mm thick.			0.03: Inferred FILL.
							Gravelly CLAY: medium to high plasticity, orange-brown and grey; gravel angular, up to 20 mm.	M	F	0.50: SPT recovered: 0.4 m.
			SPT: 0.5 - 0.95 m 3, 3, 4 N = 7			CH	CLAY: high plasticity, grey and yellow-brown; weathered shale fragments observed.			0.60: Inferred Residual Soil.
AD/T	N	Not Observed		96.0	1		SILTSTONE: red-brown, extremely weathered, very low strength.			1.00: Inferred Bedrock.
				95.0	2					
							Continued on cored borehole sheet			
				94.0	3					
				93.0	4					

Hand Penetrometer UCS (kPa): 100 200 300 400 500

Method
- AD/T - Auger drilling TC bit
- AD/V - Auger drilling V bit
- WB - Washbore
- SPT - Standard penetration test
- PT - Push tube
- AS - Auger Screwing

Penetration
- No resistance
- Refusal

Water
- ▷ Inflow
- ◁ Partial Loss
- ◀ Complete Loss

Samples and Tests
- U - Undisturbed Sample
- D - Disturbed Sample
- SPT - Standard Penetration Test
- ES - Environmental Sample
- TW - Thin Walled
- LB - Large Disturbed Sample

Moisture Condition
- D - Dry
- M - Moist
- W - Wet

Consistency/Relative Density
- VS - Very soft
- S - Soft
- F - Firm
- St - Stiff
- VSt - Very stiff
- H - Hard
- VL - Very loose
- L - Loose
- MD - Medium dense
- D - Dense
- VD - Very dense
- Ce - Cemented
- C - Compact

Logged in accordance with AS 1726:2017 Geotechnical site investigations

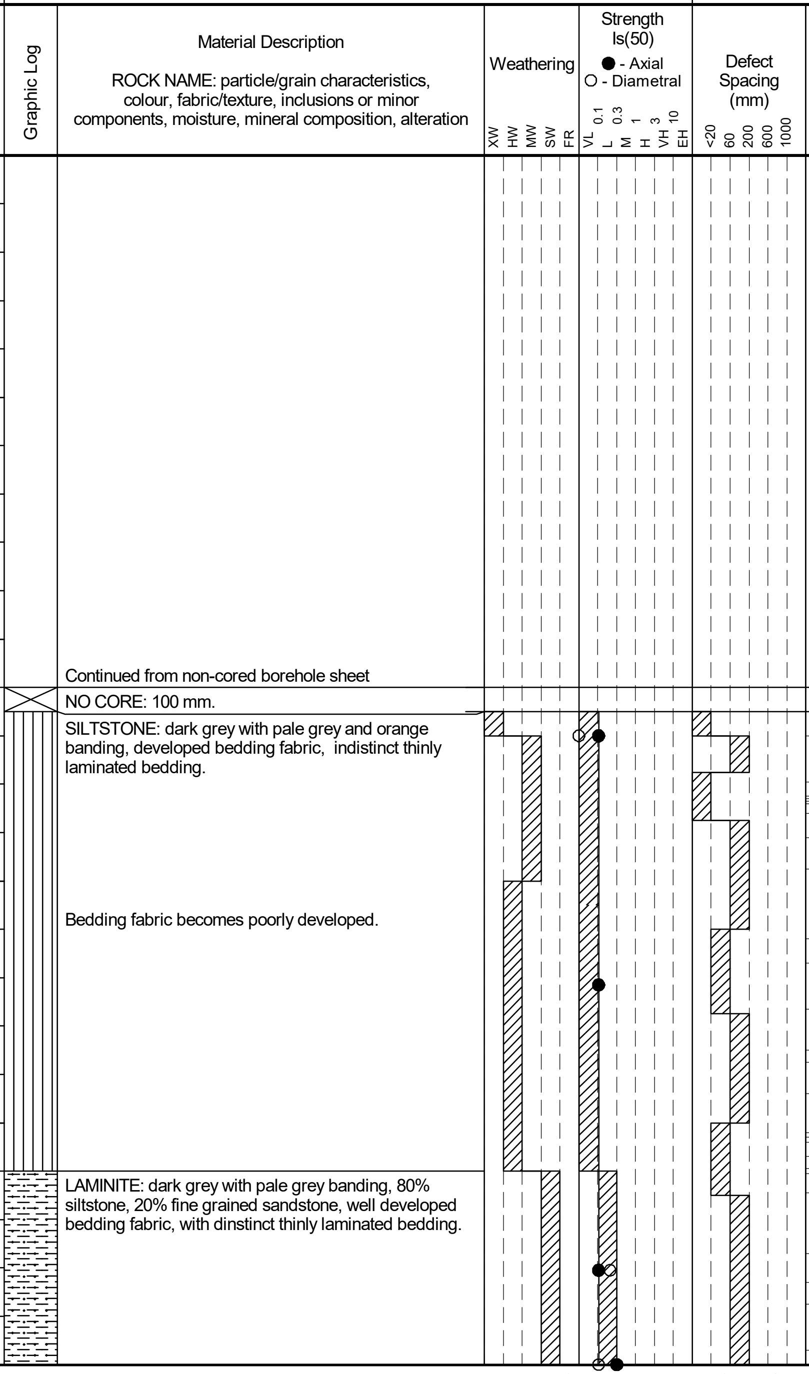
Engineering Log - Cored Borehole

Project No.: PSM3730

Client:	SINSW	Commenced:	11/10/2019
Project Name:	Chatswood Education Precinct	Completed:	11/10/2019
Hole Location:	Chatswood Primary School	Logged By:	MB
Hole Position:	331216.0 m E 6258692.0 m N	Checked By:	YB

Drill Model and Mounting:	Christie Rig - Track Mounted	Inclination:	-90°	RL Surface:	97.00 m		
Barrel Type and Length:	3.2 m - NMLC	Bearing:		Datum:	AHD	Operator:	BG Drilling

Method	Water	RQD (%)	Samples and Field Tests	WPT (Lugeons)	RL (m)	Depth (m)	Material Description ROCK NAME: particle/grain characteristics, colour, fabric/texture, inclusions or minor components, moisture, mineral composition, alteration	Defect Descriptions / Comments Description, alpha/beta, infilling or coating, shape, roughness, thickness, other
					96.0	1		
					95.0	2	Continued from non-cored borehole sheet	
NMLC	Not Observed						NO CORE: 100 mm.	
		63	Is(50) d=0.01 a=0.1 MPa				SILTSTONE: dark grey with pale grey and orange banding, developed bedding fabric, indistinct thinly laminated bedding.	Heavily fractured JT, 45°, S, Healed Joint BP, 0°, CL, PR, S, <1 mm BP, 3°, FE SN, PR, S BP, 3°, FE SN, PR, S BP, 3°, FE SN, PR, S BP, 5°, FE SN, PR, S BP, 0°, FE SN, PR, S BP, 0°, FE SN, PR, S
		68.4			94.0	3	Bedding fabric becomes poorly developed.	SM, CL, S, 5 mm SM, CL, S, 50 mm
			Is(50) d=0.1 a=0.1 MPa					SM, CL, S, 20 mm BP, 0°, FE SN, IR, S JT, 70°, CL, S JT, 70°, CL, S
					93.0	4		BP, 0°, FE SN, IR, S BP, 0°, FE SN, PR, S BP, 0°, FE SN, PR, S
			Is(50) d=0.2 a=0.1 MPa				LAMINITE: dark grey with pale grey banding, 80% siltstone, 20% fine grained sandstone, well developed bedding fabric, with dinstinct thinly laminated bedding.	SM, CL, S, 3 mm BP, 0°, FE SN, PR, S BP, 0°, FE SN, PR, S JT, 55°, FE SN, IR, S BP, 0°, FE SN, PR, S SM, 0°, CL, S, 2 mm BP, 0°, FE SN, PR, S BP, 5°, FE SN, PR, S



Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
HQ3- Wireline core (63.5 mm)
PQ3- Wireline core (85.0 mm)
SPT- Standard penetration test
PT - Push tube

WPT - Water pressure test

Water
▷ Inflow
◁ Partial Loss
◀ Complete Loss

Graphic Log/Core Loss
▨ Core recovered (hatching indicates material)
☒ No core recovery

Weathering
XW - Extremely Weathered
HW - Highly Weathered
MW - Moderately Weathered
SW - Slightly Weathered
FR - Fresh

Strength
VL - Very Low
L - Low
M - Medium
H - High
VH - Very High
EH - Extremely High

Defect Type
FT - Fault
SS - Shear Surface
SZ - Shear Zone
BP - Bedding parting
SM - Seam
IS - Infilled Seam
JT - Joint
CO - Contact
CZ - Crushed Zone
VN - Vein
FZ - Fracture Zone
BSH - Bedding Shear
DB - Drilling Break

Infilling/Coating
CN - Clean
SN - Stain
VN - Veneer
CO - Coating
RF - Rock fragments
G - Gravel
S - Sand
Z - Silt
CA - Calcite
CL - Clay
FE - Iron
QZ - Quartz
X - Carbonaceous

Roughness
SL - Slickensided
POL - Polished
S - Smooth
RF - Rough
VR - Very Rough

Shape
PR - Planar
CU - Curved
UN - Undulating
ST - Stepped
IR - Irregular

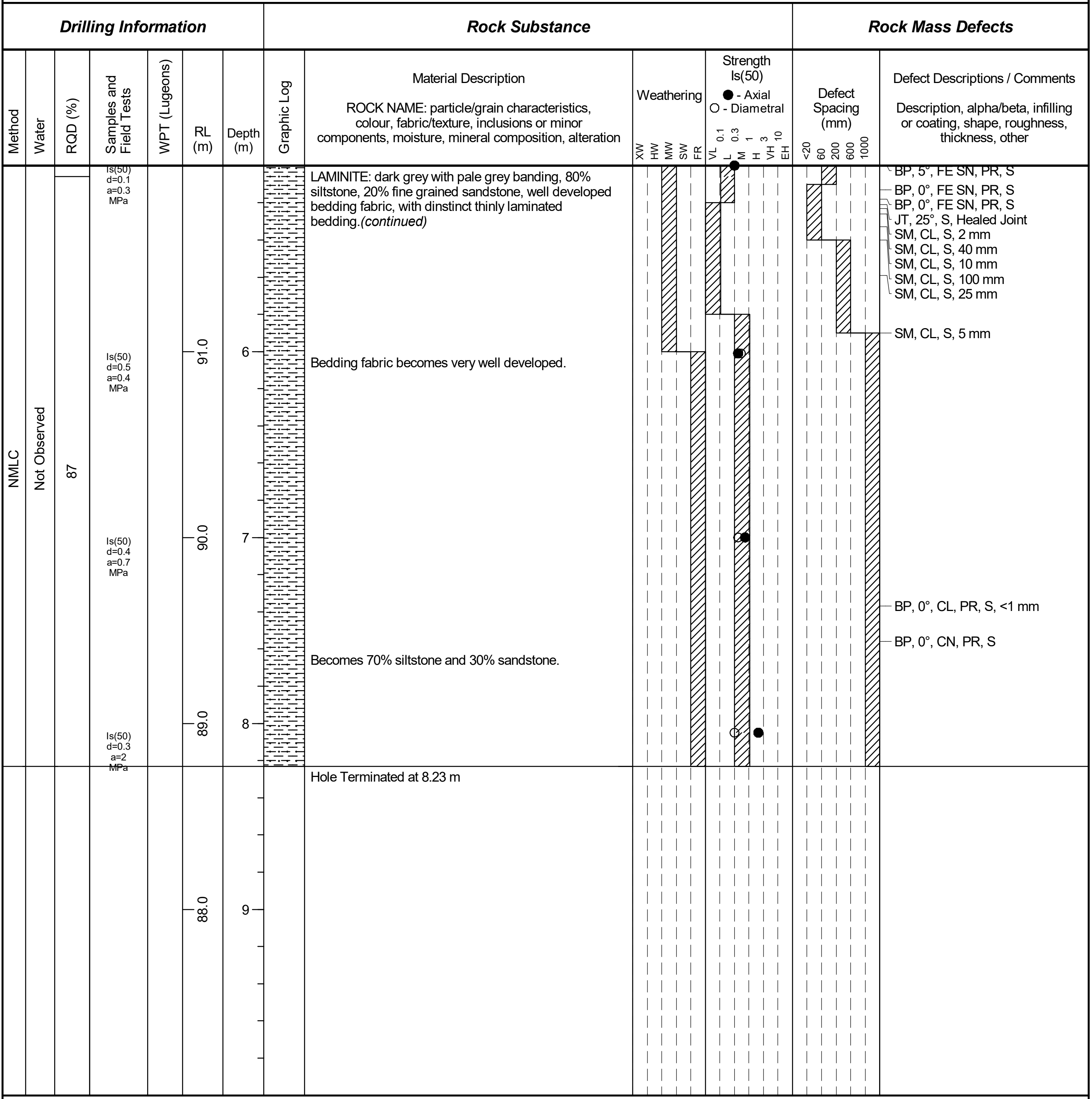
Logged in accordance with AS 1726:2017 Geotechnical site investigations

Engineering Log - Cored Borehole

Project No.: PSM3730

Client:	SINSW	Commenced:	11/10/2019
Project Name:	Chatswood Education Precinct	Completed:	11/10/2019
Hole Location:	Chatswood Primary School	Logged By:	MB
Hole Position:	331216.0 m E 6258692.0 m N	Checked By:	YB

Drill Model and Mounting:	Christie Rig - Track Mounted	Inclination:	-90°	RL Surface:	97.00 m		
Barrel Type and Length:	3.2 m - NMLC	Bearing:		Datum:	AHD	Operator:	BG Drilling



Depth (m)	RL (m)	Samples and Field Tests	Material Description
		Is(50) d=0.1 a=0.3 MPa	LAMINITE: dark grey with pale grey banding, 80% siltstone, 20% fine grained sandstone, well developed bedding fabric, with dinstinct thinly laminated bedding.*(continued)*
6	91.0	Is(50) d=0.5 a=0.4 MPa	Bedding fabric becomes very well developed.
7	90.0	Is(50) d=0.4 a=0.7 MPa	
			Becomes 70% siltstone and 30% sandstone.
8	89.0	Is(50) d=0.3 a=2 MPa	
			Hole Terminated at 8.23 m
9	88.0		

Material Description

ROCK NAME: particle/grain characteristics, colour, fabric/texture, inclusions or minor components, moisture, mineral composition, alteration

Defect Descriptions / Comments

Description, alpha/beta, infilling or coating, shape, roughness, thickness, other

- BP, 5°, FE SN, PR, S
- BP, 0°, FE SN, PR, S
- BP, 0°, FE SN, PR, S
- JT, 25°, S, Healed Joint
- SM, CL, S, 2 mm
- SM, CL, S, 40 mm
- SM, CL, S, 10 mm
- SM, CL, S, 100 mm
- SM, CL, S, 25 mm
- SM, CL, S, 5 mm
- BP, 0°, CL, PR, S, <1 mm
- BP, 0°, CN, PR, S

Method

AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
HQ3- Wireline core (63.5 mm)
PQ3- Wireline core (85.0 mm)
SPT- Standard penetration test
PT - Push tube

WPT - Water pressure test

Water

▷ Inflow
◁ Partial Loss
◀ Complete Loss

Graphic Log/Core Loss

▨ Core recovered (hatching indicates material)
☒ No core recovery

Weathering

XW - Extremely Weathered
HW - Highly Weathered
MW - Moderately Weathered
SW - Slightly Weathered
FR - Fresh

Strength

VL - Very Low
L - Low
M - Medium
H - High
VH - Very High
EH - Extremely High

Defect Type

FT - Fault
SS - Shear Surface
SZ - Shear Zone
BP - Bedding parting
SM - Seam
IS - Infilled Seam
JT - Joint
CO - Contact
CZ - Crushed Zone
VN - Vein
FZ - Fracture Zone
BSH - Bedding Shear
DB - Drilling Break

Infilling/Coating

CN - Clean
SN - Stain
VN - Veneer
CO - Coating
RF - Rock fragments
G - Gravel
S - Sand
Z - Silt
CA - Calcite
CL - Clay
FE - Iron
QZ - Quartz
X - Carbonaceous

Roughness

SL - Slickensided
POL - Polished
S - Smooth
RF - Rough
VR - Very Rough

Shape

PR - Planar
CU - Curved
UN - Undulating
ST - Stepped
IR - Irregular

Logged in accordance with AS 1726:2017 Geotechnical site investigations

JOB No.: PSM 3730

BH ID: BH 36

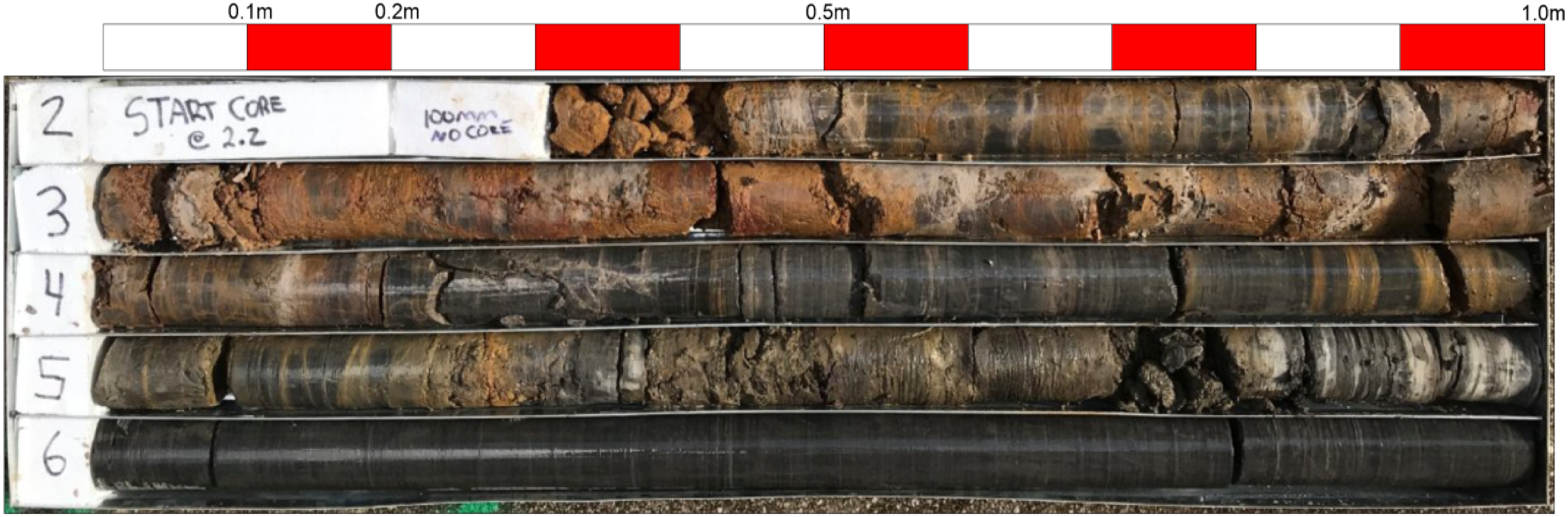
PROJECT: Chatswood Education Precinct

LOCATION: Chatswood Primary

FROM: 2.2m

TO: 7.0 m

DATE: 11/10/19



SCHOOL INFRASTRUCTURE NSW

Chatswood Education Precinct

Chatswood Primary School

CORE PHOTOS BH36

(SHEET 1 OF 2)

PSM3730-006R	**Figure 1**

Pells Sullivan Meynink

JOB No.: PSM 3730

BH ID: BH 36

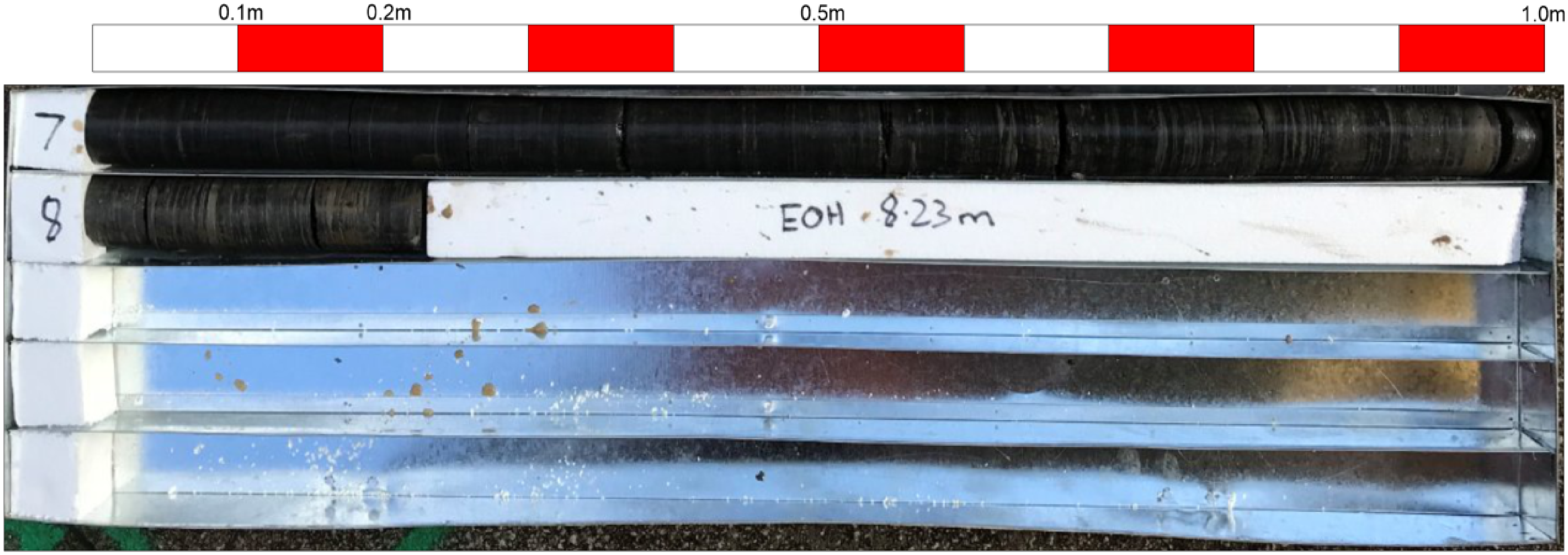
PROJECT: Chatswood Education Precinct

LOCATION: Chatswood Primary

FROM: 7.0 m

TO: 8.23 m

DATE: 11/10/19



SCHOOL INFRASTRUCTURE NSW

Chatswood Education Precinct

Chatswood Primary School

CORE PHOTOS BH36

(SHEET 2 OF 2)

PSM3730-006R	**Figure 1**

Pells Sullivan Meynink

Borehole ID (Estimated Surface RL)	Approximate Depth	Material Encountered	Notes
BH37 (RL 99.0 m)	0 – 0.09 m	ASPHALT; 90 mm thick.	
	0.09 – 0.5 m	CLAY with gravel; high plasticity, grey and dark brown, sub-angular gravel, up to 20 mm, moist and stiff consistency.	Inferred FILL CBR sample collected at 0.02 – 1.5 m.
	0.5 – 2.3 m	CLAY; high plasticity, orange-brown and grey, moist, stiff consistency, some weathered siltstone fragments observed.	Inferred Residual Soil SPT at 0.5 m: 4, 5, 6, N = 11 SPT at 1.5 m 4, 7, 8, N = 15
	2.3 – 4.0 m	SILTSTONE; grey and red-brown, extremely to highly weathered, very low strength.	Inferred Bedrock Rock description based on drill cuttings.
	4.0 m	Hole terminated at 4.0 m.	

Borehole ID (Estimated Surface RL)	Approximate Depth	Material Encountered	Notes
BH38 (RL 98.5 m)	0 – 0.18 m	CONCRETE; 180 mm thick.	
	0.18 – 0.7 m	Sandy CLAY with gravel; medium plasticity, pale brown, coarse grained sand, sub-angular gravel, up to 10 mm, moist and very loose consistency.	Inferred FILL SPT at 0.5 m: 1, 0, 2, N = 2
	0.7 – 1.6 m	CLAY with sand and trace gravel; high plasticity, dark brown and grey, medium to coarse grained sand, sub-angular gravel, up to 10 mm, moist and stiff consistency.	Inferred FILL SPT at 1.5 m 3, 5, 6, N = 11
	1.6 – 2.3 m	CLAY; high plasticity, orange-brown and grey, moist, stiff consistency, roots present, weathered siltstone fragments observed.	Inferred Residual Soil
	2.3 – 4.0 m	SILTSTONE; red-brown and grey, highly to extremely weathered, very low strength.	Inferred Bedrock Rock description based on drill cuttings.
	4.0 m	Hole terminated at 4.0 m.	

Borehole ID (Estimated Surface RL)	Approximate Depth	Material Encountered	Notes
BH39 (RL 97.0 m)	0 – 0.02 m	ASPHALT; 20 mm thick.	
	0.02 – 1.6 m	Sandy gravelly CLAY; low plasticity, dark brown and grey, coarse grained sand, angular gravel, up to 20 mm, moist and stiff consistency. Some shale fill cobbles, up to 90 mm, observed at 1.0 m.	Inferred FILL CBR sample collected at 0.5 – 1.5 m. SPT at 0.5 m 5, 4, 6, N = 10. SPT at 1.5 m 7, 12, Refusal.
	1.6 – 4.0 m	SILSTONE; orange-brown and grey, highly to extremely weathered, very low strength.	Inferred Bedrock Rock description based on drill cuttings.
	4.0 m	Hole terminated at 4.0 m.	

Appendix B
Point Load Test Results

Pells Sullivan Meynink

POINT LOAD STRENGTH INDEX TEST RESULTS

Job No. *PSM3730-006R* **Sheet** 1 **of** 2

Project *Chatswood Education Precinct*

Test Method: *AS 4133.4.1 - 1993 Methods of Testing Rocks for Engineering Purposes, Determination of Point Load Strength Index*

Test Machine: *GSA 6500*

Calibration Date: *3/12/2012*

Sampling Technique: *NLMC*

Storage History: *North Ryde office indoor core storage area*

Moisture Condition: *Natural*

Loading Rate: *< 30 seconds*

Sampling Date: *23/01 to 12/10*

Testing Date: *23/01 to 12/10*

Tested By: *MB*

Rock Type	Location	Depth	Diametral Tests					Axial, Block, and Irregular Lump Tests							AS 1726 Strength Class
		(m)	D (mm)	L (mm)	P (kN)	$I_{s(50)}$ (MPa)	Failure Mode	W (mm)	D (mm)	L (mm)	P (kN)	I_s (MPa)	$I_{s(50)}$ (MPa)	Failure Mode	
Laminite	BH06	6.00	50	81	0.1	0.1	Parallel to bedding	50	43		1.5	0.5	0.5	Through substance	VL / M
Laminite	BH06	6.90	50	69	1.5	0.6	Parallel to bedding	50	36		3	1.3	1.3	Through substance	M / H
Laminite	BH06	7.79	50	90	0.2	0.1	Parallel to bedding	50	41		3.3	1.3	1.3	Through substance	VL / H
Laminite	BH07	7.56	50	56	1.9	0.7	Parallel to bedding	50	29		0.1	0.1	0.1	Through substance	VL / M
Laminite	BH07	8.39	50	99	3	1.2	Parallel to bedding	50	46		2.4	0.8	0.9	Through substance	M / H
Laminite	BH07	9.34	50	56	1.2	0.5	Parallel to bedding	50	28		2.2	1.2	1.2	Through substance	M / H
Siltstone	BH18	6.28	50	90	0.1	0	Parallel to bedding	50	42		0.5	0.2	0.2	Through substance	VL / L
Siltstone	BH18	7.21	50	92	0	0	Parallel to bedding	50	39		0.3	0.1	0.1	Through substance	VL / L
Siltstone	BH18	8.38	50	72	0.5	0.2	Parallel to bedding	50	38		1.3	0.6	0.5	Through substance	L / M
Siltstone	BH18	9.30	50	83	1.1	0.4	Parallel to bedding	50	33		0.8	0.4	0.4	Through substance	M
Siltstone	BH19	3.13	50	66	0.6	0.2	Parallel to bedding	50	28		0.7	0.4	0.3	Through substance	L / M
Siltstone	BH19	4.58	50	89	0	0	Parallel to bedding	50	42		0.6	0.2	0.2	Through substance	VL / L
Siltstone	BH19	5.23	50	67	0.1	0	Parallel to bedding	50	31		0.3	0.1	0.1	Through substance	VL / L
Siltstone	BH19	6.67	50	90	0.8	0.3	Parallel to bedding	50	26		0.8	0.5	0.4	Through substance	M
Siltstone	BH19	7.55	50	80	0.8	0.3	Parallel to bedding	50	32		0.4	0.2	0.2	Through substance	L / M
Laminite	BH26	2.41	50	60	0.2	0.1	Along defect	50	30		1.5	0.8	0.7	Through substance	VL / M
Laminite	BH26	3.32	50	60	0.6	0.3	Along defect	50	25		0.8	0.5	0.4	Through substance	L / M
Laminite	BH26	4.43	50	68	0.2	0.1	Along defect	50	34		0.9	0.4	0.4	Through substance	VL / M
Laminite	BH26	5.35	50	55	0.3	0.1	Along defect	50	32		1.3	0.6	0.6	Through substance	L / M
Laminite	BH26	6.35	50	80	0.2	0.1	Along defect	50	45		0.9	0.3	0.3	Through substance	VL / M
Siltstone	BH26	7.12	50	84	0.2	0.1	Along defect	50	19		0.7	0.6	0.5	Through substance	VL / M
Siltstone	BH26	8.09	50	57	2.4	1	Along defect	50	37		1.1	0.5	0.4	Through substance	M
Siltstone	BH28	3.90	50	57	0.1	0.1	Along defect	50	35		0.2	0.1	0.1	Through substance	VL
Siltstone	BH28	4.78	50	75	1.6	0.7	Parallel to bedding	50	33		2.5	1.2	1.1	Through substance	M / H
Siltstone	BH28	5.36	50	51	0.1	0	Along defect	50	27		0.1	0.1	0.1	Through substance	VL

By: *MB* **Checked:** *BS* **Date:** *12/10/2019*

POINT LOAD STRENGTH INDEX TEST RESULTS

Job No. *PSM3730-006R* **Sheet** 2 of 2

Project *Chatswood Education Precinct*

Test Method	*AS 4133.4.1 - 1993 Methods of Testing Rocks for Engineering Purposes, Determination of Point Load Strength Index*	Sampling Technique	*NLMC*	Sampling Date	*23/01 to 12/10*
		Storage History	*North Ryde office indoor core storage area*	Testing Date	*23/01 to 12/10*
Test Machine	*GSA 6500*	Moisture Condition	*Natural*	Tested By	*MB*
Calibration Date	*3/12/2012*	Loading Rate	*< 30 seconds*		

Rock Type	Location	Depth	Diametral Tests					Axial, Block, and Irregular Lump Tests							AS 1726 Strength Class
		(m)	D (mm)	L (mm)	P (kN)	$I_{s(50)}$ (MPa)	Failure Mode	W (mm)	D (mm)	L (mm)	P (kN)	I_s (MPa)	$I_{s(50)}$ (MPa)	Failure Mode	
Siltstone	**BH28**	**6.84**	50	50	0.8	**0.3**	*Along defect*	50	43		0.1	0	**0**	*Through substance*	**VL / L**
Siltstone	**BH28**	**7.56**	50	62	0.1	**0.1**	*Along defect*	50	23		0.2	0.1	**0.1**	*Through substance*	**VL / L**
Siltstone	**BH28**	**8.80**	50	53	0	**0**	*Along defect*	50	37		0.1	0.1	**0.1**	*Through substance*	**VL**
Laminite	**BH28**	**9.45**	50	79	0.6	**0.3**	*Along defect*	50	35		0.7	0.3	**0.3**	*Through substance*	**L**
Laminite	**BH28**	**10.00**	50	100	2.1	**0.9**	*Along defect*	50	32		1.1	0.6	**0.5**	*Through substance*	**M**
Laminite	**BH28**	**11.22**	50	57	4.4	**1.8**	*Parallel to bedding*	50	41		6.9	2.6	**2.7**	*Through substance*	**H**
Siltstone	**BH33**	**3.56**	50	93	0.2	**0.1**	*Parallel to bedding*	50	37		0.1	0	**0**	*Through substance*	**VL**
Laminite	**BH33**	**4.55**	50	93	0.3	**0.1**	*Parallel to bedding*	50	28		2.5	1.4	**1.3**	*Through substance*	**L / H**
Laminite	**BH33**	**5.55**	50	65	0.4	**0.2**	*Parallel to bedding*	50	37		1.8	0.8	**0.8**	*Through substance*	**L / M**
Laminite	**BH33**	**6.48**	50	81	0.7	**0.3**	*Parallel to bedding*	50	36		4.9	2.1	**2.1**	*Through substance*	**L / H**
Laminite	**BH33**	**7.42**	50	70	1.4	**0.6**	*Parallel to bedding*	50	30		5.4	2.8	**2.7**	*Through substance*	**M / H**
Laminite	**BH33**	**8.00**	50	80	1.8	**0.7**	*Parallel to bedding*	50	39		4.2	1.7	**1.7**	*Through substance*	**M / H**
Siltstone	**BH36**	**2.40**	50	90	0	**0**	*Parallel to bedding*	50	35		0.2	0.1	**0.1**	*Through substance*	**VL**
Siltstone	**BH36**	**3.43**	50	80	0.2	**0.1**	*Parallel to bedding*	50	30		0.2	0.1	**0.1**	*Through substance*	**VL**
Laminite	**BH36**	**4.61**	50	59	0.4	**0.2**	*Parallel to bedding*	50	27		0.3	0.2	**0.1**	*Through substance*	**L**
Laminite	**BH36**	**5.00**	50	70	0.3	**0.1**	*Parallel to bedding*	50	17		0.4	0.3	**0.3**	*Through substance*	**L**
Laminite	**BH36**	**6.01**	50	70	1.2	**0.5**	*Parallel to bedding*	50	30		0.8	0.4	**0.4**	*Through substance*	**M**
Laminite	**BH36**	**7.00**	50	62	1	**0.4**	*Parallel to bedding*	50	29		1.3	0.7	**0.7**	*Through substance*	**M**
Laminite	**BH36**	**8.05**	50	53	0.8	**0.3**	*Parallel to bedding*	50	26		3.6	2.2	**2**	*Through substance*	**M / H**

By: *MB* **Checked:** *BS* **Date:** *12/10/2019*

Appendix C
CBR testing results

115 Wicks Road
Macquarie Park, NSW 2113
PO Box 976
North Ryde, Bc 1670
Telephone: 02 9888 5000
Facsimile: 02 9888 5001
Email: dtreweek@jkgroup.net.au

STS
SOIL TEST SERVICES
ABN 43 002 145 173

FOUR DAY SOAKED CALIFORNIA BEARING RATIO TEST REPORT

Client: Pells Sullivan Meynink
PSM Job No.: PSM3730

Ref No: L4246E
Report: 1
Report Date: 6/02/2019
Page 1 of 1

BOREHOLE NUMBER	BH 2	BH Middle	BH 5	BH 7	BH 10
DEPTH (m)	0.10 - 0.30	0.10 - 0.20	0.10 - 0.20	0.10 - 0.20	0.10 - 0.20
Surcharge (kg)	4.5	4.5	4.5	4.5	4.5
Maximum Dry Density (t/m^3)	1.83 STD	1.73 STD	1.65 STD	1.59 STD	2.05 STD
Optimum Moisture Content (%)	13.4	15.6	17.5	18.0	19.4
Moulded Dry Density (t/m^3)	1.79	1.69	1.62	1.57	2.00
Sample Density Ratio (%)	98	98	98	99	98
Sample Moisture Ratio (%)	103	98	100	91	96
Moisture Contents					
Insitu (%)	10.7	9.9	11.4	8.4	8.3
Moulded (%)	13.9	15.2	17.4	16.4	18.7
After soaking and After Test, Top 30mm(%)	19.6	21.7	24.9	23.9	21.9
Remaining Depth (%)	16.3	17.0	20.2	20.1	19.5
Material Retained on 19mm Sieve (%)	10*	1*	2*	1*	1*
Swell (%)	0.5	1.0	0.5	0.0	0.5
C.B.R. value: @2.5mm penetration	9	4.5			
@5.0mm penetration			6	7	5

NOTES: Sampled and supplied by client.
- Refer to appropriate Borehole logs for soil descriptions
- Test Methods : AS 1289 6.1.1, 5.1.1 & 2.1.1.
- Date of receipt of sample: 25/01/2019.
- * Denotes not used in test sample.

NATA Accredited Laboratory
Number:1327

Accredited for compliance with ISO/IEC 17025 - Testing.
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Approved Signatory / Date
(D. Treweek)
6/2/19

115 Wicks Road
Macquarie Park, NSW 2113
PO Box 976
North Ryde, Bc 1670
Telephone: 02 9888 5000
Facsimile: 02 9888 5001

SOIL TEST SERVICES
ABN 43 002 145 173

FOUR DAY SOAKED CALIFORNIA BEARING RATIO TEST REPORT

Client: Pells Sullivan Meynink
PSM Job No.: PSM3730

Ref No: L4251E
Report: 1
Report Date: 27/02/2019
Page 1 of 1

BOREHOLE NUMBER	BH 18	BH 19	BH 21
DEPTH (m)	0.20 - 1.50	0.20 - 1.50	0.20 - 1.50
Surcharge (kg)	4.5	4.5	4.5
Maximum Dry Density (t/m^3)	1.74 STD	1.79 STD	1.69 STD
Optimum Moisture Content (%)	12.9	12.9	20.0
Moulded Dry Density (t/m^3)	1.72	1.76	1.65
Sample Density Ratio (%)	99	98	98
Sample Moisture Ratio (%)	104	104	103
Moisture Contents			
Insitu (%)	10.8	12.4	17.4
Moulded (%)	13.4	13.4	20.5
After soaking and After Test, Top 30mm(%)	23.7	22.5	24.7
Remaining Depth (%)	20.6	19.4	21.4
Material Retained on 19mm Sieve (%)	0	0	0
Swell (%)	3.0	1.5	1.5
C.B.R. value: @2.5mm penetration	2.5	2.0	4.0

NOTES:

- Refer to appropriate Borehole logs for soil descriptions
- Test Methods : AS 1289 6.1.1, 5.1.1 & 2.1.1.
- Date of receipt of sample: 18/02/2019.
- Sampled and supplied by client.

NATA
NATA Accredited Laboratory
Number:1327

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Authorised Signature / Date
(D. Treweek)
27/2/19

115 Wicks Road
Macquarie Park, NSW 2113
PO Box 976
North Ryde, Bc 1670
Telephone: 02 9888 5000
Facsimile: 02 9888 5001
Email: dtreweek@jkgroup.net.au

SOIL TEST SERVICES
ABN 43 002 145 173

FOUR DAY SOAKED CALIFORNIA BEARING RATIO TEST REPORT

Client: Pells Sullivan Meynink
PSM Job No.: PSM3730

Ref No: L4356E
Report: 1
Report Date: 23/10/2019
Page 1 of 1

		BH 29	BH 30	BH 37	BH 39
BOREHOLE NUMBER		BH 29	BH 30	BH 37	BH 39
DEPTH (m)		0.095 - 1.00	0.02 - 1.00	0.50 - 1.50	0.50 - 1.50
Surcharge (kg)		4.5	4.5	4.5	4.5
Maximum Dry Density (t/m^3)		1.76 STD	1.73 STD	1.52 STD	1.62 STD
Optimum Moisture Content (%)		16.5	16.3	23.4	21.8
Moulded Dry Density (t/m^3)		1.73	1.69	1.49	1.59
Sample Density Ratio (%)		98	98	98	98
Sample Moisture Ratio (%)		97	101	98	99
Moisture Contents					
Insitu (%)		20.1	20.7	27.0	24.8
Moulded (%)		16.0	16.5	23.0	21.6
After soaking and After Test, Top 30mm(%)		24.0	23.8	30.9	26.3
	Remaining Depth (%)	21.0	20.8	27.9	24.0
Material Retained on 19mm Sieve (%)		0	0	0	1*
Swell (%)		3.0	1.5	0.5	0.5
C.B.R. value:	@2.5mm penetration	1.5	2.0	2.0	
	@5.0mm penetration				4.0

NOTES: Sampled and supplied by client. Samples tested as received.
- Refer to appropriate Borehole logs for soil descriptions
- Test Methods : AS 1289 6.1.1, 5.1.1 & 2.1.1.
- Date of receipt of sample: 14/10/2019.
- * Denotes not used in test sample.

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In full without approval of the laboratory. Results relate only to the items tested or sampled.

NATA
NATA Accredited Laboratory
Number:1327

All services provided by STS are subject to our standard terms and conditions. A copy is available on request.

Approved Signatory / Date
(D. Treweek)
23/10/19

Appendix D
Atterberg Limit Test Results

GROUND TECHNOLOGIES
Geotechnical . Environmental . Laboratories

Ground Technologies Pty Ltd
ABN 25 089 213 294
19 Bernera Road, Prestons NSW 2170
PO Box 1121 Green Valley NSW 2168

Test Results - Atterberg Limits

Client:	**PSM**	Job No.:	**GT3023**
Project:	**Material Testing**	Report No.:	**GTR3023-L3**
Location:	**Chatswood**	Test Date:	**05-Feb-19**
Contact:	**Yun Bai**	Client Ref No:	**PSM3730**

Sample Location		**BH02 (1.5m)**	**BH04 (1.0m)**	**BH05 (1.0m)**	**BH07 (1.7m)**
Sample Number		**L2**	**L3**	**L4**	**L5**
Test Procedure		AS1289 3.1.2,3.2.1,3.3.1,3.4.1, 2.1.1			
ATTERBERG LIMITS					
Liquid Limit	%	**35**	**31**	**44**	**37**
Plastic Limit	%	**19**	**17**	**21**	**19**
Plasticity Index	%	**16**	**14**	**23**	**18**
Linear Shrinkage	%	**ND**	**ND**	**ND**	**ND**
Curling/ Crumbling/ Cracking		**None**	**None**	**None**	**None**
Sample History		Low Temperature Oven Dried, Dry Sieved	Low Temperature Oven Dried, Dry Sieved	Low Temperature Oven Dried, Dry Sieved	Low Temperature Oven Dried, Dry Sieved
Sample Description		**Brown Silty Clay**	**Grey Brown Sandy Gravelly Clay**	**Light Brown Gravelly Clay (Shale)**	**Light Brown Silty Clay**

Comments: Sampling Method: Sample supplied by Client
Date Sampled: Sample supplied by Client

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ACCREDITED FOR TECHNICAL COMPETENCE

NATA Accredited Laboratory No. 14343
Accredited for compliance with ISO/IEC 17025-Testing
The results of the tests, calibrations and/or measurements in this document are traceable to Australian/National Standards

Mahamood Firoz

Approved Signatory

Date of issue 6/02/2019

GROUND TECHNOLOGIES

Geotechnical . Environmental . Laboratories

Ground Technologies Pty Ltd
ABN 25 089 213 294
19 Bernera Road, Prestons NSW 2170
PO Box 1121 Green Valley NSW 2168

Test Results - Atterberg Limits

Client:	**PSM**	Job No.:	**GT3023**
Project:	**Material Testing**	Report No.:	**GTR3023-L4**
Location:	**Chatswood**	Test Date:	**05-Feb-19**
Contact:	**Yun Bai**	Client Ref No:	**PSM3730**

Sample Location		**BH8 (1.5m)**	**BH09 (1.0m)**	**BH11 (0.2 - 0.5m)**	**BH12 (1.0m)**
Sample Number		**L6**	**L7**	**L8**	**L9**
Test Procedure		AS1289 3.1.2,3.2.1,3.3.1,3.4.1, 2.1.1			
ATTERBERG LIMITS					
Liquid Limit	%	**56**	**55**	**52**	**41**
Plastic Limit	%	**26**	**23**	**22**	**20**
Plasticity Index	%	**30**	**32**	**30**	**21**
Linear Shrinkage	%	**ND**	**ND**	**ND**	**ND**
Curling/ Crumbling/ Cracking		**None**	**None**	**None**	**None**
Sample History		Low Temperature Oven Dried, Dry Sieved	Low Temperature Oven Dried, Dry Sieved	Low Temperature Oven Dried, Dry Sieved	Low Temperature Oven Dried, Dry Sieved
Sample Description		**Brown Silty Clay**	**Brown Silty Clay**	**Grey Brown Silty Clay**	**Grey Brown Gravelly Clay (Shale)**

Comments: Sampling Method: Sample supplied by Client
Date Sampled: Sample supplied by Client

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NATA Accredited Laboratory No. 14343
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Mahamood Firoz

Approved Signatory

Date of issue 6/02/2019

GROUND TECHNOLOGIES
Geotechnical . Environmental . Laboratories

Ground Technologies Pty Ltd
ABN 25 089 213 294
19 Bernera Road, Prestons NSW 2170
PO Box 1121 Green Valley NSW 2168

Test Results - Atterberg Limits

Client:	**PSM**	Job No.:	**GT3023**
Project:	**Material Testing**	Report No.:	**GTR3023-L5**
Location:	**Chatswood**	Test Date:	**05-Feb-19**
Contact:	**Yun Bai**	Client Ref No:	**PSM3730**

Sample Location		**BH14 (2.1m)**	**BH16 (1.0m)**
Sample Number		**L10**	**L11**
Test Procedure		AS1289 3.1.2,3.2.1,3.3.1,3.4.1, 2.1.1	
ATTERBERG LIMITS			
Liquid Limit	%	**33**	**48**
Plastic Limit	%	**19**	**22**
Plasticity Index	%	**14**	**26**
Linear Shrinkage	%	**ND**	**ND**
Curling/ Crumbling/ Cracking		**None**	**None**
Sample History		Low Temperature Oven Dried, Dry Sieved	Low Temperature Oven Dried, Dry Sieved
Sample Description		**Grey Gravelly Silty Clay**	**Orange Brown Silty Clay**

Comments: Sampling Method: Sample supplied by Client
Date Sampled: Sample supplied by Client

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Mahamood Firoz

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Date of issue 6/02/2019

GROUND TECHNOLOGIES
Geotechnical . Environmental . Laboratories

Ground Technologies Pty Ltd
ABN 25 089 213 294
19 Bernera Road, Prestons NSW 2170
PO Box 1121 Green Valley NSW 2168
Ph: (02) 8783 8200
Email: lab@groundtech.com.au

Test Results - Atterberg Limits

Client:	**PSM**	Job No.:	**GT3023**
Project:	**Material Testing**	Report No.:	**GTR3023-L7**
Location:	**Chatswood**	Test Date:	**22-Feb-19**
Contact:	**Matias Braga**	Client Ref No:	**PSM3730**

Sample Location		**BH18 (1.5m)**	**BH19 (0.5m)**	**BH20 (0.5m)**	**BH22 (0.5 to 1.0m)**
Sample Number		**L15**	**L16**	**L17**	**L18**
Test Procedure		AS1289 3.1.2,3.2.1,3.3.1,3.4.1, 2.1.1			
ATTERBERG LIMITS					
Liquid Limit	%	**46**	**42**	**41**	**43**
Plastic Limit	%	**20**	**20**	**20**	**21**
Plasticity Index	%	**26**	**22**	**21**	**22**
Linear Shrinkage	%	**ND**	**ND**	**ND**	**ND**
Curling/ Crumbling/ Cracking		**None**	**None**	**None**	**None**
Sample History		Low Temperature Oven Dried, Dry Sieved	Low Temperature Oven Dried, Dry Sieved	Low Temperature Oven Dried, Dry Sieved	Low Temperature Oven Dried, Dry Sieved
Sample Description		**Brown Clay**	**Brown Clay**	**Brown Clay**	**Grey Brown Clay**

Comments: Sampling Method: Sample supplied by Client
Date Sampled: Sample supplied by Client

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Mahamood Firoz

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Date of issue 26/02/2019

Ground Technologies Pty Ltd
ABN 25 089 213 294
19 Bernera Road, Prestons NSW 2170
PO Box 1121 Green Valley NSW 2168
Ph: (02) 8783 8200
Email: lab@groundtech.com.au

Test Results - Atterberg Limits

Client:	**PSM**	Job No.:	**GT3023**
Project:	**Material Testing**	Report No.:	**GTR3023-L8**
Location:	**Chatswood**	Test Date:	**22-Feb-19**
Contact:	**Matias Braga**	Client Ref No:	**PSM3730**

Sample Location		**BH23 (0.5 to 1.0m)**
Sample Number		**L19**
Test Procedure		AS1289 3.1.2,3.2.1,3.3.1,3.4.1, 2.1.1
ATTERBERG LIMITS		
Liquid Limit	%	**66**
Plastic Limit	%	**23**
Plasticity Index	%	**43**
Linear Shrinkage	%	**ND**
Curling/ Crumbling/ Cracking		**None**
Sample History		Low Temperature Oven Dried, Dry Sieved
Sample Description		**Brown Clay**

Comments: Sampling Method: Sample supplied by Client
Date Sampled: Sample supplied by Client

NATA
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NATA Accredited Laboratory No. 14343
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Mahamood Firoz

Approved Signatory

Date of issue 26/02/2019

Appendix E
Environmental testing results

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order : **ES1902686**
Client : **PELLS SULLIVAN MEYNINK T/A PSM Admin PTY LTD**
Contact : YUN BAI
Address : G3, 56 DELHI ROAD
NORTH RYDE NSW, AUSTRALIA 2113
Telephone : +61 02 9812 5000
Project : Chatswood High
Order number : PSM3730
C-O-C number : ----
Sampler : Matias Braga
Site : ----
Quote number : EN/333
No. of samples received : 10
No. of samples analysed : 10

Page : 1 of 4
Laboratory : Environmental Division Sydney
Contact : Customer Services ES
Address : 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone : +61-2-8784 8555
Date Samples Received : 25-Jan-2019 15:47
Date Analysis Commenced : 30-Jan-2019
Issue Date : 08-Feb-2019 16:53

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics, Smithfield, NSW
Dian Dao		Sydney Inorganics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- ALS is not NATA accredited for the analysis of Exchangeable Cations on Alkaline Soils when performed under ALS Method ED006.
- ED007 and ED008: When Exchangeable Al is reported from these methods, it should be noted that Rayment & Lyons (2011) suggests Exchange Acidity by 1M KCl - Method 15G1 (ED005) is a more suitable method for the determination of exchange acidity (H+ + Al3+).

Analytical Results

Sub-Matrix: **SOIL**
(Matrix: **SOIL**)

			Client sample ID	**BH01 - 2.0m**	**BH03 - 2.0m**	**BH05 - 0.2m**	**BH07 - 2.5m**	**BH08 - 2.5m**
			Client sampling date / time	23-Jan-2019 08:07	23-Jan-2019 09:46	23-Jan-2019 13:25	23-Jan-2019 07:45	23-Jan-2019 11:03
Compound	*CAS Number*	*LOR*	*Unit*	**ES1902686-001**	**ES1902686-002**	**ES1902686-003**	**ES1902686-004**	**ES1902686-005**
				Result	Result	Result	Result	Result
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	**4.8**	**7.8**	**4.7**	**5.1**	**5.8**
EA010: Conductivity (1:5)								
Electrical Conductivity @ 25°C	----	1	µS/cm	**92**	**180**	**75**	**48**	**19**
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	**7.2**	**11.6**	**16.7**	**7.3**	**6.0**
ED006: Exchangeable Cations on Alkaline Soils								
Exchangeable Calcium	----	0.2	meq/100g	----	**12.8**	----	----	----
Exchangeable Magnesium	----	0.2	meq/100g	----	**1.9**	----	----	----
Exchangeable Potassium	----	0.2	meq/100g	----	**0.3**	----	----	----
Exchangeable Sodium	----	0.2	meq/100g	----	**0.5**	----	----	----
Cation Exchange Capacity	----	0.2	meq/100g	----	**15.5**	----	----	----
Exchangeable Sodium Percent	----	0.2	%	----	**3.2**	----	----	----
ED007: Exchangeable Cations								
Exchangeable Calcium	----	0.1	meq/100g	**1.3**	----	**1.9**	**1.0**	<0.1
Exchangeable Magnesium	----	0.1	meq/100g	**1.2**	----	**0.8**	**1.0**	**0.9**
Exchangeable Potassium	----	0.1	meq/100g	**0.3**	----	**0.2**	**0.3**	**0.3**
Exchangeable Sodium	----	0.1	meq/100g	**0.4**	----	**0.2**	**0.2**	**0.2**
Cation Exchange Capacity	----	0.1	meq/100g	**3.2**	----	**3.5**	**2.5**	**1.5**
Exchangeable Sodium Percent	----	0.1	%	**11.4**	----	**7.9**	**6.8**	**14.8**
ED040S : Soluble Sulfate by ICPAES								
Sulfate as SO4 2-	14808-79-8	10	mg/kg	**70**	**200**	**100**	**60**	**20**
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	10	mg/kg	**70**	**10**	**40**	**10**	<10

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			Client sample ID	**BH12 - 0.3-0.4m**	**BH09 - 0.5m**	**BH11 - 6.0m**	**BH14 - 0.5-1.0m**	**BH16 - 2.5m**
			Client sampling date / time	23-Jan-2019 15:18	23-Jan-2019 12:26	23-Jan-2019 13:30	23-Jan-2019 08:30	23-Jan-2019 11:30
Compound	CAS Number	LOR	Unit	**ES1902686-006**	**ES1902686-007**	**ES1902686-008**	**ES1902686-009**	**ES1902686-010**
				Result	Result	Result	Result	Result
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	**4.9**	**6.7**	**6.0**	**4.9**	**4.9**
EA010: Conductivity (1:5)								
Electrical Conductivity @ 25°C	----	1	µS/cm	**83**	**208**	**51**	**119**	**106**
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	**13.5**	**23.6**	**32.6**	**24.5**	**5.8**
ED007: Exchangeable Cations								
Exchangeable Calcium	----	0.1	meq/100g	**2.5**	**9.8**	<0.1	**1.3**	<0.1
Exchangeable Magnesium	----	0.1	meq/100g	**1.8**	**2.2**	**1.8**	**1.1**	**0.6**
Exchangeable Potassium	----	0.1	meq/100g	**0.3**	**0.3**	**0.4**	**1.0**	**0.2**
Exchangeable Sodium	----	0.1	meq/100g	**0.4**	**0.3**	**0.8**	**0.3**	**0.6**
Cation Exchange Capacity	----	0.1	meq/100g	**5.0**	**12.5**	**3.1**	**3.8**	**1.5**
Exchangeable Sodium Percent	----	0.1	%	**7.9**	**2.3**	**26.4**	**9.3**	**41.8**
ED040S : Soluble Sulfate by ICPAES								
Sulfate as SO4 2-	14808-79-8	10	mg/kg	**110**	**340**	**70**	**100**	**100**
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	10	mg/kg	**60**	**20**	**40**	**110**	**90**

CERTIFICATE OF ANALYSIS

Work Order : **ES1905009**
Client : **PELLS SULLIVAN MEYNINK T/A PSM Admin PTY LTD**
Contact : YUN BAI
Address : G3, 56 DELHI ROAD
NORTH RYDE NSW, AUSTRALIA 2113
Telephone : +61 02 9812 5000
Project : Chatswood Primary School
Order number :
C-O-C number : ----
Sampler : MATIAS BRAGA
Site : ----
Quote number : EN/333
No. of samples received : 5
No. of samples analysed : 5

Page : 1 of 2
Laboratory : Environmental Division Sydney
Contact : Customer Services ES
Address : 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone : +61-2-8784 8555
Date Samples Received : 18-Feb-2019 15:20
Date Analysis Commenced : 18-Feb-2019
Issue Date : 21-Feb-2019 12:23

NATA
Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

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- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Dian Dao		Sydney Inorganics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

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Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

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Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- ED007 and ED008: When Exchangeable Al is reported from these methods, it should be noted that Rayment & Lyons (2011) suggests Exchange Acidity by 1M KCl - Method 15G1 (ED005) is a more suitable method for the determination of exchange acidity (H+ + Al3+).

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Client sample ID*	**BH18 - 1.0m**	**BH19 - 2.6m**	**BH20 - 7.0m**	**BH21 - 0.5m**	**BH22 - 1.5m**
			Client sampling date / time	16-Feb-2019 07:40	16-Feb-2019 12:30	17-Feb-2019 08:30	17-Feb-2019 08:40	17-Feb-2019 10:09
Compound	*CAS Number*	*LOR*	*Unit*	**ES1905009-001**	**ES1905009-002**	**ES1905009-003**	**ES1905009-004**	**ES1905009-005**
				Result	Result	Result	Result	Result
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	**5.3**	**5.6**	**6.3**	**5.5**	**5.0**
EA010: Conductivity (1:5)								
Electrical Conductivity @ 25°C	----	1	µS/cm	**90**	**17**	**25**	**47**	**58**
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	**18.3**	**9.2**	**7.4**	**17.0**	**10.1**
ED007: Exchangeable Cations								
Exchangeable Calcium	----	0.1	meq/100g	**15.0**	<0.1	**4.4**	**0.8**	**1.6**
Exchangeable Magnesium	----	0.1	meq/100g	**1.4**	**1.3**	**4.5**	**3.1**	**2.1**
Exchangeable Potassium	----	0.1	meq/100g	**0.6**	**0.3**	**0.2**	**0.6**	**0.5**
Exchangeable Sodium	----	0.1	meq/100g	**0.5**	**0.9**	**0.7**	**1.2**	**0.3**
Cation Exchange Capacity	----	0.1	meq/100g	**17.4**	**2.6**	**9.8**	**5.7**	**4.4**
Exchangeable Sodium Percent	----	0.1	%	**2.6**	**33.7**	**6.9**	**21.6**	**6.4**
ED040S : Soluble Sulfate by ICPAES								
Sulfate as SO4 2-	14808-79-8	10	mg/kg	**140**	**20**	**20**	**70**	**50**
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	10	mg/kg	**20**	**10**	<10	**20**	<10

Appendix F
JBS&G Environmental Assessment Report

Appendix F1
Chatswood High School

Chatswood High School
Chatswood Education Precinct

Detailed Site Investigation

24 Centennial Avenue,
Chatswood NSW

1 March 2019

55579 – 120512 (Rev A)

JBS&G Australia Pty Ltd

www.jbsg.com.au

Chatswood High School
Chatswood Education Precinct

Detailed Site Investigation

24 Centennial Avenue,
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1 March 2019

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JBS&G Australia Pty Ltd

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Abbreviations

Term	Definition
ACM	Asbestos Containing Materials
AF/FA	Asbestos fines and friable asbestos
AEC	Areas of Environmental Concern
AHD	Australian Height Datum
ASRIS	Australian Soil Resource Information System
ASS	Acid Sulfate Soils
BTEXN	Benzene, Toluene, Ethylbenzene, Xylenes and Naphthalene
CLM Act	NSW Contaminated Land Management Act 1997
COC	Chain of Custody
COPC	Contaminants of Potential Concern
CSM	Conceptual Site Model
DBYD	Dial Before You Dig
DP	Deposited Plan
DQI	Data Quality Indicators
DQO	Data Quality Objectives
DSI	Detailed Site Investigation
EIL	Ecological Investigation Levels
EPA	NSW Environment Protection Authority
ESA	Environmental Site Assessment
ESLs	Ecological Screening Levels
ha	Hectare
HILs	Health Investigation Levels
HSLs	Health Screening Levels
JBS&G	JBS&G Australia Pty Ltd
JRA	Job Risk Assessment
LEP	Local Environment Plan
LOR	Limit of Reporting
NATA	National Accreditation Testing Authority
OCP	Organochlorine Pesticides
OPP	Organophosphorous Pesticides
PAH	Polycyclic Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyls
PID	Photoionisation Detector
POEO Act	NSW Protection of the Environment Operations Act 1997
PSI	Preliminary Site Investigation
QA/QC	Quality Assurance/Quality Control
RPD	Relative Percentage Difference
SAQP	Sampling Analytical and Quality Plan
SWMS	Safe Work Method Statement
TRH	Total Recoverable Hydrocarbons
UCL	Upper Confidence Limit
VOC	Volatile Organic Compounds

Executive Summary

JBS&G Australia Pty Ltd (JBS&G) was engaged by Pells Sullivan Meynink (PSM, the client), on behalf of Johnstaff, to complete a Detailed Site Investigation (DSI) for the Chatswood High School site, located at 24-58 Centennial Avenue, Chatswood, NSW (the site). The site is legally identified as Lot 1 in DP 725204, Lots 20, 21, 22, 23 in Section 6 DP2273, Lots 18, 19, 20, 21 in Section 7 DP2273, and Lots 16, 17, 18, 19, 20 in Section 8 DP2273. The site covers an area of approximately 5.9 ha. The site location and site layout are shown in **Figures 1** and **2**, respectively.

The site, along with Chatswood Public School, forms the broader Chatswood Education Precinct. The Chatswood Education Precinct forms part of the NSW Government's investment in primary and secondary education to meet the increasing demand for educational facilities. It is understood by JBS&G that the site (Chatswood High School) will be upgraded and combine kindergarten to year 6 and years 7 to 9, whilst the Chatswood Public School site will be repurposed for use as a senior campus for years 10 to 12.

In order to facilitate the further design and planning approvals for redevelopment works, Detailed Site Investigations (DSI) are required to be completed across the Chatswood Education Precinct to assess the suitability of the site for future use as an educational facility. The DSI documented herein relates to the current Chatswood High School site and is required pursuant to the Planning Secretary's Environmental Assessment Requirements (SEARs) for the State Significant Development (SSD) application number SSD 9483. Specifically, the DSI seeks to address SEARs Key Issue 13 Contamination, being, to assess and quantify any soil and groundwater contamination and demonstrate that the site is suitable for the proposed use in accordance with *State Environmental Planning Policy 55 – Remediation of Land* (SEPP 55).

The objectives of this DSI are to characterise potential contamination at the site, and to draw conclusions regarding the suitability of the land for use as a primary and secondary school, or, to make recommendations to enable such conclusions.

Data utilised for the assessment of site suitability as documented herein were collected over a five-day period from the 21st to 25th January. JBS&G undertook an intrusive investigation which advanced 30 soil boreholes across the site utilising a combination of judgemental and systematic sampling regimes consistent with EPA (1995) guidelines. Analytical results were assessed alongside those of fifteen sample locations available in a previously completed preliminary site assessment (PSI) presented by Douglas Partners (DP 2018[1]).

All locations with the exception of BH25 were observed to contain fill materials between the ground surface (or below hardstand) to a maximum depth of 2.2 m below ground surface (m bgs) (BH15) and generally comprised a dark brown gravelly silty sand with gravel inclusions. Some locations exhibited minor inclusions of concrete, brick, glass, ash and metal fragments. No hydrocarbon odours or staining were observed at any of the sample locations or during site inspections. Inspection of fill materials did not identify fragments of suspected asbestos containing materials (ACM). One fragment of asbestos containing material (ACM) was identified on the ground surface approximately 5 m west of BH13. This fragment was collected and dispatched to the laboratory for analysis. No other fragments of ACM were observed during the investigation.

The natural material underlying fill materials typically comprised a grey - brown (with brown and yellow mottling) silty clay overlying a grey weathered laminated shale.

The site's analytical data set was compared against the most conservative land use scenario, pursuant to the *National Environmental Protection Measure (NEPM)* (NEPC 2013) – residential with

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[1] Report on Preliminary Site (Contamination) Investigation with Limited Sampling: Proposed Redevelopment Chatswood Public School, High School and Public School "Bush Campus", Chatswood, Douglas Partners 2018 (DP 2018)

accessible soils, which is equally protective of human and ecological health for preschool and primary school land use scenarios.

The analytical data indicated that materials from the site were below the applicable health based criteria, with only at two locations reported in excess of the adopted site criteria - as reported in DP (2018) – BH11-0-0.1 (5.6 mg/kg) and BH13-0-0.1 (3.2 mg/kg). JBS&G note that both of these locations are in areas of the site that are covered by asphalt on the ground surface and is likely to be the source of elevated PAHs within these samples. As noted in NEPC (2013), where B(a)P exists in bitumen it is relatively immobile an does not represent a significant health risk. Furthermore, statistical analysis of the site’s data set, pursuant to NEPC (2013), indicated that the 95% upper confidence limit (UCL) of the mean was below the adopted land use criteria and therefore the reported concentration was assessed as not presenting an unacceptable risk to future users of the site.

In relation to ecological considerations, concentrations of COPCs were generally reported below the adopted ecological criteria (ESLs/EILs), with the exception of the heavy metals nickel and zinc, reported in excess of the EIL at 6 and 9 locations, respectively, petroleum hydrocarbons at three locations, and B(a)P at four locations.

A review of the encountered soils which were largely reworked natural materials and noting the site’s geological setting indicate that the reported concentrations of the heavy metals of nickel and zinc are likely attributed to the parent material of the site’s soils, likely to be shales from the Wianamatta Group that are naturally enriched in nickel and zinc.

In relation to the reported concentrations of B(a)P and TRH reported in excess of the adopted ecological screening levels, observations made during the completion of field works indicated vegetation in proximity to sampling locations that reported elevated levels of these compounds, and across the site in general, appeared to healthy, with no visual indicators of vegetative stress, indicating that soil processes responsible for ecological health did not appear to be inhibited. Furthermore, NEPC (2013) notes that high molecular weight PAHs such as B(a)P are not readily taken up by plants, and as such are unlikely to pose an unacceptable risk to plant growth.

Based on the scope of works undertaken, and in accordance with the limitations in **Section 12**, JBS&G consider that the site is suitable for the development and intended use as a primary and secondary school facility.

JBS&G recommend the formulation of an Unexpected Finds Protocol (UFP) for the site to address any unexpected finds that may be encountered during redevelopment of the site.

1. Introduction

1.1 Background

JBS&G Australia Pty Ltd (JBS&G) was engaged by Pells Sullivan Meynink (PSM, the client), on behalf of John Staff, to complete a Detailed Site Investigation (DSI) for the Chatswood High School site, located at 24-58 Centennial Avenue, Chatswood, NSW (the site). The site is legally identified as Lot 1 in DP 725204, Lots 20, 21, 22, 23 in Section 6 DP2273, Lots 18, 19, 20, 21 in Section 7 DP2273, and Lots 16, 17, 18, 19, 20 in Section 8 DP2273. The site covers an area of approximately 5.9 ha. The site location and site layout are shown in **Figures 1** and **2**, respectively.

The site, along with Chatswood Public School, forms the broader Chatswood Education Precinct. The Chatswood Education Precinct forms part of the NSW Government's investment in primary and secondary education to meet the increasing demand for educational facilities. It is understood by JBS&G that the site (Chatswood High School) will be upgraded and combine kindergarten to year 6 and years 7 to 9, whilst the Chatswood Public School site, subject of a separate DSI report, will be repurposed for use as a senior campus for years 10 to 12.

In order to facilitate the further design and planning approvals for redevelopment works, Detailed Site Investigations (DSI) are required to be completed across the Chatswood Education Precinct to assess the suitability of the site for future use as an educational facility. The report documented herein relates to the current Chatswood High School site and will assess site suitability, as required pursuant to the Planning Secretary's Environmental Assessment Requirements (SEARs) for the State Significant Development (SSD) application number SSD 9483, specifically relating to SEARs Key Issue 13 Contamination, being, to:

- Assess and quantify any soil and groundwater contamination and demonstrate that the site is suitable for the proposed use in accordance with SEPP 55.

A Preliminary Site Investigation with limited soil sampling was undertaken at the site by Douglas Partners in 2018 (DP 2018[2]), the findings of which recommend a detailed investigation to assess the suitability of the site for the proposed land uses. The DSI presented herein has been developed in accordance with guidelines made or approved by the NSW Environment Protection Authority (EPA), including the *National Environmental Protection Council* (NEPC) (2013) *National Environmental Protection (Assessment of Site Contamination) Measure* (NEPM), and relevant Australian Standards.

1.2 Objectives

The objectives of this DSI are to characterise potential contamination at the site, and to draw conclusions regarding the suitability of the site for the proposed land use, or, to make recommendations to enable such conclusions.

1.3 Scope of Works

The scope of works for the assessment included:

- A desktop review of available site history information, including:
    - Review of previously completed environmental assessment and geotechnical reports relating to the site and surrounding area, as provided by the client;
- A detailed site inspection to identify potential AECs;

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[2] Report on Preliminary Site (Contamination) Investigation with Limited Sampling: Proposed Redevelopment Chatswood Public School, High School and Public School "Bush Campus", Chatswood, Douglas Partners 2018 (DP 2018)

- Development and documentation of a conceptual site model (CSM) based on the available information;
- Development and documentation of the SAQP, with data quality objectives (DQOs) for the DSI in accordance with relevant EPA guidelines;
- Implementation of an intrusive investigation program based on the SAQP presented in this report;
- Analysis of collected soil samples at two NATA accredited laboratories: Eurofins MGT and Envirolab;
- Comparison of collected data against NSW EPA published / endorsed investigation criteria to facilitate an assessment of land use suitability; and
- Preparation of a DSI report in general accordance with relevant EPA guidelines.

2. Site Conditions and Surrounding Environment

2.1 Site Identification

The location of the site is shown in **Figure 1**, and the current layout is shown in **Figure 2**. The site details are summarised in **Table 2.1**.

Table 2.1: Site Details

Lot / DP Number	Lot 1, DP 725204 Lots 20, 21, 22, 23 Section 6, DP2273 Lots 18, 19, 20, 21 Section 7, DP2273 Lots 16, 17, 18, 19, 20 Section 8, DP2273
Street Address	24 – 58 Centennial Avenue, Chatswood
Local Government Authority	Willoughby City Council
Site Area	Approximate centre of site: 331070.397 E 6258544.008 N (GDA94-MGA56)
Current Zoning	SP2 Infrastructure (Educational Establishment) E2 Environmental Conservation (south western corner)
Geographic Coordinates	Approximately 5.1 ha
Previous Land Use	High school
Current Land Use	High school
Potential Future Use and Permissible Uses	Primary and high school

2.2 Site Description

A detailed site inspection was undertaken on 9 January 2019, and field works were completed on 21, 22, 23,24 and 25 January 2019, by two of JBS&G's trained and experienced field scientists. Site observations are discussed below, and a photographic log is included as **Appendix A**.

The site comprises a rectangular parcel of land of approximately 5.1 hectares, measuring approximately 230 m x 280 m. The site is secured at its perimeter with fencing and multiple access points to the site are provided via locked gates. Two access points are located on the eastern boundary (Oliver Road and Freeman Road), on the northern and north-western boundary of the site (Centennial Avenue), and on the southern boundary of the site via Eddy Road. Vehicular access is also provided via an entrance located south-west of the site on De Villiers Avenue which leads to a car park located in the southwestern portion of the site. The site generally slopes in a south/south westerly direction, from Centennial Avenue towards Eddy Road.

The site is generally split into two halves, with the northern half of the site containing a majority of buildings and hardstand areas of the site. The southern half of the site largely comprises recreational areas, including a synthetically turfed sports field, basketball courts, an asphalt carpark and a corridor of dense vegetation at the southern boundary of the site – Eddy Rd.

Concrete and asphalt hardstand covered all ground surfaces between the various buildings and demountables within the northern portion of the site, with purpose-built planter boxes present throughout containing soils, mulch, and plants. The site layout is shown in **Figure 2**.

2.3 Surrounding Land Use

Surrounding land-uses at the time of site inspection are described following:

- North – Centennial Avenue forms the northern boundary of the site with residential dwellings present further north;
- South – Eddy Road forms the southern boundary of the site, with residential dwellings present further south. JBS&G note that a review of aerial photography indicates that a Caltex Service Station is located approximately 400 m south east of the site – on the corner of Pacific Highway and Moriarty Road;

- East – high density residential dwellings of up to 6 storeys share the eastern boundary of the site. Further to the east exists the Pacific Highway; and
- West – The western boundary of the site was formed by Dardanelles Road, adjacent to residential dwellings. Ferndale Park and Swaines Creek are located further west.

2.4 Environmental Setting

2.4.1 Topography

A review of topographical information available on SIX Maps indicated the site's relief is approximately 20m – with the elevation of the northern boundary approximately 95 m Australian Height Datum (m AHD), and approximately 75 m AHD at the southern boundary.

The site appears to have undergone cut and fill activities based on observations made during the site inspection.

2.4.2 Geology & Soil

A review of the Soil Landscapes of the Sydney 1:100,000 Geological Series Sheet 9130 Sheet (1983[3]) indicates the site and surrounds are underlain by the Mesozoic Ashfield Shale of the Wianamatta Group, comprising dark grey to black marine-deposited shale.

Reference to the online ESPADE tool hosted by the NSW Office of Environment and Heritage (OEH 2018[4]) indicated the site is underlain by the Blacktown Soil Landscape Group. These soils comprise shallow to moderately deep (<100 cm) red and brown podzolic soils in well-drained areas, and deep (150-300 cm) yellow podzolic soils and soloths on lower slopes and poorly drained areas. Limitations of this group include moderately reactive highly plastic subsoil, low soil fertility and poor soil drainage.

DP (2018) identified fill material of various consistency and origin in boreholes advanced at the site. A large portion of filling encountered was variably compacted predominantly silty clay material with carious inclusions, which was observed to have "similar classification to the natural clay present at the site and in some instances was hard to distinguish from natural clays" (DP 2018). Natural silty clays were observed overlying shale bedrock at a majority of locations (DP 2018).

2.4.3 Acid Sulfate Soils

A review of the *Acid Sulfate Soil Risk Map for Botany Bay*[5] indicates that the site is located in an area of no-known occurrences of ASS.

Based on observations made during the intrusive investigation across the site, sediments typical of potential and actual ASS were not observed (i.e. absence of grey, organic rich, hydrogen sulphide odour etc) in the lithological profile.

The Section 10.7 Planning Certificate (presented in DP, 2018) indicates that the site does not have the likelihood of occurrence of acid sulfate soils. This is consistent with the site's topographical and geological setting.

2.4.4 Hydrology

Precipitation to fall onto buildings and paved areas will flow into engineered drainage lines and the local stormwater system. Rainfall will potentially penetrate the soft ground (e.g. garden beds, unpaved areas across the school grounds) and migrate as shallow/perched groundwater towards Swaines Creek, and/or to stormwater infrastructure. It is anticipated that surface run-off will flow to

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[3] Soil Landscapes of the Sydney 1:100,000 Sheet (9130) Edition 2 (DECCW 2009)

[4] ESAPDE, NSW Office of Environment and Heritage, http://www.environment.nsw.gov.au/eSpade2Webapp, 4 February 2018 (OEH 2018)

[5] *Acid Sulfate Soil Risk Map – Botany Bay, Edition 2, 1997.* 1:25 000 Ref: 91 30S3. NSW DLWC

engineered stormwater infrastructure and towards the nearby Swaines Creek, located approximately 450 m west of the site.

2.4.5 Hydrogeology

A search for registered groundwater borehole information was undertaken on Water NSW[6] website indicated seventeen groundwater bores within 500 m of the site (**Table 2.2**). Summary pages of groundwater bore information provided by Water NSW is presented in **Appendix B**. Fourteen of the groundwater bore summary pages provided by Water NSW did not provide information regarding standing water level (SWL) or lithological logs. As such they have not been included in this summary.

Based on the reported geology and surrounding topography it is anticipated the direction of groundwater flow is towards the west towards the Lane Cove River.

Groundwater at the site is not expected to occur within bedrock, with perched groundwater existing at interfaces of soils and underlying bedrock.

Bore ID	Depth (mbgs)	SWL (mbgs)	Distance from site (m)	Date Installed	Use	Lithology
GW029731	21.6	Unknown	480 E	01/04/1967	Recreation (Groundwater)	Clay to 6.7 m, shale to 17.98, sandstone to 21.6 m.
GW107757	162.6	25.6	490 E	29/07/2005	Recreation (Groundwater)	Fill to 1.4 m, clay to 5.1 m, shale to 5.1 m, clay to 16.7 m, sandstone to 65.7 m, shale to 66.7 m, sandstone with shale lenses to 162.6 m.
GW111773	5.5	Unknown	500 SE	16/03/2012	Monitoring	Concrete to 0.2 m, fill to 0.8 m, clay to 6 m.

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[6] *Water NSW* website accessed 16/01/2019, https://realtimedata.waternsw.com.au/

3. Site History

The site history has been documented in DP (2018). JBS&G's review of the site history have identified additional searches that are relevant and applicable to understanding the historical and environmental setting.

3.1 EPA Per- and Poly- Fluoroalkyl Substances (PFAS) Register

A search of the EPA's PFAS register indicated that there were no records pertaining to the site. A record of the search is presented in **Appendix C**.

3.2 NSW Fair Trading Loose Fill Asbestos Insulation Register

A search of the NSW Fair Trading loose fill asbestos insulation register indicated that there were no records pertaining to the site. A record of the search is presented in **Appendix D**.

3.3 Summary of Site History

Based on a review of available historical records, the site appears to have been utilised for a dwelling and estate in private ownership prior to the redevelopment of the site as Chatswood High School. The site appears to have undergone redevelopment at various stages since the 1950s and is likely to have undergone cut and fill activities during these periods, as reported in DP (2018) and confirmed by observations made during the current investigation.

Based on the historical site uses, JBS&G do not consider that there are significant risks for widespread impacts across the site. Based on the range of sources and the general consistency of the historical information, it is considered that the historical assessment has an acceptable level of accuracy with respect to the potentially contaminating activities historically occurring at the site.

4. Previous Investigations

4.1 Preliminary Site (Contamination) Investigation (DP 2018)

Douglas Partners (DP) completed a preliminary environmental site assessment (ESA; referred to as Preliminary Site Investigation (PSI) in this report) of the Chatswood High School site in addition to assessment of the nearby Chatswood Public School. The investigation entailed a desktop review of publicly available documents pertaining to the site history, and preliminary intrusive sampling associated with the geotechnical investigation.

A review of the site's history indicated that the site was part of a residential estate before being redeveloped into a high school in the 1950s.

DP (2018) identified the following AECs at the site:

- Filling – potential for filling (likely from cut and fill) activities for the purpose of levelling the site for development. Associated contaminants of potential concern (COPC) identified were TRH, BTEX, PAHs, PCBs, OCPs, OPPs, phenols and asbestos;
- Building material – potentially contaminating materials that will result from demolition of buildings previously at the site. COPCs identified were asbestos, synthetic mineral fibres (SMF), PCBs, PAHs and coal tar;
- Soils and contaminants associated with surrounding land uses such as Chatswood Toyota. Associated COPCs identified were metals, TRH, BTEX, PAHs, PCBs, OCPs, OPPs, VOCs, phenols and asbestos.

DP (2018) undertook a limited intrusive assessment that was completed via solid flight auger and hand auger at 12 locations across the site. DP (2018) adopted the most conservative human and ecological health assessment criteria, including; health investigation level (HIL) A for non-petroleum chemical contaminants, health screening levels (HSLs) A and B for vapour intrusion, HSL A for direct contact, and management limits for TPH.

Fill materials were encountered from 0.15 m bgs to 2.1 m bgs and was variably compacted predominantly silty clay material with carious inclusions, which was observed to have "similar classification to the natural clay present at the site and in some instances was hard to distinguish from natural clays" (DP 2018). Elevated concentrations of zinc (one sample), nickel (one sample), benzo(a)pyrene (two samples), TRH >C_{16}-C_{34}(F3) (three samples), and BaP TEQ (one sample) were detected at isolated locations, all encountered within surface or near-surface fill material. Only one result exceeded health-based criteria (BaP TEQ at BH11 0-0.1m), in an area where asphalt may have been present. DP (2018) suggests that there is a low risk of gross or widespread contamination at the site, with some elevated metals and hydrocarbons relating to inclusions of ash and asphalt in fill. The other elevated concentrations exceeded ecological criteria only.

No groundwater was encountered at any location during the sampling event.

The report concluded that exceedances of adopted site criteria were observed and as such, remediation may be required pending results from subsequent detailed site investigations (DSIs).

5. Conceptual Site Model

Based on the desktop review and observations from the site inspection, the following conceptual site model (CSM) has been developed for the site.

5.1 Potential Areas of Environmental Concern

Based on the objectives of the assessment, desktop review and observations made during the site inspection, AECs and associated COPCs were identified at the site, as noted in **Table 5.1**.

Table 5.1: Areas of Environmental Concern and Associated Contaminants of Potential Concern

Area of Environmental Concern (AEC)	Potentially Affected Media	Contaminant of Potential Concern (COPC)	Risk Profile
Fill Materials Imported and/or reworked fill materials used to create site levels (comprising material of unknown character and/or origin)	Soil	Heavy metals, total recoverable hydrocarbons (TRH), benzene, toluene, ethylbenzene and xylenes (BTEX), PAHs, polychlorinated biphenyls (PCB), organochlorine pesticides (OCP), and asbestos	Moderate
Former Site Structures The demolition of former structures at the site prior to and during the various stages of redevelopment may have resulted in cross-contamination to underlying and surrounding soils.	Soil	Heavy metals, TRH/BTEX, PAHs, PCBs, asbestos	Low

5.2 Potentially Contaminated Media

Potentially contaminated media comprise:

- Fill Materials; and
- Underlying Natural Soils.

Review of site historical information, DP (2018) and findings from the site inspection indicate that the site has historically unlikely to have involved significant contaminating historical uses. The review identified the potential for cut and fill activities to have occurred at the site. Fill materials may contain COPCs at concentrations that exceed the applicable human and ecological assessment criteria and therefore may present an unacceptable risk to human and ecological receptors for the future use of the site.

The historical review of the site layout identified several historical structures which were demolished as part of the site's redevelopment in the 1950s. Noting the age of the site's structures (ongoing since 1950s), construction of buildings at the site may have utilised hazardous building materials. JBS&G consider it unlikely that contamination to the underlying soils from these materials has occurred noting that the structures have not undergone significant refurbishment since construction.

A review of the site history did not identify point sources and/or liquid contaminants at the site that are likely to pose a significant risk for the migration of contamination to underlying natural materials and groundwater.

JBS&G consider the potential for contamination to the underlying natural lithologies/geology to be a function of the primary contamination in soil. Noting the historical and current site uses, JBS&G do not consider primary contamination in soils are likely to be in concentrations that would result in significant contamination to underlying strata.

Noting contaminants likely to exist at the site are in solid form and unlikely to be significantly leachable, contaminants within fill material and other surface soils, and the historical uses of the site, vertical migration through the fill profile into the underlying natural soils and groundwater is unlikely to have occurred.

5.3 Potential for Migration

Contaminants generally migrate from site via a combination of windblown dusts, rainwater infiltration, groundwater migration and surface water runoff. The propensity for contaminants to migrate is dependent on:

- The nature of the contaminants (solid/liquid/gas and mobility characteristics);
- The extent of the contaminants (isolated or widespread);
- The location of the contaminants (surface soils or at depth); and
- The site topography, geology, hydrology and hydrogeology.

The potential contaminants identified as part of the site area history review and previous investigation are generally in a solid form (e.g. heavy metals, asbestos, etc.).

Although the site is partially unsealed, dense grass and shrub cover and the predominantly paved nature of the site reduces the potential for windblown dust migration of contamination from the site, should contamination exist in surface soils.

There is a low potential for vertical migration of surface waters where hardstand pavements exhibit extensive cracking and / or along joints, and in areas of soft ground cover. Additionally, there is low potential for vertical contaminant migration from soils to shallow (perched) groundwater, if present, via infiltration. As noted above, the potential for contaminant migration to deeper groundwater is unlikely.

5.4 Potential Exposure Pathways

Potential human receptors of environmental impact include future site users (school students, users of open spaces), visitors and construction/maintenance contractors engaged to work at the site who may potentially be exposed to COPCs through inhalation, direct contact and/or ingestion (children) of impacted soils.

Exposure to windblown dusts may pose a potential risk to sensitive human receptors however these are also considered unlikely given the predominantly vegetated site surfaces.

During redevelopment of the site, potential human receptors will include:

- Inhalation of potential COPC dust and migrating upwards from fill material of unknown origins; and/ or
- Potential dermal and oral contact to impacted soils as present at shallow depths and/ or accessible by future service excavations across the extent of the site; and/ or
- Surface water runoff.

The site contains areas covered by vegetation, presenting ongoing potential ecological receptors, although no vegetation stress relating to potential contamination from known AECs was observed during site inspection. Flora on site are potential receptors of shallow soil contamination if present. Possible off-site ecological receptors include potential surface water receptors (i.e. Swains Creek to the southwest of the site).

5.5 Preferential Pathways

For the purpose of this assessment, preferential pathways have been identified as natural and/or man-made pathways that result in the preferential migration of COPC as either liquids or gasses.

Man-made preferential pathways may be present at the site, associated with areas of disturbed natural/fill material, service easements and stormwater/retention basins on site.

Natural preferential pathways are likely limited to natural lithological boundaries, such as between porous soils and weathered/residual bedrock, where infiltrating groundwater is vertically confined and begins to migrate laterally, and surface water drainage features.

6. Sampling and Analytical Plan

6.1 Data Quality Objectives

Data quality objectives (DQOs) are statements that define the confidence required in conclusions drawn for data produced for a project, and which must be set to realistically define and measure the quality of data needed.

DQOs have been developed for this DSI, as discussed in the following sections.

6.1.1 State the Problem

The site is proposed to be redeveloped for a mixed primary and high school campus providing facilities for students between the years of Kindergarten to Year 10. As such, an assessment is required to characterise potential contamination at the site, and to assess whether potential contamination from historical activities at the site may pose an unacceptable risk to future receptors for the proposed mixed primary and high school campus, or, to make recommendations to enable such conclusions to be made.

6.1.2 Identify the Decision

The decisions below generally follow the EPA (2017[7]) decision making process for assessing urban redevelopment sites:

1. Are there any unacceptable risks to likely future on-site receptors?
2. Are there any issues relating to background soil concentrations that exceed appropriate site soil criteria?
3. Are there any impacts of chemical mixtures?
4. Are there any aesthetic issues at the site?
5. Is there any evidence of, or potential for, migration of contaminants from the site?
6. Is a site management strategy required?

6.1.3 Identify Inputs to the Decision

Inputs identified to provide sufficient data to make the decisions nominated above include:

- Historical site information and inspection of the site to identify and/or confirm potential AECs and COPCs at the site;
- The collection and interpretation of environmental data through collection and analysis of soil;
- Laboratory analysis of samples of potentially contaminated media for COPC; and
- Confirmation that data generated by sample analyses were of sufficient quality to allow reliable comparison to assessment criteria as undertaken by assessment of quality assurance / quality control (QA/QC).

Specifically, sufficient data needs to be collected from each of the identified potentially impacted media (e.g. fill material and natural soils) at the site relating to the in the identified AECs and associated COPC.

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[7] *Guidelines for the NSW Site Auditor Scheme* (3rd Edition). NSW Environment Protection Authority, October 2017, EPA 2017;

6.1.4 Define the Study Boundaries

The study boundaries are limited to cadastral site boundaries as shown on **Figure 2**.

The vertical extent of the soil investigation was to a maximum depth of 2.8 m bgs.

Due to the project objectives, seasonality was not assessed as part of this investigation. Data are therefore representative of the timing and duration of the current investigation and DP (2018).

6.1.5 Develop a Decision Rule

Analytical data was assessed against NSW EPA endorsed criteria, presented in **Section 7**.

Statistical analyses of the data was undertaken, where required, in accordance with relevant guidance documents. The following statistical criteria was adopted:

- The upper 95% confidence limit on the average concentration for each analyte (calculated for samples collected from consistent soil horizons, stratigraphy or material types) must be below the adopted criterion;
- No single analyte concentration shall exceed 250% of the adopted criterion; and
- The standard deviation of the results must be less than 50% of the criterion.

The decision rules adopted to answer the decisions identified in **Section 6.1.2** are summarised in **Table 6.1**.

Table 6.1 Summary of Decision Rules

Decisions Required to be Made	Decision Rule
1. Are there any unacceptable risks to on-site future receptors?	Analytical data will be compared against EPA endorsed criteria. Statistical analysis of the data will be completed, where necessary, in accordance with relevant guidance documents, as appropriate, to facilitate the decisions. The criteria in **Section 6** were adopted with respect to soil. Either: the reported concentrations were all below the Site criteria; Or: no single analyte concentration exceeded 250 % of the adopted site criterion; and the standard deviation of the results was less than 50 % of the Site criterion; And: the 95 % UCL of the average concentration for each analyte was below the adopted site criterion. If the statistical criteria stated above were satisfied, the answer to the decision was **No**. If the statistical criteria were not satisfied, the answer to the decision was **Yes**.
2. Are there any issues relating to the local area background soil concentrations that exceed appropriate soil criteria?	If COPC concentrations in soils exceeded published background concentrations (NEPC 2013), the answer to the decision is **Yes**. Otherwise the answer to the decision is **No**.
3. Are there any chemical mixtures?	Were there more than one group of contaminants present which increase the risk of harm? If there is, the answer to the decision is **Yes**. Otherwise, the answer to the decision is **No**.
4. Are there any aesthetic issues?	If there were any asbestos containing material (ACM) fragments on the ground surface, any unacceptable odours or soil discolouration, or excessive extraneous/foreign/waste materials, the answer to the decision is **Yes**. Otherwise, the answer to the decision is **No**.
5. Is there any evidence of, or potential for, migration of contaminants from the site?	Based on assessment results, is there any evidence of, or the potential for, migration of unacceptable contaminant concentrations to migrate from the site? If yes, the answer to the decisions is **Yes**. Otherwise, the answer to the decision is **No**.
6. Is a site management strategy required?	Is the answer to any of the above decisions Yes? If yes, a site management strategy is required. If no, a site management strategy is not required.

6.1.6 Specific Limits on Decision Errors

This step is to establish the decision maker's tolerable limits on decision errors, which are used to establish performance goals for limiting uncertainty in the data. Data generated during this project must be appropriate to allow decisions to be made with confidence.

Specific limits for this project have been adopted in accordance with the appropriate guidance from the NSW EPA, NEPC (2013), appropriate indicators of data quality (DQIs used to assess QA/QC) and standard JBS&G procedures for field sampling and handling.

To assess the usability of the data prior to making decisions, the data will be assessed against pre-determined DQIs for completeness, comparability, representativeness, precision and accuracy.

The pre-determined Data Quality Indicators (DQIs) established for the project are discussed below in relation to precision, accuracy, representativeness, comparability, completeness and sensitivity (PARCCS parameters), and are shown in **Table 6.2**.

- **Precision** - measures the reproducibility of measurements under a given set of conditions. The precision of the laboratory data and sampling techniques is assessed by calculating the Relative Percent Difference (RPD) of duplicate samples.
- **Accuracy** - measures the bias in a measurement system. The accuracy of the laboratory data that are generated during this study is a measure of the closeness of the analytical results obtained by a method to the 'true' value. Accuracy is assessed by reference to the analytical results of laboratory control samples, laboratory spikes and analyses against reference standards.
- **Representativeness** –expresses the degree which sample data accurately and precisely represent a characteristic of a population or an environmental condition. Representativeness is achieved by collecting samples on a representative basis across the site, and by using an adequate number of sample locations to characterise the site to the required accuracy.
- **Comparability** - expresses the confidence with which one data set can be compared with another. This is achieved through maintaining a level of consistency in techniques used to collect samples; ensuring analysing laboratories use consistent analysis techniques and reporting methods.
- **Completeness** – is defined as the percentage of measurements made which are judged to be valid measurements. The completeness goal is set at there being sufficient valid data generated during the study.
- **Sensitivity** – expresses the appropriateness of the chosen laboratory methods, including the limits of reporting, in producing reliable data in relation to the adopted criteria.

If any of the DQIs are not met, further assessment of the data set is required to determine whether the non-conformance has significant effects on the usefulness of the data. Corrective action to correct an adverse impact on the reliability of the dataset may include, but is not limited to, the request of further information from samplers and/or analytical laboratories, downgrading of the quality of the data or alternatively, re-collection of the data.

Table 6.2: Summary of Data Quality Indicators

Data Quality Indicators	Frequency	Data Quality Criteria
Precision		
Duplicates (intra-laboratory)	1 / 20 samples	<50% RPD[1]
Triplicates (inter-laboratory)	1 / 20 samples	<50% RPD[1]
Laboratory Duplicates	1 / 20 samples	<50% RPD[1]
Accuracy		
Surrogate spikes	All organic samples	70-130% recovery
	Phenols	30-130% recovery
Laboratory control samples	1 per lab batch	70-130% recovery
Matrix spikes	1 per lab batch	70-130% recovery (phenols 30-130%)
Representativeness		
Sampling appropriate for media and analytes	All samples	-[2]
Samples extracted and analysed within holding times.	-	Organics (14 days), inorganics (6 months)
Laboratory Blanks	1 per lab batch	<LOR
Trip blanks	1 per lab batch	<LOR
Trip spike	1 per lab batch	70-130% recovery
Storage blank	1 per lab batch	<LOR
Rinsate sample	1 per sampling event/media	<LOR
Comparability		
Standard operating procedures for sample collection & handling	All Samples	All Samples
Standard analytical methods used for all analyses	All Samples	NATA accreditation
Consistent field conditions, sampling staff and laboratory analysis	All Samples	All samples[2]
Limits of reporting appropriate and consistent	All Samples	All samples[2]
Completeness		
Sample description and Chain of Custody (COCs) completed and appropriate	All Samples	All samples[2]
Appropriate documentation	All Samples	All samples[2]
Satisfactory frequency and result for QC samples		95% compliance
Data from critical samples is considered valid	-	Critical samples valid
Sensitivity		
Analytical methods and limits of recovery appropriate for media and adopted site assessment criteria	All samples	LOR<= site assessment criteria

[1] If the RPD between duplicates is greater than the pre-determined data quality indicator, a judgment was made as to whether the excess is critical in relation to the validation of the data set or unacceptable sampling error is occurring in the field.

[2] A qualitative assessment of compliance with standard procedures and appropriate sample collection methods was completed during the DQI compliance assessment.

6.2 Optimise the Design of Obtaining Data

Various strategies for developing a statistically based sampling plan are identified in EPA (1995[8]), including judgemental, random, systematic and stratified sampling patterns.

Soil Investigation

For a site of approximately 5.1 ha, Table A of NSW EPA (2012) recommend a minimum of 55 soil sampling locations. However, noting DP (2018) suggests that there is a low risk of gross or widespread contamination at the site, with some elevated metals and hydrocarbons relating to inclusions of ash and asphalt in fill, and the potential for asbestos. No point sources such as underground storage tanks (USTs) were reported. Filling reported appears to be predominantly consistent with reworking of excavated surficial natural soil/rock materials in some areas, rather

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[8] *Contaminated Sites: Sampling Design Guidelines*. NSW EPA 1995 (EPA 1995)

than importation. Review of historical aerial imagery provided by DP (2018) indicate that the site is unlikely to have been subject to high-risk contaminating activities.

As such, JBS&G undertook a comprehensive soil investigation at the site which involved the advancement of 30 boreholes utilising a combination of judgemental and systematic sampling regimes. The sample locations advanced by JBS&G were in addition to the 15 previously advanced by Douglas Partners, reported in DP (2018). JBS&G note that this is slightly less than Table A of NSW EPA (1995), however considering the site's historical an environmental setting, this is considered suitably robust to draw conclusions regarding the site's suitability.

Systematic sampling locations were generally advanced across the accessible site area, with the exception of the newly installed sports field (synthetic turf area in south eastern portion of the site) to assess more widespread soil contamination.

Soil sampling locations, including those from DP (2018), are shown in **Figure 3**.

6.2.1 Sampling Methodology

6.2.1.1 Soil Sampling Methodology

Soil sampling was completed utilising an excavator equipped with an auger or via manual excavation utilising a hand auger.

Soil samples were generally collected at surface (0-0.15 m) or directly underneath hardstand pavement, 0.5 m and then at 0.5 m intervals to a maximum depth of 2.8 m bgs (BH15) or a minimum of 0.5 m into natural material (or prior refusal), whichever was the shallower. Where physical evidence of potential contamination was identified during the works, sampling locations were extended to vertically delineate contamination, where practicable. Following shallow refusal at 0.3 m bgs, BH02 was reattempted (BH02a) within proximity. During the collection of soil samples at all locations, features such as seepage, discolouration, staining, odours and other indicators of contamination, if present, were noted on borelogs, provided in **Appendix D**.

Collected samples were immediately transferred to laboratory supplied sample jars and bags. The sample jars were then transferred to a chilled ice box for sample preservation prior to and during shipment to the testing laboratory. A chain-of-custody form was completed and forwarded with the samples to the testing laboratory. Based upon field observations, selected samples were analysed in accordance with the laboratory schedule (**Table 6.2**).

JBS&G note that not all soil samples collected were analysed. All samples will remain at the primary laboratory for a period of two months from the date of sampling. This will allow future analysis to be completed in the event that further information is required to characterise site conditions, provided that proposed analytes remain within technical holding times.

6.2.1.2 Field PID Screening

During site works, sufficient sample material was collected to allow for field testing using a photo-ionisation detector (PID) and laboratory analyses to assess the potential presence of VOCs including petroleum hydrocarbons. Samples obtained for PID screening were placed in a sealed plastic bag for approximately 2 minutes to equilibrate, prior to a PID being attached to the bag. Readings were then monitored for a period of approximately 30 seconds or until values stabilised and the stabilise/highest reading recorded on field logs. The PID was calibrated prior to the commencement of field works and then check readings were completed on a daily basis during the field program using suitable calibration gas (isobutylene – 100 ppm). Field calibration forms are provided in **Appendix E**. PID results are provided in the logs in **Appendix D**.

6.2.1.3 Duplicate and Triplicate Sample Preparation

At selected sample points, sufficient soil was collected to provide primary, blind (duplicate intra-laboratory), and split (triplicate inter-laboratory) replicate samples. In order to minimise the loss of potential volatiles, soil samples were not homogenised. Each sample was labelled with primary, duplicate or triplicate sample identification before being placed in the same chilled esky for transport to the laboratory.

6.2.1.4 Equipment Decontamination

Where sampling equipment was required to be reused, i.e. augers, appropriate decontamination procedures, including brushing and rinsing augers, if required, in accordance with standard JBS&G operating procedures were adhered to. Decontamination forms are provided in **Appendix E**.

New nitrile gloves were utilised for the collection of each soil sample to avoid cross contamination between samples and locations.

6.2.2 Laboratory Analysis

JBS&G contracted Eurofins|MGT Australia (Eurofins) at Lane Cove, NSW, as the primary laboratory for the required analyses. Envirolab Services Pty Ltd (Envirolab) in Chatswood, NSW, were contracted for analysis of triplicate samples. Eurofins and Envirolab are NATA registered for the required analyses. In addition, the laboratory was required to meet JBS&G internal QA/QC requirements. Laboratory analysis of samples was conducted as summarised in **Table 6.2**.

Table 6.1: Sampling and Analytical Program

Sample Type	Number of Sample Locations	Analyses (excluding QA/QC)
Soil	30 boreholes	Asbestos in soil (500 mL per NEPM): 30 samples Metals (x8) and PAHs: 30 samples TRH, BTEX: 5 samples OCPs: 5 samples PCBs: 5 samples

In addition to the above primary analyses, to address the DQIs, field duplicate and triplicate soil samples were analysed at a rate of at least 1/20 primary samples. A rinsate sample was collected from non-disposable soil sampling equipment, and trip blank and trip spike samples will be submitted with each batch of samples.

7. Assessment Criteria

7.1 Regulatory and Technical Guidelines

The investigation was undertaken with consideration to aspects of the following guidelines, as relevant:

- National Environment Protection (Assessment of Site Contamination) Measure 2013 (as amended 2013). National Environment Protection Council (NEPC 2013);
- Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites. NSW EPA, 1997 (OEH 2011);
- Contaminated Sites: Guidelines for the NSW Site Auditor Scheme, 3rd Edition. NSW EPA, 2017 (EPA 2017); and
- Contaminated Sites: Guidelines on Duty to Report Contamination under the Contaminated Land Management Act 1997. NSW EPA 2015 (EPA 2015).

7.2 Assessment Criteria – Soil

The NEPC (2013) NEPM provides risk-based investigation and screening levels for selected organic and inorganic chemicals in soils. Different levels are provided for a variety of exposure settings including residential, open-space / parks / recreational and commercial / industrial land uses.

It is understood that the site is proposed to be redeveloped to incorporate educational facilities for primary and high school aged students. In accordance with the applicable land uses outlined in NEPC (2013) and the respective risk assessment assumptions utilised in their formulation, analytical data from previous (DP 2018) investigations and the current investigation will be compared against the following human health and ecological investigation and screening levels (HILs/HSLs and EILs/ESLs):

- HIL-A and HSL-A: Residential with accessible soils (includes preschools and primary schools);
- EIL & ESL – urban residential and public open space (coarse soil); and
- In addition to the above, aesthetic considerations as per NEPC (2013) will be considered during the current investigation.

8. Quality Assurance and Quality Control

Detailed discussion of the QAQC assessment of the dataset is included in **Appendix F**.

8.1 QA/QC Conclusion

The field sampling and handling procedures across the site produced QA/QC results which indicate that data collected is of an acceptable quality for the DSI objectives.

The NATA certified laboratory reports indicate that the project laboratories were achieving levels of performance within their recommended control limits during the period when the samples from this program were analysed.

On the basis of the results of the field and laboratory QA/QC program, the soil data are of an acceptable quality upon which to draw conclusions regarding the environmental condition of the site.

9. Results

Soil sampling locations are shown on **Figure 3** and a summary of soil analytical data with comparison to the adopted site criteria is presented in **Table A**. Detailed laboratory reports and chain of custody documentation is provided in **Appendix H**. Borehole logs are presented in **Appendix D**.

9.1 Observations

A photographic log documenting key observations made during the current investigation is provided in **Appendix A**.

A total of 30 soil sampling locations were advanced across the site by JBS&G. All locations except BH25 were observed to contain fill materials between the ground surface (or below hardstand) to a maximum depth of 2.2 m bgs (BH15). Fill materials generally comprised a grey or brown gravelly silty sand with gravel inclusions and some minor inclusions of concrete, brick, glass, ash, geofabric and metal fragments.

No hydrocarbon odours or staining was observed at any of the sample locations or during site inspections. This was corroborated by measurements of volatile compounds as measured utilising a PID, with low concentrations of volatile compounds between 0.6 ppm (BH02) and 9.8 ppm (BH04).

Inspection of fill materials did not identify fragments of suspected asbestos containing materials (ACM). JBS&G did however, identify a fragment of ACM on the ground surface in proximity (circa 5m) to BH15. Laboratory analysis confirmed the fragment to contain chrysotile and amosite asbestos fibres. The fragment of ACM was collected by JBS&G and dispatched forto the laboratory for analysis. No other visible ACM was observed during the investigation

Natural material underlying the site typically comprised a grey - brown (with brown and yellow mottling) silty clay overlying a grey weathered laminated shale.

It is further noted that no indicators of potential acid sulphate soils were observed during intrusive works at the site.

9.2 Analytical Results

Full copies of the laboratory documentation are provided in **Attachment L**. Summarised laboratory results from JBS&G 2019 are presented in **Table A**. Analytical data from DP (2018) are presented in the **Table** section of this report and have been included in the sections below for completeness.

9.2.1 Heavy Metals

All individual heavy metals concentrations were reported at levels less than the adopted site assessment criteria for human health.

In relation to ecological criteria, the following exceedances are reported:

- EIL Urban Residential: Nickel limit of 30 mg/kg
    - BH03_0.4-0.5 – 97 mg/kg;
    - BH18_0.7-0.8 – 41 mg/kg;
    - BH29_0-0.15 (Primary) – 44 mg/kg (highest of duplicate pairs);
    - BH8 / 0-0.1 m (DP 2018) – 46 mg/kg;
- EIL Urban Residential: Zinc limit of 70 mg/kg
    - BH01_0-0.15 – 88 mg/kg;
    - BH02A_0-0.15 – 71 mg/kg;
    - BH08_0-0.15 – 100 mg/kg;

  - BH10_1-1.1 – 690 mg/kg;
  - BH11_0-0.15 – 150 mg/kg;
  - BH12_0.4-0.5 – 77 mg/kg;
  - BH14_0-0.15 – 70 mg/kg;
  - BH21_0-0.15 – 160 mg/kg; and
  - BH1 / 0.5-0.6 m (DP 2018) – 490 mg/kg.

9.2.2 PAHs

Total PAH and Benzo(a)pyrene (B(a)P) TEQ values for analysed samples were reported at concentrations less than the adopted assessment criteria, with the following exceptions:

- HIL A Residential with accessible soil: B(a)P TEQ limit of 3 mg/kg
  - BH11 / 0.0-0.1 m (DP 2018) – 5.6 mg/kg
  - BH13 / 0.0-0.1 located within Chatswood Public School Bush Campus (DP 2018) – 3.2 mg/kg and 3.4 mg/kg
- ESL Urban Residential and Public Open Space, Coarse Soil: B(a)P limit of 0.7 mg/kg
  - BH01_0-0.15 - 1 mg/kg
  - BH4 / 0-0.1 m (DP 2018) – 0.73 mg/kg
  - BH11 / 0.0-0.1 m (DP 2018) - 3.9 mg/kg
  - BH13 / 0.0-0.1 located within Chatswood Public School Bush Campus (DP 2018) – 2.2 mg.kg and 2.3 mg/kg

9.2.3 TRH/BTEX and VOCs

Concentrations of all TRH, BTEX and VOCs were reported below the adopted site assessment criteria in analysed soil samples with the following exceptions:

- ESL Urban Residential and Public Open Space, Coarse Soil TRH >C16-C34 (F3) limit of 300 mg/kg:
  - BH10-0.05-0.15 (duplicate) – 440 mg/kg;
  - BH8 / 0-0.1 m (DP2018) – 600 mg/kg
  - BH9 / 0.2-0.3 m (DP2018) – 550 mg/kg
  - BH12 / 0-0.1 m (DP2018) – 530 mg/kg

9.2.4 OCPs and PCBs

Concentrations of OCP and PCB compounds were reported below the adopted health and ecological assessment criteria for all analysed soil samples.

9.2.1 Asbestos

No Asbestos Fines or Fibrous Asbestos (AF/FA) were reported above the health-based assessment criterial or laboratory limit of detection for all samples submitted for analysis.

One fragment of ACM collected from the ground surface in proximity to BH13 (BH13-FRAG) was confirmed to contain chrysotile and amosite asbestos fibres. This fragment was removed for analysis. No other fragments of ACM were observed in proximity to the collected sample. In addition, no other fragments of ACM were observed within fill materials or on the ground surface during the completion of the field works.

10. Site Characterisation

Based on the decision-making process for assessing urban redevelopment sites detailed in EPA (2017) and discussed in **Section 6.1.2**, the decisions required to be made are discussed below.

10.1 Potential Risks to Future Onsite Receptors

The following discussion relates to the site's data set, and includes analytical data collected from DP (2018), in addition to analytical data collected by JBS&G, as documented herein.

The assessment of site suitability is generally undertaken with consideration to the risks various compounds in the environment potentially pose to human and ecological health under one or more land use scenarios. A Tier 1 assessment of potential risk is undertaken by comparison with generic land use criteria such as published by NEPC (2013).

In consideration of the site's data set, potentially unacceptable risks to the health of human receptors at the site under the most conservative land use, pursuant to NEPC (2013), were constrained to PAHs, specifically, carcinogenic PAHS as B(a)P TEQ, reported in excess of the adopted site criterion at two locations, as discussed below.

Concentrations of carcinogenic PAHs (B(a)P TEQ) were reported marginally in excess of the applicable human-health land use criteria of 3 mg/kg (HIL A) at two locations, as reported in DP (2018) – BH11-0-0.1 (5.6 mg/kg) and BH13-0-0.1 (3.2 mg/kg). JBS&G note that both of these locations are in areas of the site that are covered by asphalt on the ground surface and is likely to be the source of elevated PAHs within these samples. As noted in NEPC (2013), where B(a)P exists in bitumen it is relatively immobile an does not represent a significant health risk. In accordance with provisions in NEPC (2013), statistical assessment of Tier 1 soil exceedances is permitted to assess the potential risk of the site's soils as a whole, to future receptors of the site. As such, the site data set for fill material was statistically assessed utilising the 95% upper confidence limit (UCL) for carcinogenic PAHs as B(a)P TEQ. Qualifications for the utilisation of statistical assessment are provided below:

- All samples utilised for the statistical assessment were derived from fill material which exhibited similar characteristics;
- No data point used in the statistical assessment was greater than 250 % of the HIL-A criterion for carcinogenic PAHs (3 mg/kg);
- The number of samples used in the assessment was 48 (n=48);
- The maximum value was 5.6 mg/kg and the minimum value was LOR (0.605 mg/kg – half LOR); and
- The standard deviation was 0.815, less than 50 % of the HIL-A criterion.

As such, the data set was considered suitable for statistical assessment. The 95% UCL for fill material at the site was assessed as 1 mg/kg, below the HIL-A criterion of 3 mg/kg. As such, JBS&G consider that the reported concentrations of carcinogenic PAHs as B(a)P TEQ at BH11-0-0.1 and BH13-0-0.1 do not represent an unacceptable risk to human health for the proposed future use of the site. The statistical calculations are provided in **Appendix G.**

JBS&G note that one fragment of ACM was identified in proximity to BH13 which was confirmed by the laboratory to contain chrysotile and amosite asbestos. This fragment was removed to facilitate analysis and no other ACM was observed on the site surface.

Risks to ecological health are often considered in respect to the risks various compounds within the environment pose to ecological health under a given land use scenario and exist for the protection of soil processes, plant species and organisms that inhabit or contact soils.

In relation to the site's data set, concentrations of COPCs were generally reported below the adopted ecological criteria (ESLs/EILs), with the exception of the heavy metals of nickel and zinc, reported in excess of the EIL at 6 and 9 locations, respectively, petroleum hydrocarbons at three locations, and B(a)P at four locations, as presented in **Section 9**.

A review of the site's geological setting (**Section 2**) and soil/geological profiles encountered during the completion of the DSI indicate that the reported concentrations of the heavy metals of nickel and zinc are likely attributed to the parent material of the site's soils, likely to be shales from the Wianamatta Group that are naturally enriched in nickel and zinc.

In relation to the reported concentrations of B(a)P and TRH reported in excess of the adopted ecological screening levels, observations made during the completion of field works indicated that vegetation in proximity to sampling locations that reported elevated levels of these compounds, and across the site in general, appeared to healthy, with no visual indicators of vegetative stress, indicating that soil processes responsible for ecological health did not appear to be inhibited. Furthermore, NEPC (2013) notes that high molecular weight PAHs such as B(a)P are not readily taken up by plants, and as such are unlikely to pose an unacceptable risk to plant growth.

10.2 Background Soil Concentrations

Soil samples collected from natural material indicated metal concentrations were below the background metal concentrations provided in Olszowy et. al. (1995) and were below the adopted site criteria (**Section 7**) (for natural materials only).

10.3 Chemical Mixtures

There were no potential chemical mixtures identified during the investigation that may pose an unacceptable contamination risk at the site with respect to future site users.

10.4 Aesthetic Issues

Little to no anthropogenic material was noted on the ground surface across the site that would present an aesthetic issue for the future use of the site. JBS&G note that the single fragment of ACM that was identified in proximity to BH13 was removed for laboratory analysis thereby removing the aesthetic risk presented. Minor inclusions of anthropogenic materials were identified within some fill materials across the site during intrusive sampling at the site, however due to the small sizes, composition and concentration within sols, these are not considered represent an unacceptable aesthetic risk for the intended land use. No unacceptable staining or odourous materials were observed.

10.5 Potential Migration of Contaminants

The potential for migration of contaminants offsite is considered low given the nature, magnitude, distribution and depth of identified contamination (ecological only).

10.6 Site Management Strategy

With consideration to the site conditions as reported herein, JBS&G consider that the site does not present unacceptable risks to human and ecological health that require further management and/or remediation to make the site suitable for ongoing use as an educational facility (senior) and future use as a mixed primary and high school. Typical unexpected find protocols can be implemented during future maintenance/development works involving ground disturbance to deal with any unidentified contamination.

11. Conclusions

Based on the scope of works undertaken, and in accordance with the limitations in **Section 12**, JBS&G consider that the site does not present any unacceptable risks to human and ecological health, pursuant to NEPC (2013), and is considered suitable for use as a primary and secondary school facility.

JBS&G recommend the formulation of an Unexpected Finds Protocol (UFP) for the site to address any unexpected finds that may be encountered during the redevelopment of the site.

12. Limitations

This report has been prepared for use by the client who has commissioned the works in accordance with the project brief only, and has been based in part on information obtained from the client and other parties.

The advice herein relates only to this project and all results conclusions and recommendations made should be reviewed by a competent person with experience in environmental investigations, before being used for any other purpose.

JBS&G accepts no liability for use or interpretation by any person or body other than the client who commissioned the works. This report should not be reproduced without prior approval by the client, or amended in any way without prior approval by JBS&G, and should not be relied upon by other parties, who should make their own enquires.

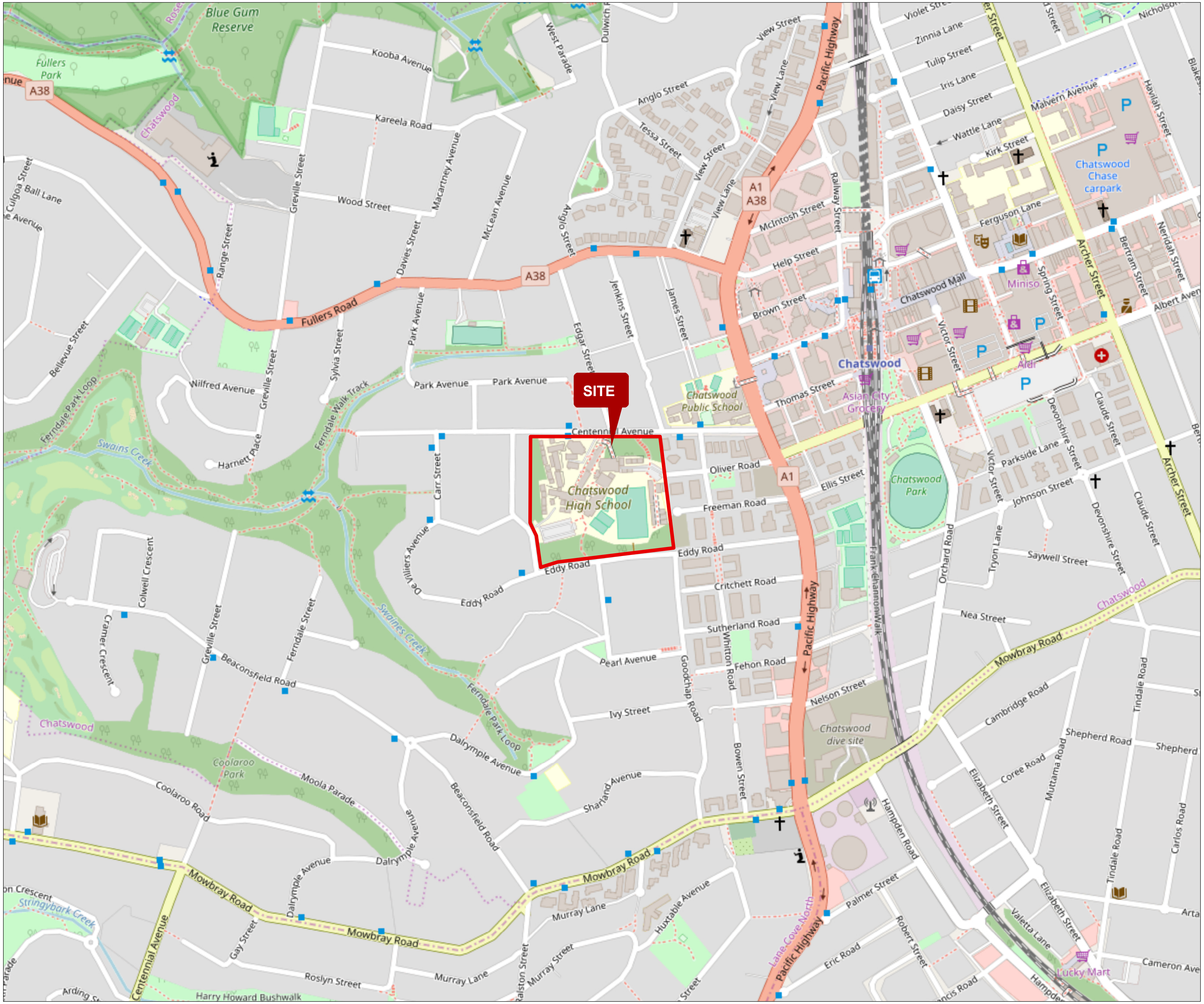
Sampling and chemical analysis of environmental media is based on appropriate guidance documents made and approved by the relevant regulatory authorities. Conclusions arising from the review and assessment of environmental data are based on the sampling and analysis considered appropriate based on the regulatory requirements.

Limited sampling and laboratory analyses were undertaken as part of the investigations undertaken, as described herein. Ground conditions between sampling locations and media may vary, and this should be considered when extrapolating between sampling points. Chemical analytes are based on the information detailed in the site history. Further chemicals or categories of chemicals may exist at the site, which were not identified in the site history and which may not be expected at the site.

Changes to the subsurface conditions may occur subsequent to the investigations described herein, through natural processes or through the intentional or accidental addition of contaminants. The conclusions and recommendations reached in this report are based on the information obtained at the time of the investigations.

This report does not provide a complete assessment of the environmental status of the site, and it is limited to the scope defined herein. Should information become available regarding conditions at the site including previously unknown sources of contamination, JBS&G reserves the right to review the report in the context of the additional information.

Figures



Legend:

🟥 Approximate Site Boundary

JBS&G

Job No: 55579

Client: Pells Sullivan Meynik

Version: R01 Rev A	Date 27/02/2019
Drawn By: AV	Checked By: DD

Scale 1:10,000

0 120 240

metres

Coord. Sys. GDA 1994 MGA Zone 56

24 Centennial Avenue
Chatswood, NSW

High School

SITE LOCATION

FIGURE 1

File Name: \\JBSG-NSW-FS01\Company Data\Projects\Pells Sullivan Meynik\55579 Chatswood Education Precint\GIS\Maps\R01 Rev A\55579_01_SiteLoc.mxd
Reference: © OpenStreetMap (and) contributors, CC-BY-SA

Legend:

🟥 Approximate Site Boundary

▨ Demountable Buildings

Job No: 55579	
Client: Pells Sullivan Meynik	
Version: R01 Rev A	Date 27/02/2019
Drawn By: AV	Checked By: DD
Scale 1:1,500	

0 10 20

metres

Coord. Sys. GDA 1994 MGA Zone 56

24 Centennial Avenue
Chatswood, NSW

High School

SITE LAYOUT

FIGURE 2

File Name: \\JBSG-NSW-FS01\Company Data\Projects\Pells Sullivan Meynik\55579 Chatswood Education Precint\GIS\Maps\R01 Rev A\55579_02_SiteLay.mxd
Reference: Nearmap - nearmap.com.au - Imagery 27-12-2018

Legend:

🟥 Approximate Site Boundary

● Sample Locations (JBS&G 2019)

● Historical Samples (DP 2018)

JBS&G

Job No: 55579	
Client: Pells Sullivan Meynik	
Version: R01 Rev A	Date 27/02/2019
Drawn By: AV	Checked By: DD
Scale 1:1,500	

0 10 20
metres

Coord. Sys. GDA 1994 MGA Zone 56

24 Centennial Avenue
Chatswood, NSW

High School

SAMPLE LOCATIONS

FIGURE 3

File Name: \\JBSG-NSW-FS01\Company Data\Projects\Pells Sullivan Meynik\55579 Chatswood Education Precint\GIS\Maps\R01 Rev A\55579_03_SampleLoc.mxd
Reference: Nearmap - nearmap.com.au - Imagery 27-12-2018

Tables

Table A - Summary Analytical Results (Soil)
Project Number: 55579
Project Name: Chatswood High School DSI

			Metals & Metalloids								Polycyclic Aromatic Hydrocarbons																					TPHs (NEPC 1999)					TRHs (NEPC 2013)						
			Arsenic (Total)	Cadmium	Chromium (Total)	Copper	Lead	Mercury (Inorganic)	Nickel	Zinc	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a)pyrene	Benzo(a)pyrene TEQ (lower bound)*	Benzo(a)pyrene TEQ (medium bound)*	Benzo(a)pyrene TEQ (upper bound)*	Benzo(b,j)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Carcinogenic PAHs as B(a)P TEQ	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Phenanthrene	PAHs (Total)	Pyrene	Total Positive PAHs	C6-C9 Fraction	C10-C14 Fraction	C15-C28 Fraction	C29-C36 Fraction	C10-C36 Fraction (Total)	>C10-C16 Fraction	>C16-C34 Fraction	>C34-C40 Fraction	>C10-C40 Fraction (Total)	>C10-C16 less Naphthalene (F2)	C6-C10 Fraction	C6-C10 less BTEX (F1)
			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL			2	0.4	1	1	1	0.1	1	1	0.1	0.1	0.1	0.1	0.05	0.5	0.5	0.5	0.5	0.1	0.5	0.1	0.1		0.1	0.1	0.1	0.1	0.5	0.1	0.05	20	20	50	50	50	50	100	100	50	50	20	20
NEPM 2013 EIL - Urban Residential (generic)			100		190[#1]	60[#2]	1100		30[#3]	70[#4]																																	
NEPM 2013 ESL Urban Residential and Public Open Space, Coarse Soil															0.7[#5]																							300[#5]	2800[#5]		120[#6]		180[#6]
NEPM 2013 HSL Asbestos in Soil - Bonded ACM - Residential - HSL A																																											
NEPM 2013 HSL Asbestos in Soil - FA & AF - HSL																																											
NEPM 2013 Soil HIL A			100[#9]	20	100[#10]	6000	300[#11]	40[#12]	400	7400						3	3	3						3[#14]					300[#15]														
NEPM 2013 Soil HSL A & HSL B for Vapour Intrusion - Sand 0 to <1m																																									110[#17]		45[#18]
Field_ID	**Sampled_Date-Time**	**Lab_Report_Number**																																									
BH01_0-0.15	21/01/2019	637804	5.1	<0.4	8.8	11	39	<0.1	<5	88	<0.5	<0.5	<0.5	1.3	1	1.3	1.6	1.8	0.6	0.5	0.8	1.6	<0.5	1.566[#4]	2.8	<0.5	<0.5	<0.5	11.7	3.1	-	<20	<20	150	110	260	<50	220	<100	220	<50	<20	<20
BH02A_0-0.15	24/01/2019	637804	5.3	<0.4	14	36	37	<0.1	5.8	71	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<1.21[#9]	0.8	<0.5	<0.5	<0.5	1.6	0.8	-	-	-	-	-	-	-	-	-	-	-	-	-
BH03_0.4-0.5	21/01/2019	637804	2.8	<0.4	87	32	11	<0.1	97	64	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<1.21[#9]	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-
BH04_0.2-0.3	21/01/2019	637804	3.9	<0.4	8.7	22	47	<0.1	8.9	44	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<1.21[#9]	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<40	<20	<50	<50	<50	<50	<100	<100	<100	<50	<40	<40
BH05_1.0-1.1	21/01/2019	637804	6.7	<0.4	<5	18	23	<0.1	<5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<1.21[#9]	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-
BH06_0.4-0.5	21/01/2019	637804	17	<0.4	32	11	60	<0.1	6.6	33	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<1.21[#9]	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-
BH07_0.5-0.6	24/01/2019	637804	11	<0.4	14	23	24	<0.1	5.6	27	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<1.21[#9]	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-
BH08_0-0.15	25/01/2019	637804	6.3	<0.4	15	27	40	0.5	<5	100	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<1.21[#9]	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<20	<20	<50	<50	<50	<50	<100	<100	<100	<50	<20	<20
BH09_0.4-0.5	21/01/2019	637804	7	<0.4	12	14	27	<0.1	6.8	38	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<1.21[#9]	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-
BH10_1-1.1	21/01/2019	637804	13	1	16	26	110	<0.1	7.9	690	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<1.21[#9]	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<20	<20	<50	<50	<50	<50	<100	<100	<100	<50	<20	<20
BH11_0-0.15	21/01/2019	637804	5	<0.4	12	18	49	<0.1	12	150	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<1.21[#9]	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-
BH12_0.4-0.5	21/01/2019	637804	9.2	<0.4	15	22	24	<0.1	10	77	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<1.21[#9]	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-
BH13_0.7-0.8	25/01/2019	637804	5.7	<0.4	14	17	17	<0.1	6.7	22	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<1.21[#9]	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-
BH13-FRAG	24/01/2019	637804	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH14_0-0.15	25/01/2019	637804	6.9	<0.4	17	21	43	0.1	9.7	70	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<1.21[#9]	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-
BH15_0-0.15	21/01/2019	637804	2.9	<0.4	10	18	22	<0.1	6.1	61	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<1.21[#9]	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-
BH16_0.4-0.5	22/01/2019	637804	6.6	<0.4	11	26	37	<0.1	5.8	43	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<1.21[#9]	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-
BH17_0.4-0.5	22/01/2019	637804	4.6	<0.4	42	12	60	<0.1	<5	28	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<1.21[#9]	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-
BH18_0.7-0.8	22/01/2019	637804	4.8	<0.4	47	17	29	<0.1	41	52	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<1.21[#9]	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-
BH19_0.4-0.5	22/01/2019	637804	2.1	<0.4	12	10	14	<0.1	11	49	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<1.21[#9]	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-
BH20_1-1.1	22/01/2019	637804	15	<0.4	20	14	30	<0.1	<5	13	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<1.21[#9]	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-
BH21_0-0.15	22/01/2019	637804	6.2	<0.4	17	33	63	<0.1	9.6	160	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<1.21[#9]	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-
BH22_1-1.1	22/01/2019	637804	15	<0.4	24	16	24	<0.1	<5	23	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<1.21[#9]	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-
BH23_0.4-0.5	22/01/2019	637804	12	<0.4	16	10	28	<0.1	<5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<1.21[#9]	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-
BH24_0-0.15	22/01/2019	637804	2.6	<0.4	12	16	25	<0.1	7.5	55	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<1.21[#9]	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<20	<20	<50	130	130	<50	120	130	250	<50	<20	<20
BH25_0.5-0.6	22/01/2019	637804	14	<0.4	27	14	26	<0.1	7.1	15	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<1.21[#9]	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-
BH26_1-1.1	22/01/2019	637804	10	<0.4	17	18	44	<0.1	<5	21	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<1.21[#9]	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-
BH27_0.4-0.5	25/01/2019	637804	7.1	<0.4	16	20	47	<0.1	5.2	60	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<1.21[#9]	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-
BH28_1-1.1	22/01/2019	637804	7.5	<0.4	14	10	22	<0.1	<5	5.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<1.21[#9]	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-
BH29_0-0.15	24/01/2019	637804	4.5	<0.4	42	23	26	<0.1	44	41	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<1.21[#9]	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-
BH30_0-0.15	24/01/2019	637804	8.4	<0.4	12	19	69	<0.1	<5	51	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<1.21[#9]	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-
QA20190121RC_01	21/01/2019	210425	10	<0.4	12	42	15	<0.1	23	40	<0.1	<0.1	<0.1	0.1	0.1	<0.5	<0.5	<0.5	-	0.2	-	0.1	<0.1	0.168[#3]	0.3	<0.1	<0.1	0.2	-	0.3	1.3	<25	<50	100	410	-	<50	380	500	880	<50	<25	<25
QA20190123RC_01	23/01/2019	210425	<4	<0.4	10	14	19	<0.1	4	35	<0.1	<0.1	<0.1	0.2	0.2	<0.5	<0.5	<0.5	-	0.1	-	0.2	<0.1	0.283[#3]	0.2	<0.1	0.1	<0.1	-	0.3	1.5	<25	<50	<100	<100	-	<50	<100	<100	<50	<50	<25	<25
QA20190124RC_01	24/01/2019	210425	<4	<0.4	25	23	25	<0.1	31	30	<0.1	<0.1	<0.1	0.1	0.1	<0.5	<0.5	<0.5	-	<0.1	-	0.1	<0.1	0.1665[#3]	0.2	<0.1	<0.1	0.1	-	0.2	0.83	<25	<50	<100	<100	-	<50	<100	<100	<50	<50	<25	<25
QC20190121RC_01	21/01/2019	637848	13	<0.4	14	33	17	<0.1	23	59	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<1.21[#9]	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<20	<20	150	410	560	<50	440	400	840	<50	<20	<20
QC20190123RC_01	23/01/2019	637848	4.6	<0.4	9.7	8.6	11	<0.1	7.3	14	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<1.21[#9]	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<20	<20	<50	<50	<50	<50	<100	<100	<100	<50	<20	<20
QC20190124RC_01	24/01/2019	637848	5.1	<0.4	42	24	31	<0.1	42	41	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<1.21[#9]	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<20	<20	<50	<50	<50	<50	<100	<100	<100	<50	<20	<20

Statistical Summary

			Arsenic (Total)	Cadmium	Chromium (Total)	Copper	Lead	Mercury (Inorganic)	Nickel	Zinc	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a)pyrene	Benzo(a)pyrene TEQ (lower bound)*	Benzo(a)pyrene TEQ (medium bound)*	Benzo(a)pyrene TEQ (upper bound)*	Benzo(b,j)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Carcinogenic PAHs as B(a)P TEQ	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Phenanthrene	PAHs (Total)	Pyrene	Total Positive PAHs	C6-C9 Fraction	C10-C14 Fraction	C15-C28 Fraction	C29-C36 Fraction	C10-C36 Fraction (Total)	>C10-C16 Fraction	>C16-C34 Fraction	>C34-C40 Fraction	>C10-C40 Fraction (Total)	>C10-C16 less Naphthalene (F2)	C6-C10 Fraction	C6-C10 less BTEX (F1)
Number of Results			36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	33	36	33	36	36	36	36	36	36	36	33	36	3	11	11	11	11	8	11	11	11	11	11	11	11
Number of Detects			34	1	35	36	36	2	26	34	0	0	0	4	4	1	33	33	1	3	1	4	0	4	5	0	1	2	2	5	3	0	0	3	4	3	0	4	3	4	0	0	0
Minimum Concentration			2.1	<0.4	<5	8.6	11	<0.1	4	<5	<0.1	<0.1	<0.1	0.1	0.1	<0.5	<0.5	<0.5	<0.5	<0.1	<0.5	0.1	<0.1	0.1665	0.2	<0.1	<0.1	<0.1	<0.5	0.2	0.83	<20	<20	<50	<50	<50	<50	<100	<100	<50	<50	<20	<20
Minimum Detect			2.1	1	8.7	8.6	11	0.1	4	5.2	ND	ND	ND	0.1	0.1	1.3	0.6	1.2	0.6	0.1	0.8	0.1	ND	0.1665	0.2	ND	0.1	0.1	1.6	0.2	0.83	ND	ND	100	110	130	ND	120	130	220	ND	ND	ND
Maximum Concentration			17	1	87	42	110	0.5	97	690	<0.5	<0.5	<0.5	1.3	1	1.3	1.6	1.8	0.6	0.5	0.8	1.6	<0.5	1.566	2.8	<0.5	<0.5	<0.5	11.7	3.1	1.5	<40	<50	150	410	560	<50	440	500	880	<50	<40	<40
Maximum Detect			17	1	87	42	110	0.5	97	690	ND	ND	ND	1.3	1	1.3	1.6	1.8	0.6	0.5	0.8	1.6	ND	1.566	2.8	ND	0.1	0.2	11.7	3.1	1.5	ND	ND	150	410	560	ND	440	500	880	ND	ND	ND
Average Concentration			7.4	0.22	20	20	34	0.064	13	66	0.23	0.23	0.23	0.27	0.26	0.28	0.6	1.1	0.26	0.25	0.27	0.28	0.23	0.6	0.33	0.23	0.23	0.24	0.64	0.35	1.2	12	14	59	117	134	25	137	130	226	25	12	12
Median Concentration			6.45	0.2	14.5	18	27.5	0.05	6.75	42	0.25	0.25	0.25	0.25	0.25	0.25	0.6	1.2	0.25	0.25	0.25	0.25	0.25	0.605	0.25	0.25	0.25	0.25	0.25	0.25	1.3	10	10	25	50	25	25	50	50	50	25	10	10
Standard Deviation			4.1	0.13	16	8	20	0.075	18	113	0.056	0.056	0.056	0.18	0.13	0.18	0.2	0.29	0.061	0.06	0.096	0.23	0.056	0.2	0.43	0.056	0.052	0.042	2	0.48	0.34	3	7	50	149	192	0	145	162	323	0	3	3
Number of Guideline Exceedances			0	0	0	0	0	0	5	8	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0
Number of Guideline Exceedances(Detects Only)			0	0	0	0	0	0	5	8	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0

Env Stds Comments

#1:TV taken for Chromium (III), Clay Content of 1%
#2:TV taken for pH 4.5
#3:TV taken for CEC 5
#4:TV taken for pH 4 and CEC 5
#5:ESLs are of low reliability.
#6:ESLs are of moderate reliability.
#7:Residential A with garden/accessible soil also includes children's day care centres, preschools and primary schools.
#8:The screening level of 0.001% w/w asbestos in soil for FA and AF (i.e. non-bonded/friable asbestos) only applies where the FA and AF are able to be quantified by gravimetric procedures (refer Section 4.10). This screening level is not applicable to free fibres.
#9:Key limitations of HSL should be referred to prior to application in Friebel and Nadebaum (2011b and 2011d).
#10:TV adopted from Chromium (VI)
#11:Assumptions of HSL are presented in Friebel and Nadebaum (2011a and 2011b).
#12:Refer to HSL and soil saturation concentration limit.
#13:Sensitive setting HSL A & HSL B Sand 0m to <1m criteria adopted. Exceedence quantifies further interpretation.
#14:Refer to Section 8.2 and Appendix J in Friebel and Nadebaum (2011a).
#15:TV maybe be multiplied by a factor to account for biodegradation of vapour
#16:HIL relates to non-dioxin-like PCBs only. If PCB source is suspected a site-specific assessment should be untertaken
#17:To obtain F2 subtract naohthalene from >C10-C16.
#18:To obtain F1 subtract the sum of BTEX from C6-C10.

Data Comments

#1 No asbestos detected at the reporting limit of 0.001% w/w.*Synthetic mineral fibre detected.Organic fibre detected.No respirable fibres detected.
#2 No asbestos detected at the reporting limit of 0.001% w/w.*Organic fibre detected.No respirable fibres detected.
#3 ESDAT Combined with Non-Detect Multiplier of 0.5. Some Analytes are missing from this Combined Compound.
#4 ESDAT Combined with Non-Detect Multiplier of 0.5.
#5 Chrysotile and amosite asbestos detected.
#6 Synthetic mineral fibres detected.
#7 No respirable fibres detected.
#8 Organic fibres detected.
#9 ESDAT Combined.
#10 114x40x3
#11 Nil

Table A - Summary Analytical Results (Soil)
Project Number: 55579
Project Name: Chatswood High School DSI

			BTEXN							Organochlorine Pesticides																							
			Benzene	Ethylbenzene	Toluene	Xylene (o)	Xylene (m & p)	Xylene (Total)	Naphthalene	4,4-DDE	Aldrin	Aldrin + Dieldrin (Sum of Total)	alpha-BHC	alpha-Chlordane	beta-BHC	Chlordane	DDD	DDT	Dieldrin	DDT+DDE+DDD (Sum of Total)	delta-BHC	Endosulfan alpha	Endosulfan beta	Endosulfan sulphate	Endrin	gamma-Chlordane	Endrin aldehyde	Endrin ketone	Heptachlor	Heptachlor Epoxide	Lindane	Methoxychlor	Toxaphene
			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL			0.1	0.1	0.1	0.1	0.2	0.3	0.1	0.05	0.05	0.05	0.05	0.1	0.05	0.1	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.1	0.05	0.05	0.05	0.05	0.05	0.05	1
NEPM 2013 EIL - Urban Residential (generic)									170									180															
NEPM 2013 ESL Urban Residential and Public Open Space, Coa			50[#5]	70[#5]	85[#5]			105[#5]																									
NEPM 2013 HSL Asbestos in Soil - Bonded ACM - Residential -																																	
NEPM 2013 HSL Asbestos in Soil - FA & AF - HSL																																	
NEPM 2013 Soil HIL A					160[#13]							6				50				240					10				6			300	20
NEPM 2013 Soil HSL A & HSL B for Vapour Intrusion - Sand 0 t			0.5	55	160			40	3																								
Field_ID	**Sampled_Date-Time**	**Lab_Report_Number**																															
BH01_0-0.15	21/01/2019	637804	<0.1	<0.1	<0.1	<0.1	<0.2	<0.3	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH02A_0-0.15	24/01/2019	637804	-	-	-	-	-	-	<0.5	<0.05	<0.05	<0.05	<0.05	-	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<1
BH03_0.4-0.5	21/01/2019	637804	-	-	-	-	-	-	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH04_0.2-0.3	21/01/2019	637804	<0.2	<0.2	<0.2	<0.2	<0.4	<0.6	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH05_1.0-1.1	21/01/2019	637804	-	-	-	-	-	-	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH06_0.4-0.5	21/01/2019	637804	-	-	-	-	-	-	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH07_0.5-0.6	24/01/2019	637804	-	-	-	-	-	-	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH08_0-0.15	25/01/2019	637804	<0.1	<0.1	<0.1	<0.1	<0.2	<0.3	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH09_0.4-0.5	21/01/2019	637804	-	-	-	-	-	-	<0.5	<0.05	<0.05	<0.05	<0.05	-	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<1
BH10_1-1.1	21/01/2019	637804	<0.1	<0.1	<0.1	<0.1	<0.2	<0.3	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH11_0-0.15	21/01/2019	637804	-	-	-	-	-	-	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH12_0.4-0.5	21/01/2019	637804	-	-	-	-	-	-	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH13_0.7-0.8	25/01/2019	637804	-	-	-	-	-	-	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH13-FRAG	24/01/2019	637804	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH14_0-0.15	25/01/2019	637804	-	-	-	-	-	-	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH15_0-0.15	21/01/2019	637804	-	-	-	-	-	-	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH16_0.4-0.5	22/01/2019	637804	-	-	-	-	-	-	<0.5	<0.05	<0.05	<0.05	<0.05	-	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<1
BH17_0.4-0.5	22/01/2019	637804	-	-	-	-	-	-	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH18_0.7-0.8	22/01/2019	637804	-	-	-	-	-	-	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH19_0.4-0.5	22/01/2019	637804	-	-	-	-	-	-	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH20_1-1.1	22/01/2019	637804	-	-	-	-	-	-	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH21_0-0.15	22/01/2019	637804	-	-	-	-	-	-	<0.5	<0.05	<0.05	<0.05	<0.05	-	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<1
BH22_1-1.1	22/01/2019	637804	-	-	-	-	-	-	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH23_0.4-0.5	22/01/2019	637804	-	-	-	-	-	-	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH24_0-0.15	22/01/2019	637804	<0.1	<0.1	<0.1	<0.1	<0.2	<0.3	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH25_0.5-0.6	22/01/2019	637804	-	-	-	-	-	-	<0.5	<0.05	<0.05	<0.05	<0.05	-	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<1
BH26_1-1.1	22/01/2019	637804	-	-	-	-	-	-	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH27_0.4-0.5	25/01/2019	637804	-	-	-	-	-	-	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH28_1-1.1	22/01/2019	637804	-	-	-	-	-	-	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH29_0-0.15	24/01/2019	637804	-	-	-	-	-	-	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH30_0-0.15	24/01/2019	637804	-	-	-	-	-	-	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
QA20190121RC_01	21/01/2019	210425	<0.2	<1	<0.5	<1	<2	<1	<0.1	<0.1	<0.1	<0.2[#9]	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	-
QA20190123RC_01	23/01/2019	210425	<0.2	<1	<0.5	<1	<2	<1	<0.1	<0.1	<0.1	<0.2[#9]	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	-
QA20190124RC_01	24/01/2019	210425	<0.2	<1	<0.5	<1	<2	<1	<0.1	<0.1	<0.1	<0.2[#9]	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	-
QC20190121RC_01	21/01/2019	637848	<0.1	<0.1	<0.1	<0.1	<0.2	<0.3	<0.5	<0.05	<0.05	<0.05	<0.05	-	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<1
QC20190123RC_01	23/01/2019	637848	<0.1	<0.1	<0.1	<0.1	<0.2	<0.3	<0.5	<0.05	<0.05	<0.05	<0.05	-	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<1
QC20190124RC_01	24/01/2019	637848	<0.1	<0.1	<0.1	<0.1	<0.2	<0.3	<0.5	<0.05	<0.05	<0.05	<0.05	-	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<1

			Polychlorinated Biphenyls								Chlorinated Benzenes	Asbestos										Other		A VIC - IWRG6	
			Aroclor 1016	Aroclor 1221	Aroclor 1232	Aroclor 1242	Aroclor 1248	Aroclor 1254	Aroclor 1260	PCBs (Total)	Hexachlorobenzene	Approx. Sample Mass	Asbestos from ACM in Soil	Asbestos from FA & AF in Soil	Mass ACM	Mass Asbestos in ACM	Mass FA	Mass Asbestos in FA	Mass AF	Mass Asbestos in AF	Mass Asbestos in FA & AF	% Moisture 103oC	Moisture	Organochlorine Pesticides EPAVic	Other Organochlorine Pesticides EPAVic
			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	g	%w/w	%w/w	g	g	g	g	g	g	g	%	%	mg/kg	mg/kg
EQL			0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.05											1	0.1	0.1	0.1
NEPM 2013 EIL - Urban Residential (generic)																									
NEPM 2013 ESL Urban Residential and Public Open Space, Coa																									
NEPM 2013 HSL Asbestos in Soil - Bonded ACM - Residential -													0.01[#7]												
NEPM 2013 HSL Asbestos in Soil - FA & AF - HSL														0.001[#8]											
NEPM 2013 Soil HIL A										1[#16]	10														
NEPM 2013 Soil HSL A & HSL B for Vapour Intrusion - Sand 0 t																									
Field_ID	**Sampled_Date-Time**	**Lab_Report_Number**																							
BH01_0-0.15	21/01/2019	637804	-	-	-	-	-	-	-	-	-	617	0	0	0	0	0	0	0	0	0	17	-	-	-
BH02A_0-0.15	24/01/2019	637804	-	-	-	-	-	-	-	-	<0.05	516	0	0	0	0	0	0	0	0	0	14	-	<0.1	<0.1
BH03_0.4-0.5	21/01/2019	637804	-	-	-	-	-	-	-	-	-	629	0	0	0	0	0	0	0	0	0	16	-	-	-
BH04_0.2-0.3	21/01/2019	637804	-	-	-	-	-	-	-	-	-	484	0	0	0	0	0	0	0	0	0	26	-	-	-
BH05_1.0-1.1	21/01/2019	637804	-	-	-	-	-	-	-	-	-	874	0	0	0	0	0	0	0	0	0	11	-	-	-
BH06_0.4-0.5	21/01/2019	637804	-	-	-	-	-	-	-	-	-	669	0	0	0	0	0	0	0	0	0	19	-	-	-
BH07_0.5-0.6	24/01/2019	637804	-	-	-	-	-	-	-	-	-	763	0	0	0	0	0	0	0	0	0	13	-	-	-
BH08_0-0.15	25/01/2019	637804	-	-	-	-	-	-	-	-	-	722	0	0	0	0	0	0	0	0	0	13	-	-	-
BH09_0.4-0.5	21/01/2019	637804	-	-	-	-	-	-	-	-	<0.05	669	0	0	0	0	0	0	0	0	0	14	-	<0.1	<0.1
BH10_1-1.1	21/01/2019	637804	-	-	-	-	-	-	-	-	-	715	0	0	0	0	0	0	0	0	0	13	-	-	-
BH11_0-0.15	21/01/2019	637804	-	-	-	-	-	-	-	-	-	636	0	0	0	0	0	0	0	0	0	18	-	-	-
BH12_0.4-0.5	21/01/2019	637804	-	-	-	-	-	-	-	-	-	599	0	0	0	0	0	0	0	0	0	14	-	-	-
BH13_0.7-0.8	25/01/2019	637804	-	-	-	-	-	-	-	-	-	669	0	0	0	0	0	0	0	0	0	17	-	-	-
BH13-FRAG	24/01/2019	637804	-	-	-	-	-	-	-	-	-	17	0	0	0	0	0	0	0	0	0	-	-	-	-
BH14_0-0.15	25/01/2019	637804	-	-	-	-	-	-	-	-	-	621	0	0	0	0	0	0	0	0	0	16	-	-	-
BH15_0-0.15	21/01/2019	637804	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	493	0	0	0	0	0	0	0	0	0	32	-	-	-
BH16_0.4-0.5	22/01/2019	637804	-	-	-	-	-	-	-	-	<0.05	753	0	0	0	0	0	0	0	0	0	10	-	<0.1	<0.1
BH17_0.4-0.5	22/01/2019	637804	-	-	-	-	-	-	-	-	-	676	0	0	0	0	0	0	0	0	0	23	-	-	-
BH18_0.7-0.8	22/01/2019	637804	-	-	-	-	-	-	-	-	-	600	0	0	0	0	0	0	0	0	0	17	-	-	-
BH19_0.4-0.5	22/01/2019	637804	-	-	-	-	-	-	-	-	-	742	0	0	0	0	0	0	0	0	0	17	-	-	-
BH20_1-1.1	22/01/2019	637804	-	-	-	-	-	-	-	-	-	609	0	0	0	0	0	0	0	0	0	31	-	-	-
BH21_0-0.15	22/01/2019	637804	-	-	-	-	-	-	-	-	<0.05	708	0	0	0	0	0	0	0	0	0	10	-	<0.1	<0.1
BH22_1-1.1	22/01/2019	637804	-	-	-	-	-	-	-	-	-	489	0	0	0	0	0	0	0	0	0	20	-	-	-
BH23_0.4-0.5	22/01/2019	637804	-	-	-	-	-	-	-	-	-	664	0	0	0	0	0	0	0	0	0	16	-	-	-
BH24_0-0.15	22/01/2019	637804	-	-	-	-	-	-	-	-	-	798	0	0	0	0	0	0	0	0	0	16	-	-	-
BH25_0.5-0.6	22/01/2019	637804	-	-	-	-	-	-	-	-	<0.05	496	0	0	0	0	0	0	0	0	0	20	-	<0.1	<0.1
BH26_1-1.1	22/01/2019	637804	-	-	-	-	-	-	-	-	-	552	0	0	0	0	0	0	0	0	0	27	-	-	-
BH27_0.4-0.5	25/01/2019	637804	-	-	-	-	-	-	-	-	-	790	0	0	0	0	0	0	0	0	0	12	-	-	-
BH28_1-1.1	22/01/2019	637804	-	-	-	-	-	-	-	-	-	465	0	0	0	0	0	0	0	0	0	18	-	-	-
BH29_0-0.15	24/01/2019	637804	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	654	0	0	0	0	0	0	0	0	0	9.7	-	-	-
BH30_0-0.15	24/01/2019	637804	-	-	-	-	-	-	-	-	-	542	0	0	0	0	0	0	0	0	0	16	-	-	-
QA20190121RC_01	21/01/2019	210425	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	-	-	-	-	6.1	-	-
QA20190123RC_01	23/01/2019	210425	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	-	-	-	-	18	-	-
QA20190124RC_01	24/01/2019	210425	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	-	-	-	-	7.9	-	-
QC20190121RC_01	21/01/2019	637848	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	887	0	0	0	0	0	0	0	0	0	8.8	-	<0.1	<0.1
QC20190123RC_01	23/01/2019	637848	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	668	0	0	0	0	0	0	0	0	0	9.1	-	<0.1	<0.1
QC20190124RC_01	24/01/2019	637848	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	635	0	0	0	0	0	0	0	0	0	11	-	<0.1	<0.1

Statistical Summary

Number of Results	11	11	11	11	11	11	36	11	11	11	11	3	11	8	11	11	11	11	11	11	11	11	11	3	11	8	11	11	11	11	8
Number of Detects	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minimum Concentration	<0.1	<0.1	<0.1	<0.1	<0.2	<0.3	<0.1	<0.05	<0.05	<0.05	<0.05	<0.1	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<1
Minimum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration	<0.2	<1	<0.5	<1	<2	<1	<0.5	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.1	<0.1	<0.1	<0.1	<1
Maximum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Average Concentration	0.068	0.18	0.11	0.18	0.35	0.26	0.23	0.032	0.032	0.045	0.032	0.05	0.032	0.05	0.032	0.032	0.032	0.032	0.032	0.032	0.032	0.032	0.032	0.05	0.032	0.025	0.032	0.032	0.032	0.032	0.5
Median Concentration	0.05	0.05	0.05	0.05	0.1	0.15	0.25	0.025	0.025	0.025	0.025	0.05	0.025	0.05	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.05	0.025	0.025	0.025	0.025	0.025	0.025	0.5
Standard Deviation	0.025	0.21	0.092	0.21	0.42	0.16	0.056	0.012	0.012	0.035	0.012	0	0.012	0	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0	0.012	0	0.012	0.012	0.012	0.012	0
Number of Guideline Exceedances	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of Guideline Exceedances(Detects Only)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Number of Results	8	8	8	8	8	8	8	8	11	34	34	34	34	34	34	34	34	34	34	33	3	8	8
Number of Detects	0	0	0	0	0	0	0	0	0	34	34	34	34	34	34	34	34	34	34	33	3	0	0
Minimum Concentration	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	17	0	0	0	0	0	0	0	0	0	8.8	6.1	<0.1	<0.1
Minimum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	17	ND	ND	ND	ND	ND	ND	ND	ND	ND	8.8	6.1	ND	ND
Maximum Concentration	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	887	0	0	0	0	0	0	0	0	0	32	18	<0.1	<0.1
Maximum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	887	ND	ND	ND	ND	ND	ND	ND	ND	ND	32	18	ND	ND
Average Concentration	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.032	630	0	0	0	0	0	0	0	0	0	17	11	0.05	0.05
Median Concentration	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.025	645	0	0	0	0	0	0	0	0	0	16	7.9	0.05	0.05
Standard Deviation	0	0	0	0	0	0	0	0	0.012	152	0	0	0	0	0	0	0	0	0	5.9	6.4	0	0
Number of Guideline Exceedances	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of Guideline Exceedances(Detects Only)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Env Stds Comments

#1:TV taken for Chromium (III), Clay Content of 1%
#2:TV taken for pH 4.5
#3:TV taken for CEC 5
#4:TV taken for pH 4 and CEC 5
#5:ESLs are of low reliability.
#6:ESLs are of moderate reliability.
#7:Residential A with garden/accessible soil also includes childr
#8:The screening level of 0.001% w/w asbestos in soil for FA an
#9:Key limitations of HSL should be referred to prior to applicat
#10:TV adopted from Chromium (VI)
#11:Assumptions of HSL are presented in Friebel and Nadebau
#12:Refer to HSL and soil saturation concentration limit.
#13:Sensitive setting HSL A & HSL B Sand 0m to <1m criteria ad
#14:Refer to Section 8.2 and Appendix J in Friebel and Nadeba
#15:TV maybe be multiplied by a factor to account for biodegr
#16:HIL relates to non-dioxin-like PCBs only. If PCB source is su
#17:To obtain F2 subtract naohthalene from >C10-C16.
#18:To obtain F1 subtract the sum of BTEX from C6-C10.

Data Comments

#1 No asbestos detected at the reporting limit of 0.001% w/w.
#2 No asbestos detected at the reporting limit of 0.001% w/w.
#3 ESDAT Combined with Non-Detect Multiplier of 0.5. Some
#4 ESDAT Combined with Non-Detect Multiplier of 0.5.
#5 Chrysotile and amosite asbestos detected.
#6 Synthetic mineral fibres detected.
#7 No respirable fibres detected.
#8 Organic fibres detected.
#9 ESDAT Combined.
#10 114x40x3
#11 Nil

Table K1: Summary of Laboratory Results for Soil Analysis

Sample	Soil Type (C=coarse F=fine)	Date Sampled	Heavy Metals									PAH						TRH/TPH ^{i}	
			As	Cd	Cr ^{c}	Cu	Pb	TCLP Pb	Hg	Ni	Zn	total ^{d}	TCLP total	BaP TEQ	BaP	TCLP BaP	Naphthalene	C_6 - C_9	C_{10} - C_{36} ^{e}
			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/L	mg/kg	mg/kg	mg/kg	mg/kg	mg/L	mg/kg	mg/kg	mg/L	mg/kg	mg/kg	mg/kg
Soil Assessment Criteria (SAC) - NEPM (as amended 2013) (refer to report body for details)																			
Residential with Accessible Soil																			
HIL A			100	20	100 ^{c}	6,000	300		40	400	7,400	300		3					
EIL/ ESL	coarse		100		250	110	1,100			35	250				0.7		170		
EIL/ ESL	fine		100		640	110	1,100			270	290				0.7		170		
Management Limit	coarse																		
Management Limit	fine																		
HSL A&B, vapour intrusion, 0-<1m, sand																	3		
HSL A&B, vapour intrusion, 0-<1m, clay																	5		
HSL A, direct contact																	1,400		
Waste Classification Thresholds																			
General Solid	CT1		100	20	100		100		4	40		200			0.8			650	10,000
	SCC1/TCLP1		500	100	1,900		1,500	5	50	1,050		200			10	0.04		650	10,000
Restricted Solid	CT2		400	80	400		400		16	160		800			3.2			2,600	40,000
	SCC2/TCLP2		2,000	400	7,600		6,000	20	200	4,200		800			23	0.16		2,600	40,000
Published Background Ranges for Assessment of Natural Soils																			
NEPC (1999)			1-50	1	5-1000	2-100	2-200		0.03	5-500	10-300								
ANZECC (1992)			0.2-30	0.04-2	0.5-110	1-190	<2-200		0.001-0.1	2-400	2-180	0.95-5							
ANZECC (2000)			1-53	0.016-0.78	2.5-673	0.4-412	2-81			1-517	1-263								
Laboratory Results																			
High School																			
1 / 0.5-0.6	filling-F	22/01/18	6	<0.4	12	20	52		<0.1	8	280	<0.05		<0.5	<0.05		<0.1	<25	<250
REPLICATE1-220118	filling-F	22/01/18	13	<0.4	16	27	58		<0.1	13	490	<0.5		<0.5	<0.5		<0.5		
2 / 0.1	silty clay?	23/01/18	4	<0.4	14	13	70		<0.1	3	86	0.2		<0.5	<0.05		<0.1	<25	195
3 / 0-0.1	silty clay?	23/01/18	5	<0.4	12	14	18		<0.1	3	15	0.51		<0.5	0.09		<0.1	<25	<250
Replicate 6	silty clay?	23/01/18	5	<0.4	12	15	33		<0.1	4	28	2.6		<0.5	0.2		<0.1		
4 / 0-0.1	filling-C	22/01/18	9	<0.4	11	25	62		0.1	7	120	8		1	0.73		<0.1	<25	<250
5 / 1-1.1	filling-F	22/01/18	7	<0.4	14	18	26		<0.1	7	34	<0.05		<0.5	<0.05		<0.1	<25	<250
6 / 0.2-0.3	silty clay	22/01/18	<4	<0.4	5	8	16		<0.1	1	3	<0.05		<0.5	<0.05		<0.1	<25	<250
7 / 0-0.1	filling-C	23/01/18	7	<0.4	28	36	38		<0.1	25	83	0.1		<0.5	<0.05		<0.1	<25	<250
7 / 0.5-0.6	filling-F	23/01/18	7	<0.4	12	30	**130**	0.07	<0.1	8	82	<0.05		<0.5	<0.05		<0.1	<25	<250
8 / 0-0.1	filling-C	23/01/18	<4	<0.4	41	51	15		<0.1	**46**	59	0.2		<0.5	<0.05		<0.1	<25	770
8 / 0.7-0.8	filling-F	23/01/18	8	<0.4	10	19	16		<0.1	7	31	<0.05		<0.5	<0.05		<0.1	<25	<250
9 / 0.2-0.3	filling-F	22/01/18	12	<0.4	8	56	8		<0.1	33	35	<0.05		<0.5	<0.05		<0.1	<25	775
10 / 2-2.1	filling-F	22/01/18	8	<0.4	13	21	24		<0.1	9	53	0.3		<0.5	0.06		<0.1	<25	<250
11 / 0-0.1	filling-C	23/01/18	6	<0.4	11	21	27		<0.1	5	40	46	0.004	**5.6**	**3.9**	<0.001	<1 - 0.6	<25	225
12 / 0-0.1	filling-C	23/01/18	<4	<0.4	21	35	11		<0.1	25	34	4.1		<0.5	0.3		<0.1	<25	835
Public School and Bush Campus																			
13 / 0.0-0.1	filling-C	23/01/18	4	<0.4	9	45	95		0.4	7	97	23	NIL (+)VE	**3.2**	**2.2**	<0.001	<0.1	<25	120
Replicate 4	filling-C	23/01/18	4	<0.4	16	34	88		0.4	11	83	27		**3.4**	**2.3**		0.2		
13 / 0.4-0.5	filling-C	23/01/18	5	<0.4	18	35	52		0.2	9	82	6.1		1	0.64		<0.1	<25	<250
14 / 0.0-0.1	filling-F	23/01/18	5	<0.4	10	23	29		<0.1	4	64	<0.05		<0.5	<0.05		<0.1	<25	<250
15 / 0-0.1	filling-F	19/01/18	5	<0.4	9	31	18		<0.1	10	62	<0.05		<0.5	<0.05		<0.1	<25	120
16 / 0.0-0.1	filling-C	24/01/18	6	<0.4	8	89	**130**	0.08	<0.1	8	58	86	NIL (+)VE	**16**	**11**	<0.001	0.3	<25	570
17 / 0.3-0.4	silty clay?	24/01/18	<4	<0.4	20	2	22		<0.1	3	5	3.4		0.5	0.4		<0.1	<25	<250
18 / 0.5	filling-F	23/01/18	<4	<0.4	30	39	31		<0.1	34	44	**470**		**44**	**30**		**8**	<25	1,440
18 / 1.0-1.1	filling-F	23/01/18	<4	<0.4	13	16	25		<0.1	5	14	**620**	0.08	**56**	**38**	<0.001	**9.2**	<25	1,800
18 / 1.5	filling-F	23/01/18										190		**17**	**12**		3	<25	620
19 / 0-0.1	filling-C	19/01/18	<4	<0.4	9	20	62		<0.1	5	80	22		2.1	**1.4**		<0.1	<25	<250
20 / 0.0-0.1	filling-C	24/01/18	<4	<0.4	16	28	24		0.1	19	48	0.94		<0.5	0.08		<0.1	<25	1,470
21 / 0.0-0.1	filling-C	24/01/18	<4	<0.4	35	22	61		<0.1	38	48	**460**	0.004	**57**	**39**	<0.001	0.7	<25	4,100
21 / 1-1.1	silty clay?	24/01/18										14		1.7	**1.2**		<0.1	<25	<250
22 / 0.3-0.4	filling-F	24/01/18	<4	<0.4	19	12	66		<0.1	6	30	15		2.8	**1.8**		<0.1	<25	<250
23 / 0-0.1	filling-F	19/01/18	5	<0.4	10	19	81		<0.1	5	69	31		**3.4**	**2.3**		0.1	<25	110
24 / 0.3-0.4	filling-F	24/01/18	4	<0.4	13	21	**150**	0.06	0.2	7	100	23	NIL (+)VE	**3.5**	**2.3**	<0.001	<0.1	<25	440
25 / 0.2-0.3	filling-C	24/01/18	<4	<0.4	4	2	3		<0.1	1	3	<0.05		<0.5	<0.05		<0.1	<25	<250
26 / 0.2-0.3	filling-C	24/01/18	7	<0.4	12	16	26		<0.1	6	48	4.6		0.6	0.4		<0.1	<25	280
27 / 0-0.3	filling-C	19/01/18	5	0.5	16	170	**120**		0.1	7	1,000	0.3		<0.5	0.06		<0.1	<25	4,395
28 / 0.4-0.45	filling-C	19/01/18	<4	<0.4	29	26	91		<0.1	19	150	21	NIL (+)VE	2.9	**1.9**	<0.001	0.1	<25	760
REPLICATE1-190118	filling-C	19/01/18	3.6	< 0.4	13	23	85		< 0.1	9.8	170	15.7		2.2	**1.7**		< 0.5		

Table K1: Summary of Laboratory Results for Soil A

Sample	Soil Type (C=coarse F=fine)	Date Sampled	TRH (NEPM 2013)[i]						TPH (NEPM 2013) (silica gel clean up)			BTEX				phenol	PCB[d]	OCP[d]	OPP	asbestos
			C6-C10	>C10-C16	C6 – C10 less BTEX (F1)	>C10-C16 less naphthalene (F2)	>C16-C34 (F3)	>C34-C40 (F4)	>C10-C16[j] (F2)	>C16-C34 (F3	>C34-C40 (F4	Benzene	Toluene	Ethylbenzene	xylene[e]					
			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	0.1g/kg
Soil Assessment Criteria (SAC) - NEPM (as amendec																				
Residential with Accessible Soil																				
HIL A																3,000	1	6	340	
EIL/ ESL	coarse			120	180		300	2,800	120	300	2,800	50	85	70	105			180 (DDT)		
EIL/ ESL	fine			120	180		1,300	5,600	120	1,300	5,600	65	105	125	45			180 (DDT)		
Management Limit	coarse		700	1,000			2,500	10,000	1,000	2,500	10,000									
Management Limit	fine		800	1,000			3,500	10,000	1,000	3,500	10,000									
HSL A&B, vapour intrusion, 0-<1m, sand					45	110			110			0.5	160	55	40					
HSL A&B, vapour intrusion, 0-<1m, clay					50	280			280			0.7	480	NL	110					
HSL A, direct contact					4,400	3,300	4,500	6,300	3,300	4,500	6,300	100	14,000	4,500	12,000					
Waste Classification Thresholds																				
General Solid	CT1											10	288	600	1,000	288	<50	<50[f]	4[g]	nil
	SCC1/TCLP1											18	518	1,080	1,800	518	<50	<50[f]	7.5[g]	nil
Restricted Solid	CT2											40	1,152	2,400	4,000	1,152	<50	<50[f]	16[g]	nil
	SCC2/TCLP2											72	2,073	4,320	7,200	2,070	<50	<50[f]	30[g]	nil
Published Background Ranges for Assessment of N																				
NEPC (1999)																				
ANZECC (1992)												0.05 - 1	0.1 - 1			0.03 – 0.5	0.02 – 0.1	<0.001 - <0.97		
ANZECC (2000)																				
Laboratory Results																				
High School																				
1 / 0.5-0.6	filling-F	22/01/18	<25	<50	<25	<50	<100	<100				<0.2	<0.5	<1	<1	<5	<0.1	<0.1	<0.1	NAD
REPLICATE1-220118	filling-F	22/01/18																		
2 / 0.1	silty clay?	23/01/18	<25	<50	<25	<50	<100	120				<0.2	<0.5	<1	<1	<5	<0.1	<0.1	<0.1	NAD
3 / 0-0.1	silty clay?	23/01/18	<25	<50	<25	<50	<100	<100				<0.2	<0.5	<1	<1	<5	<0.1	<0.1	<0.1	NAD
Replicate 6	silty clay?	23/01/18																		
4 / 0-0.1	filling-C	22/01/18	<25	<50	<25	<50	<100	<100				<0.2	<0.5	<1	<1	<5	<0.1	<0.1	<0.1	NAD
5 / 1-1.1	filling-F	22/01/18	<25	<50	<25	<50	<100	<100				<0.2	<0.5	<1	<1	<5	<0.1	<0.1	<0.1	NAD
6 / 0.2-0.3	silty clay	22/01/18	<25	<50	<25	<50	<100	<100				<0.2	<0.5	<1	<1	<5	<0.1	<0.1	<0.1	
7 / 0-0.1	filling-C	23/01/18	<25	<50	<25	<50	<100	<100				<0.2	<0.5	<1	<1	<5	<0.1	<0.1	<0.1	NAD
7 / 0.5-0.6	filling-F	23/01/18	<25	<50	<25	<50	<100	<100				<0.2	<0.5	<1	<1	<5	<0.1	<0.1	<0.1	
8 / 0-0.1	filling-C	23/01/18	<25	<50	<25	<50	600	570				<0.2	<0.5	<1	<1	<5	<0.1	<0.1	<0.1	NAD
8 / 0.7-0.8	filling-F	23/01/18	<25	<50	<25	<50	<100	<100				<0.2	<0.5	<1	<1	<5	<0.1	<0.1	<0.1	NAD
9 / 0.2-0.3	filling-F	22/01/18	<25	<50	<25	<50	550	700				<0.2	<0.5	<1	<1	<5	<0.1	<0.1	<0.1	NAD
10 / 2-2.1	filling-F	22/01/18	<25	<50	<25	<50	<100	<100				<0.2	<0.5	<1	<1	<5	<0.1	<0.1	<0.1	NAD
11 / 0-0.1	filling-C	23/01/18	<25	<50	<25	<50	210	<100				<0.2	<0.5	<1	<1	<5	<0.2	<0.1	<0.1	NAD
12 / 0-0.1	filling-C	23/01/18	<25	<50	<25	<50	530	800				<0.2	<0.5	<1	<1	<5	<0.1	<0.1	<0.1	NAD
Public School and Bush Campus																				
13 / 0.0-0.1	filling-C	23/01/18	<25	<50	<25	<50	160	<100				<0.2	<0.5	<1	<1	<5	<0.1	<0.1	<0.1	NAD
Replicate 4	filling-C	23/01/18																		
13 / 0.4-0.5	filling-C	23/01/18	<25	<50	<25	<50	<100	<100				<0.2	<0.5	<1	<1					NAD
14 / 0.0-0.1	filling-F	23/01/18	<25	<50	<25	<50	<100	<100				<0.2	<0.5	<1	<1	<5	<0.1	<0.1	<0.1	NAD
15 / 0-0.1	filling-F	19/01/18	<25	<50	<25	<50	100	<100				<0.2	<0.5	<1	<1	<5	<0.1	<0.1	<0.1	NAD
16 / 0.0-0.1	filling-C	24/01/18	<25	<50	<25	<50	500	140				<0.2	<0.5	<1	<1	<5	<0.5	<0.1	<0.1	NAD
17 / 0.3-0.4	silty clay?	24/01/18	<25	<50	<25	<50	<100	<100				<0.2	<0.5	<1	<1	<5	<0.1	<0.1	<0.1	
18 / 0.5	filling-F	23/01/18	<25	87	<25	79	1,300	210				<0.2	<0.5	<1	<1					NAD
18 / 1.0-1.1	filling-F	23/01/18	<25	140	<25	**130**	1,600	220	89	940	<100	<0.2	<0.5	<1	<1	<5	<1	<0.1	<0.1	NAD
18 / 1.5	filling-F	23/01/18	<25	<50	<25	<50	570	<100				<0.2	<0.5	<1	<1					
19 / 0-0.1	filling-C	19/01/18	<25	<50	<25	<50	<100	<100				<0.2	<0.5	<1	<1	<5	<0.1	<0.1	<0.1	NAD
20 / 0.0-0.1	filling-C	24/01/18	<25	<50	<25	<50	1,100	1,100				<0.2	<0.5	<1	<1	<5	<0.1	<0.1	<0.1	NAD
21 / 0.0-0.1	filling-C	24/01/18	<25	80	<25	80	**3,500**	1,900	<50	1,400	790	<0.2	<0.5	<1	<1	<5	<1	<1	<1	NAD
21 / 1-1.1	silty clay?	24/01/18	<25	<50	<25	<50	<100	<100				<0.2	<0.5	<1	<1					
22 / 0.3-0.4	filling-F	24/01/18	<25	<50	<25	<50	<100	<100				<0.2	<0.5	<1	<1	<5	<0.1	<0.1	<0.1	
23 / 0-0.1	filling-F	19/01/18	<25	<50	<25	<50	160	<100				<0.2	<0.5	<1	<1	<5	<0.1	<0.1	<0.1	NAD
24 / 0.3-0.4	filling-F	24/01/18	<25	<50	<25	<50	350	280				<0.2	<0.5	<1	<1	<5	<0.1	<0.1	<0.1	NAD
25 / 0.2-0.3	filling-C	24/01/18	<25	<50	<25	<50	<100	<100				<0.2	<0.5	<1	<1	<5	<0.1	<0.1	<0.1	NAD
26 / 0.2-0.3	filling-C	24/01/18	<25	<50	<25	<50	300	240				<0.2	<0.5	<1	<1	<5	<0.1	<0.1	<0.1	NAD
27 / 0-0.3	filling-C	19/01/18	<25	100	<25	100	**2,800**	2,000	<50	230	<100	<0.2	<0.5	<1	<1	98	<0.1	<0.1	<0.1	NAD
28 / 0.4-0.45	filling-C	19/01/18	<25	<50	<25	<50	580	570				<0.2	<0.5	<1	<1	<5	<0.1	<0.1	<0.1	NAD
REPLICATE1-190118	filling-C	19/01/18																		

Appendix A Photographic Log

1. EASTERN ENTRANCE VIA OLIVER ROAD – 09.01.2019

2. FOOTBALL FIELD WITH THE ADJACENT BASKETBALL COURT – 09.01.2019

3. PARKING LOT FACING WEST – 09.01.2019

4. SOUTHERN ENTRANCE ONTO FOOTBALL FIELD – 09.01.2019

JBS&G

Job No: 55579	
Client: Pells Sullivan Meynink	
Version: R01 Rev A	Date: 05.02.2019
Drawn By: MN	Checked By: DD

Not to Scale

Coord. Sys n/a

Chatswood High School

24 Centennial Avenue,
Chatswood, NSW

ATTACHMENT 2: PHOTO LOG

1. BH04 CONCRETE CORING – 21.01.2019

2. BH04 EXCAVATOR WITH SOLID FLIGHT AUGER – 21.01.2019

3. BH04 DRILLING – 21.01.2019

4. BH04 HOLE PATCH UP– 25.01.2019

JBS&G

Job No: 55579

Client: Pells Sullivan Meynink

Version: R01 Rev A	Date: 05.02.2019
Drawn By: MN	Checked By: DD

Not to Scale

Coord. Sys n/a

Chatswood High School

24 Centennial Avenue,
Chatswood, NSW

ATTACHMENT 2: PHOTO LOG

1. BASKETBALL COURT OVERVIEW – 22.01.2019

2. BH17 DRILLING – 22.01.2019

3. BH20 EXCAVATED SOIL – 22.01.2019

4. BH20 ISOLATED PATCHED HOLE WITH WARNING TAPE – 23.01.2019

JBS&G

Job No: 55579	
Client: Pells Sullivan Meynink	
Version: R01 Rev A	Date: 05.02.2019
Drawn By: MN	Checked By: DD

Not to Scale

Coord. Sys n/a

Chatswood High School

24 Centennial Avenue,
Chatswood, NSW

ATTACHMENT 2: PHOTO LOG

1. BH13 BOREHOLE LOCATION – 21.01.2019

2. ACM FRAGMENT FOUND ON THE SURFACE 5 METERS TO THE WEST OF BH13 - 25.01.2019

3. ACM FRAGMENT FOUND ON THE SURFACE 5 METERS TO THE WEST OF BH13 - 25.01.2019

4. ACM FRAGMENT FOUND ON THE SURFACE 5 METERS TO THE WEST OF BH13 - 25.01.2019

JBS&G

Job No: 55579

Client: Pells Sullivan Meynink

Version: R01 Rev A	Date: 05.02.2019
Drawn By: MN	Checked By: DD

Not to Scale

Coord. Sys n/a

Chatswood High School

24 Centennial Avenue,
Chatswood, NSW

ATTACHMENT 2: PHOTO LOG

1. BH08 DIFFERENT TYPES OF SOIL – 25.01.2019

2. BH23 SILTY SOIL MATERIAL – 22.01.2019

3. BH02 HAND AUGER – 24.01.2019

4. BH20 DIFFERENT SOIL MATERIAL – 22.01.2019

JBS&G

Job No: 55579

Client: Pells Sullivan Meynink

Version: R01 Rev A	Date: 05.02.2019
Drawn By: MN	Checked By: DD

Not to Scale

Coord. Sys n/a

Chatswood High School

24 Centennial Avenue,
Chatswood, NSW

ATTACHMENT 2: PHOTO LOG

1. BH23 EXCAVATED SOIL WITH METAL PIECE AT THE BOTTOM RIGHT – 22.01.2019

2. BH23 METAL PIECE FOUND IN FILL MATERIAL – 22.01.2019

4. BH17, BH18 GEOFABRIC MATERIAL FOUND IN FILL – 22.01.2019

Job No: 55579

Client: Pells Sullivan Meynink

Version: R01 Rev A

Date: 05.02.2019

Drawn By: MN

Checked By: DD

Not to Scale

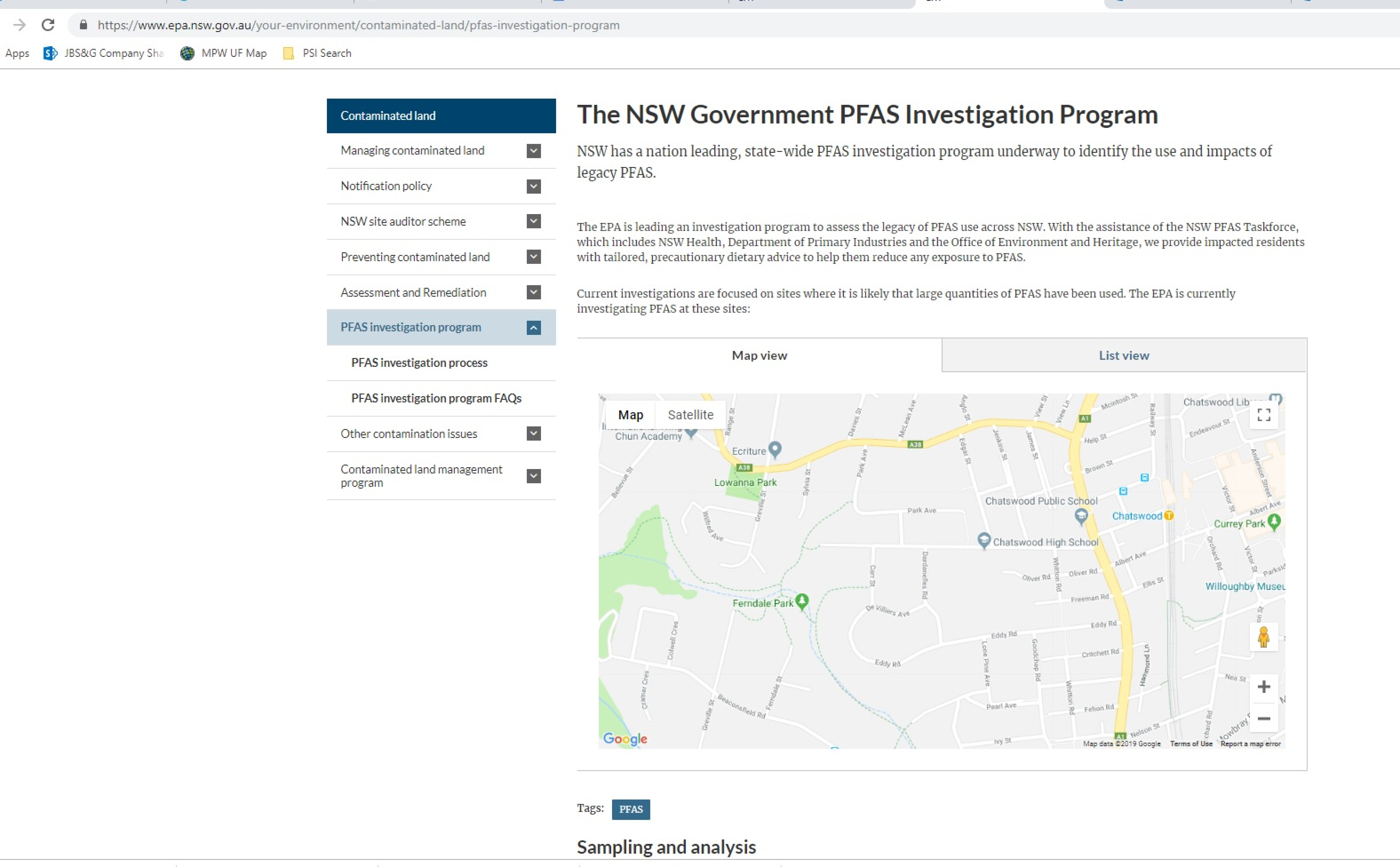
Coord. Sys n/a

Chatswood High School

24 Centennial Avenue,
Chatswood, NSW

ATTACHMENT 2: PHOTO LOG

Appendix B PFAS Register



The NSW Government PFAS Investigation Program

NSW has a nation leading, state-wide PFAS investigation program underway to identify the use and impacts of legacy PFAS.

The EPA is leading an investigation program to assess the legacy of PFAS use across NSW. With the assistance of the NSW PFAS Taskforce, which includes NSW Health, Department of Primary Industries and the Office of Environment and Heritage, we provide impacted residents with tailored, precautionary dietary advice to help them reduce any exposure to PFAS.

Current investigations are focused on sites where it is likely that large quantities of PFAS have been used. The EPA is currently investigating PFAS at these sites:

Tags: PFAS

Sampling and analysis

Appendix C Loose-Fill Asbestos Insulation Register

Loose-fill asbestos insulation register

Listen (https://app-oc.readspeaker.com/cgi-bin/rsent?customerid=7371&lang=en_au&readid=page-content&url=https://www.fairtrading.nsw.gov.au/loose-fill-asbestos-insulation-register)

Look up the premises address

Please enter exact address information (including street type) of the address you wish to search (Note, the search fields are not case sensitive).

If a match is found, the premises has been identified as containing loose-fill asbestos insulation.

Results will **only** appear if an **exact match** of an address is found.

(The fields marked with * are required.)

No Match Found - A search match was not found in the Loose-fill Asbestos Insulation Register

Address searched: 24 Centennial Avenue Chatswood

This information is correct at the time of the search

Unit	
Street number*	
Street name*	
Street type*	Alley ▾
Suburb*	
Postcode	

Submit

Site map (https://www.fairtrading.nsw.gov.au/site-map)

Privacy policy (https://www.fairtrading.nsw.gov.au/privacy-policy)

(https://www.twitter.com/nsw_fairtrading)

(https://www.facebook.com/FairTradingNSW/)

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Accessibility (https://www.fairtrading.nsw.gov.au/accessibility)

Disclaimer (https://www.fairtrading.nsw.gov.au/disclaimer)

Copyright (https://www.fairtrading.nsw.gov.au/copyright)

NSW.gov.au (http://nsw.gov.au)

Appendix D Borelogs

BH01

Project Number: 55579
Client: Pells Sullivan Meynink
Project Name: Chatswood Education Precinct
Site Address: Centennial Avenue, Chatswood

Date: 21/01/2019
Logged By: RC, MN
Contractor:
Total Hole Depth (mbgs): 1.6
Bore Diameter (mm): 150

Eastings (GDA 94):
Northings (GDA 94):
Zone/Area/Permit#:
Reference Level: Ground Surface
Elevation (m):

Method	Depth (mbgs)	Contact (mbgs)	Graphic Log	Lithological Class	Lithological Description	Samples Tests Remarks	Additional Observations
SFA			▨	Fill	Fill - Silty Sand, brown, damp, heterogeneous, loose, with inclusions of rootlets and trace brick	BH01_0.15	No odour, ACM or staining
	0.5	0.15	▨	Fill	Fill - Clay, brown, damp, homogeneous, medium plasticity, firm	BH01_0.5	No odour, ACM or staining
	1.0	0.60	▧	CL-ML	Silty Clay, brown, damp, homogeneous, medium plasticity, firm	BH01_1.1	No odour, ACM or staining
	1.5	1.10	▧	CL-ML	Silty Clay, brown with grey mottling, damp, homogeneous, medium plasticity, firm	BH01_1.5	No odour, ACM or staining End of hole at 1.6 m bgs
	2.0 2.5 3.0 3.5 4.0	1.60			Borehole BH01 terminated at 1.6m		

JBS&G

BH02

Project Number: 55579
Client: Pells Sullivan Meynink
Project Name: Chatswood Education Precinct
Site Address: Centennial Avenue, Chatswood

Date: 24/01/2019
Logged By: RC, MN
Contractor:
Total Hole Depth (mbgs): 0.3
Bore Diameter (mm): 50

Eastings (GDA 94):
Northings (GDA 94):
Zone/Area/Permit#:
Reference Level: Ground Surface
Elevation (m):

Method	Depth (mbgs)	Contact (mbgs)	Graphic Log	Lithological Class	Lithological Description	Samples Tests Remarks	Additional Observations
HA			▨	Fill	Fill - Gravelly Silty Sand, brown / grey, heterogeneous, dry, medium dense, poorly graded, with inclusions of rootlets, brick, plastic and paper	■ BH02_0.15 PID = 0.6 ppm	No odour, ACM or staining End of hole at 0.3 m bgs, moved to BH02a
	0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0	0.30			Borehole BH02 terminated at 0.3m		

BH02a

Project Number: 55579
Client: Pells Sullivan Meynink
Project Name: Chatswood Education Precinct
Site Address: Centennial Avenue, Chatswood

Date: 24/01/2019
Logged By: RC, MN
Contractor:
Total Hole Depth (mbgs): 0.6
Bore Diameter (mm): 50

Eastings (GDA 94):
Northings (GDA 94):
Zone/Area/Permit#:
Reference Level: Ground Surface
Elevation (m):

Method	Depth (mbgs)	Contact (mbgs)	Graphic Log	Lithological Class	Lithological Description	Samples Tests Remarks	Additional Observations
HA			▨	Fill	Fill - Silty Sand, brown, heterogeneous, dry, loose, with inclusions of gravels and glass	BH02a_0.15 PID = 1.5 ppm	No odour, ACM or staining
	0.5	0.20	▨	Fill	Fill - Silty Sand, light brown, heterogeneous, dry, loose, with inclusions of gravels and glass	BH02a_0.5 PID = 2.9 ppm	No odour, ACM or staining End of hole at 0.6 m bgs. Tried two other locations, hard surface, very shallow
		0.60			Borehole BH02a terminated at 0.6m		
	1.0						
	1.5						
	2.0						
	2.5						
	3.0						
	3.5						
	4.0						

BH03

Project Number: 55579
Client: Pells Sullivan Meynink
Project Name: Chatswood Education Precinct
Site Address: Centennial Avenue, Chatswood

Date: 21/01/2019
Logged By: RC, MN
Contractor:
Total Hole Depth (mbgs): 1.2
Bore Diameter (mm): 150

Eastings (GDA 94):
Northings (GDA 94):
Zone/Area/Permit#:
Reference Level: Ground Surface
Elevation (m):

Method	Depth (mbgs)	Contact (mbgs)	Graphic Log	Lithological Class	Lithological Description	Samples Tests Remarks	Additional Observations
SFA			▩	Fill	Fill - Silty Sand, brown, damp, heterogeneous, loose, with inclusions of rootlets, cobbles of rock and roots	BH03_0.15 PID = 6.3 ppm	No odour, ACM or staining
	0.5	0.15	▩	Fill	Fill - Silty Clayey Sand, moist, heterogeneous, brown, medium dense, low plasticity, with inclusions of roots	BH03_0.5 PID = 3.6 ppm	No odour, ACM or staining
	1.0	0.80	▧	CL	Clay, grey with slight yellow / brown mottling, moist, homogeneous, firm, medium plasticity	BH03_1.1 PID = 3.4 ppm	No odour, ACM or staining End of jole at 1.2 m bgs
	1.5 2.0 2.5 3.0 3.5 4.0	1.20			Borehole BH03 terminated at 1.2m		

BH04

Project Number: 55579
Client: Pells Sullivan Meynink
Project Name: Chatswood Education Precinct
Site Address: Centennial Avenue, Chatswood

Date: 21/01/2019
Logged By: RC, MN
Contractor:
Total Hole Depth (mbgs): 1.2
Bore Diameter (mm): 150

Eastings (GDA 94):
Northings (GDA 94):
Zone/Area/Permit#:
Reference Level: Ground Surface
Elevation (m):

Method	Depth (mbgs)	Contact (mbgs)	Graphic Log	Lithological Class	Lithological Description	Samples Tests Remarks	Additional Observations
CC				Fill	Fill - Concrete Slab		
SFA		0.15		Fill	Fill - Gravelly Clay, dark grey with brown mottling, damp, hard, high plasticity	BH04_0.3 PID = 1.2 ppm	No odour, ACM or staining
	0.5	0.30		CL-GC	Gravelly Clay, dark grey with brown mottling, damp, hard, high plasticity, with inclusions of rootlets	BH04_0.5 PID = 6.6 ppm	No odour, ACM or staining
	1.0	0.80		CL-GC	Gravelly Clay, dark grey with brown mottling, damp, hard, high plasticity, with inclusions of hard shale	BH04_1.1 PID = 9.8 ppm	No odour, ACM or staining End of hole at 1.2 m bgs
		1.20			Borehole BH04 terminated at 1.2m		
	1.5						
	2.0						
	2.5						
	3.0						
	3.5						
	4.0						

BH05

Project Number: 55579
Client: Pells Sullivan Meynink
Project Name: Chatswood Education Precinct
Site Address: Centennial Avenue, Chatswood

Date: 21/01/2019
Logged By: RC, MN
Contractor:
Total Hole Depth (mbgs): 1.5
Bore Diameter (mm): 150

Eastings (GDA 94):
Northings (GDA 94):
Zone/Area/Permit#:
Reference Level: Ground Surface
Elevation (m):

Method	Depth (mbgs)	Contact (mbgs)	Graphic Log	Lithological Class	Lithological Description	Samples Tests Remarks	Additional Observations
SFA			▩	Fill	Fill - Gravelly Silty Sand (topsoil), brown, loose, heterogeneous, damp, with inclusions of rootlet and mulch	■ BH05_0.15 PID = 1.1 ppm	No odour, ACM or staining
	0.5	0.15	▩	Fill	Fill - Gravelly Sand, grey, damp, heterogeneous, medium dense, with inclusions of shale and sandstone	■ BH05_0.5 PID = 1 ppm	No odour, ACM or staining
	1.0	1.00	░	SM	Crushed Shale, recovered as Silty Sand, grey, dry, heterogeneous, medium dense, with inclusions of shale	■ BH05_1.1 PID = 4.8 ppm ■ BH05_1.5 PID = 2.2 ppm	No odour, ACM or staining End of hole at 1.5 m bgs on shale
	1.5	1.50			Borehole BH05 terminated at 1.5m		
	2.0						
	2.5						
	3.0						
	3.5						
	4.0						

BH06

Project Number: 55579
Client: Pells Sullivan Meynink
Project Name: Chatswood Education Precinct
Site Address: Centennial Avenue, Chatswood

Date: 21/01/2019
Logged By: RC, MN
Contractor:
Total Hole Depth (mbgs): 1.3
Bore Diameter (mm): 150

Eastings (GDA 94):
Northings (GDA 94):
Zone/Area/Permit#:
Reference Level: Ground Surface
Elevation (m):

Method	Depth (mbgs)	Contact (mbgs)	Graphic Log	Lithological Class	Lithological Description	Samples Tests Remarks	Additional Observations
SFA			▨	Fill	Fill - Clayey Sand, heterogeneous, brown, damp, medium plasticity, firm, with inclusions of rootlets, trace of sandstone and shale	BH06_0.15 PID = 2 ppm	No odour, ACM or staining
		0.15	▨	Fill	Fill - Silty Sand, brown, heterogeneous, damp, loose, with inclusions of trace brick and shale		
	0.5		▨			BH06_0.5 PID = 3.3 ppm	
	1.0		▨				No odour, ACM or staining
		1.00	▧	CL	Clay, brown with yelllow / brown motttling, increased grey motling with depth	BH06_1.1 PID = 2.3 ppm	No odour, ACM or staining End of hole at 1.3 m bgs
		1.30			Borehole BH06 terminated at 1.3m		
	1.5						
	2.0						
	2.5						
	3.0						
	3.5						
	4.0						

BH07

Project Number: 55579
Client: Pells Sullivan Meynink
Project Name: Chatswood Education Precinct
Site Address: Centennial Avenue, Chatswood

Date: 24/01/2019
Logged By: RC, MN
Contractor:
Total Hole Depth (mbgs): 1
Bore Diameter (mm): 50

Eastings (GDA 94):
Northings (GDA 94):
Zone/Area/Permit#:
Reference Level: Ground Surface
Elevation (m):

Method	Depth (mbgs)	Contact (mbgs)	Graphic Log	Lithological Class	Lithological Description	Samples Tests Remarks	Additional Observations
HA			▨	Fill	Fill - Silty Sand, brown, damp, heterogeneous, loose	BH07_0.15 PID = 1.3 ppm	No odour, ACM or staining
	0.5	0.30	▨	Fill	Silty Clay, Light brown, heterogeneous,damp, stiff, medium plasticity, with inclusion of shale	BH07_0.6 PID = 1.6 ppm	No odour, ACM or staining End of hole at 1.0 m bgs on hard surface, possibly shale
	1.0	1.00			Borehole BH07 terminated at 1m		
	1.5						
	2.0						
	2.5						
	3.0						
	3.5						
	4.0						

BH08

Project Number: 55579
Client: Pells Sullivan Meynink
Project Name: Chatswood Education Precinct
Site Address: Centennial Avenue, Chatswood

Date: 25/01/2019
Logged By: RC, MN
Contractor:
Total Hole Depth (mbgs): 1.6
Bore Diameter (mm): 50

Eastings (GDA 94):
Northings (GDA 94):
Zone/Area/Permit#:
Reference Level: Ground Surface
Elevation (m):

Method	Depth (mbgs)	Contact (mbgs)	Graphic Log	Lithological Class	Lithological Description	Samples Tests Remarks	Additional Observations
HA			▩	Fill	Fill - Silty Clayey Sand, brown, dry, heterogeneous, loose, with inclusions of shale, trace brick, rootlets and rock	BH08_0.15 PID = 1.5 ppm	No odour, ACM or staining
	0.5	0.20	▩	Fill	Fill - Silty Clay, brown with light grey / white / red mottling, heterogeneous, firm, dry, low plasticity, with inclusions of shale rock	BH08_0.50 PID = 3.8 ppm	No odour, ACM or staining
		0.60	▩	Fill	Fill - Silty Clay, dark brown with light brown mottling, damp, low plasticity, firm, heterogeneous, with inclusions of shale rock and trace gravels		No odour, ACM or staining
	1.0	0.70	▩	Fill	Fill - Silty Clay, dark brown with light brown mottling, moist, medium plasticity, firm, heterogeneous, with inclusions of more shale rock	BH08_0.90 PID = 6.5 ppm	No odour, ACM or staining
		1.00	▩	Fill	Fill - Clayey Silt, dark brown, moist, soft, medium plasticity, heterogeneous, with inclusions of shale		No odour, ACM or staining
		1.10	▥	CL-ML	Silty Clay, light brown, stiff, moist, heterogeneous, with inclusions of shale	BH08_1.30 PID = 4 ppm	No odour, ACM or staining
	1.5	1.40	▥	CL-ML	Silty Clay, light brown / light orange, stiff, moist, heterogeneous, with inclusions of shale	BH08_1.60 PID = 4.4 ppm	No odour, ACM or staining End of hole at 1.6 m bgs
		1.60			Borehole BH08 terminated at 1.6m		
	2.0						
	2.5						
	3.0						
	3.5						
	4.0						

BH09

Project Number: 55579
Client: Pells Sullivan Meynink
Project Name: Chatswood Education Precinct
Site Address: Centennial Avenue, Chatswood

Date: 21/01/2019
Logged By: RC, MN
Contractor:
Total Hole Depth (mbgs): 1.6
Bore Diameter (mm): 150

Eastings (GDA 94):
Northings (GDA 94):
Zone/Area/Permit#:
Reference Level: Ground Surface
Elevation (m):

Method	Depth (mbgs)	Contact (mbgs)	Graphic Log	Lithological Class	Lithological Description	Samples Tests Remarks	Additional Observations
SFA			▨	Fill	Fill - Silty Clayey Sand, brown, damp, heterogeneous, medium dense, with inclusions of gravel, trace ash, rootlets and trace brick	BH09_0.15 PID = 4 ppm	No odour, ACM or staining
	0.5	0.20	▨	Fill	Fill - Silty Sand, brown, heterogeneous, damp, loose, with inclusions of shale	BH09_0.5 PID = 2.1 ppm	No odour, ACM or staining
	1.0 1.5	0.50	▧	CL-ML	Silty Clay, brown, heterogeneous, damp, low plasticity, firm, with inclusions of shale	BH09_1.1 PID = 3 ppm	End of hole ay 1.6 m bgs on shale
	2.0 2.5 3.0 3.5 4.0	1.60			Borehole BH09 terminated at 1.6m		

BH10

Project Number: 55579
Client: Pells Sullivan Meynink
Project Name: Chatswood Education Precinct
Site Address: Centennial Avenue, Chatswood

Date: 21/01/2019
Logged By: RC, MN
Contractor:
Total Hole Depth (mbgs): 2
Bore Diameter (mm): 150

Eastings (GDA 94):
Northings (GDA 94):
Zone/Area/Permit#:
Reference Level: Ground Surface
Elevation (m):

Method	Depth (mbgs)	Contact (mbgs)	Graphic Log	Lithological Class	Lithological Description	Samples Tests Remarks	Additional Observations
SFA			▨	Fill	Fill - Asphalt		
		0.05	▨	Fill	Fill - Sandy Silty Gravel, brown, dry, dense, sub-angular, with inclusions of mulch	BH10_0.15 PID = 4 ppm	QA20190121RC_01 / QC20190121RC_01 No odour, ACM or staining
	0.5	0.20	▨	Fill	Fill - Gravelly Silty Sand, light brown, heterogeneous, dry, medium dense, with inclusions of shale	BH10_0.50 PID = 1.8 ppm	No odour, ACM or staining
	1.0 1.5	0.50	▨	Fill	Fill - Gravelly Silty Sand, more silty, light brown, heterogeneous, dry, medium dense, with inclusions of shale	BH10_1.10 PID = 3.2 ppm	No odour, ACM or staining
	2.0	1.50	▧	CL-ML	Silty Clay, creamy brown, homogeneous, dry, stiff, low plasticity	BH10_1.70 PID = 2.8 ppm	No odour, ACM or staining End of hole at 2.0 m bgs
	2.5 3.0 3.5 4.0	2.00			Borehole BH10 terminated at 2m		

BH11

Project Number: 55579
Client: Pells Sullivan Meynink
Project Name: Chatswood Education Precinct
Site Address: Centennial Avenue, Chatswood

Date: 21/01/2019
Logged By: RC, MN
Contractor:
Total Hole Depth (mbgs): 1.5
Bore Diameter (mm): 150

Eastings (GDA 94):
Northings (GDA 94):
Zone/Area/Permit#:
Reference Level: Ground Surface
Elevation (m):

Method	Depth (mbgs)	Contact (mbgs)	Graphic Log	Lithological Class	Lithological Description	Samples Tests Remarks	Additional Observations
SFA			▨	Fill	Fill - Gravely Silty Sand, brown, heterogeneous, damp, medium dense, with inclusions of rootlets and shale	BH11_0.15 PID = 1.9 ppm	No odour, ACM or staining
	0.5 1.0	0.15	▨	Fill	Fill - Silty Sand, light brown, damp, heterogeneous, loose, with inclusions of shale	BH11_0.5 PID = 1.2 ppm	No odour, ACM or staining
	1.5	1.30	⁙	SM	Silty Sand / crushed shale, hard surface, light brown, damp, heterogeneous, loose, with inclusions of shale	BH11_1.4 PID = 1.4 ppm	No odour, ACM or staining End of hole at 1.5 m bgs
	2.0 2.5 3.0 3.5 4.0	1.50			Borehole BH11 terminated at 1.5m		

JBS&G

BH12

Project Number: 55579
Client: Pells Sullivan Meynink
Project Name: Chatswood Education Precinct
Site Address: Centennial Avenue, Chatswood

Date: 21/01/2019
Logged By: RC, MN
Contractor:
Total Hole Depth (mbgs): 1.5
Bore Diameter (mm): 150

Eastings (GDA 94):
Northings (GDA 94):
Zone/Area/Permit#:
Reference Level: Ground Surface
Elevation (m):

Method	Depth (mbgs)	Contact (mbgs)	Graphic Log	Lithological Class	Lithological Description	Samples Tests Remarks	Additional Observations
SFA			▨	Fill	Fill - Silty Sand, dark brown / black, moist, heterogeneous, loose, with inclusions of mulch and bark chip (organic peat)	BH12_0.15 PID = 2.8 ppm	No odour, ACM or staining
		0.20	▨	Fill	Fill - Silty Sand, light brown, loose, damp, with inclusions of gravels and rootlets		
	0.5		▨			BH12_0.5 PID = 3.9 ppm	No odour, ACM or staining
		0.50	▨	Fill	Silty Sand, light brown, loose, damp, with inclusions of shale		
	1.0		▨			BH12_1.1 PID = 2.1 ppm	No odour, ACM or staining
	1.5		▨				End of hole at 1.5 m bgs on shale
		1.50			Borehole BH12 terminated at 1.5m		
	2.0						
	2.5						
	3.0						
	3.5						
	4.0						

BH13

Project Number: 55579
Client: Pells Sullivan Meynink
Project Name: Chatswood Education Precinct
Site Address: Centennial Avenue, Chatswood

Date: 25/01/2019
Logged By: RC, MN
Contractor:
Total Hole Depth (mbgs): 1.5
Bore Diameter (mm): 50

Eastings (GDA 94):
Northings (GDA 94):
Zone/Area/Permit#:
Reference Level: Ground Surface
Elevation (m):

Method	Depth (mbgs)	Contact (mbgs)	Graphic Log	Lithological Class	Lithological Description	Samples Tests Remarks	Additional Observations
HA			☒	Fill	Fill - Silty Sand (topsoil), dark brown, heterogeneous, loose, dry, with inclusions of rootlets and trace rock	BH13_0.15 PID = 2.1 ppm	No odour, ACM or staining
	0.5	0.30	☒	Fill	Fill - Clayey Silty Sand, dark brown with light grey mottling, heterogeneous, loose, damp, with inclusions of igenous rock and trace brick	BH13_0.50 PID = 2.1 ppm	No odour, ACM or staining
		0.50	☒	Fill	Fill - Silty Clay, brown with light brown / grey mottling, heterogenous, firm, medium plasticity, damp, with inclusions of shale and trace brick		No odour, ACM or staining
		0.70	☒	Fill	Fill - Silty Clay, dark brown with light brown / grey mottling, heterogenous, firm, medium plasticity, moist, with inclusions of shale and trace brick	BH13_0.80 PID = 3.4 ppm	No odour, ACM or staining
	1.0 1.5	0.90	▧	CL	Clay, brown / red, homogeneous, damp, hard, high plasticity	BH13_1.30 PID = 6.5 ppm	No odour, ACM or staining End of hole at 1.5 m bgs
	2.0 2.5 3.0 3.5 4.0	1.50			Borehole BH13 terminated at 1.5m		

JBS&G

BH14

Project Number: 55579
Client: Pells Sullivan Meynink
Project Name: Chatswood Education Precinct
Site Address: Centennial Avenue, Chatswood

Date: 25/01/2019
Logged By: RC, MN
Contractor:
Total Hole Depth (mbgs): 1.4
Bore Diameter (mm): 50

Eastings (GDA 94):
Northings (GDA 94):
Zone/Area/Permit#:
Reference Level: Ground Surface
Elevation (m):

Method	Depth (mbgs)	Contact (mbgs)	Graphic Log	Lithological Class	Lithological Description	Samples Tests Remarks	Additional Observations
HA				Fill	Fill - Silty Sand, brown, loose, heterogenous, damp, with inclusions of rootlets	BH14_0.15 PID = 1.8 ppm	No odour, ACM or staining
	0.5	0.40		Fill	Fill - Silty Sand, brown, loose, heterogeneous, damp, with inclusions of rootlets, becomes slightly gravelly		No odour, ACM or staining
		0.60		Fill	Fill - Clayey Silty Sand, light brown / orangy, soft, heterogenous, damp, with inclusions of roots	BH14_0.7 PID = 1.3 ppm	No odour, ACM or staining
	1.0	0.80		CL-ML	Silty Clay, light brown / orangy with cream mottling, homogeneous, hard, medium plasticity	BH14_1.1 PID = 2.5 ppm	No odour, ACM or staining End of hole at 1.4 m bgs
	1.5	1.40			Borehole BH14 terminated at 1.4m		
	2.0						
	2.5						
	3.0						
	3.5						
	4.0						

BH15

Project Number: 55579
Client: Pells Sullivan Meynink
Project Name: Chatswood Education Precinct
Site Address: Centennial Avenue, Chatswood

Date: 21/01/2019
Logged By: RC, MN
Contractor:
Total Hole Depth (mbgs): 2.8
Bore Diameter (mm): 150

Eastings (GDA 94):
Northings (GDA 94):
Zone/Area/Permit#:
Reference Level: Ground Surface
Elevation (m):

Method	Depth (mbgs)	Contact (mbgs)	Graphic Log	Lithological Class	Lithological Description	Samples Tests Remarks	Additional Observations
SFA			▨	Fill	Fill - Silty Sand, damp, heterogenous, dark, brown, with inclusions of gravels and rootlets	BH15_0.15 PID = 1.8 ppm	No odour, ACM or staining
		0.20	▨	Fill	Fill - Gravelly Silty Sand, heterogeneous, brown, with inclusions of gravels and rootlets	BH15_0.50 PID = 4.7 ppm	No odour, ACM or staining
	0.5 1.0	0.50	▨	Fill	Fill - Gravelly Silty Sand, heterogeneous, brown, with inclusions of shale	BH15_1.10 PID = 1.5 ppm	No odour, ACM or staining
	1.5	1.20	▧	CL-ML	Silty Clay, brown, homogeneous, damp, medium plasticty, stiff, with inclusions of trace ash	BH15_1.60 PID = 3 ppm	No odour, ACM or staining
	2.0	1.60				BH15_2.30 PID = 1.8 ppm	No odour, ACM or staining
	2.5		▧	CL	Clay, brown, dry, homogeneous, hard, medium plasticity, with inclusions of minor ash and shale		End of hole ay 2.8 m bgs on shale
	3.0 3.5 4.0	2.80			Borehole BH15 terminated at 2.8m		

BH16

Project Number: 55579
Client: Pells Sullivan Meynink
Project Name: Chatswood Education Precinct
Site Address: Centennial Avenue, Chatswood

Date: 22/01/2019
Logged By: RC, MN
Contractor:
Total Hole Depth (mbgs): 2.2
Bore Diameter (mm): 150

Eastings (GDA 94):
Northings (GDA 94):
Zone/Area/Permit#:
Reference Level: Ground Surface
Elevation (m):

Method	Depth (mbgs)	Contact (mbgs)	Graphic Log	Lithological Class	Lithological Description	Samples Tests Remarks	Additional Observations
SFA	0.5 1.0		▨	Fill	Fill - Silty Sand, dark brown, heterogeneous, damp, loose, with inclusions of rootlets, shale and trace gravels	BH16_0.15 PID = 6 ppm BH16_0.50 PID = 1.5 ppm BH16_1.10 PID = 4.3 ppm	No odour, ACM or staining
	1.5	1.20	▨	Fill	Fill - Silty Clay, brown, damp, heterogeneous, low plasticity, soft, with inclusions of shale	BH16_1.60 PID = 4.2 ppm	No odour, ACM or staining
	2.0	1.90	▧	CL	Clay, brown with white / grey mottling, homogeneous, damp, stiff, medium plasticity	BH16_2.10 PID = 4.8 ppm	No odour, ACM or staining End of hole at 2.2 m bgs
	2.5 3.0 3.5 4.0	2.20			Borehole BH16 terminated at 2.2m		

BH17

Project Number: 55579
Client: Pells Sullivan Meynink
Project Name: Chatswood Education Precinct
Site Address: Centennial Avenue, Chatswood

Date: 22/01/2019
Logged By: RC, MN
Contractor:
Total Hole Depth (mbgs): 2
Bore Diameter (mm): 150

Eastings (GDA 94):
Northings (GDA 94):
Zone/Area/Permit#:
Reference Level: Ground Surface
Elevation (m):

Method	Depth (mbgs)	Contact (mbgs)	Graphic Log	Lithological Class	Lithological Description	Samples Tests Remarks	Additional Observations
SFA			▨	Fill	Fill - Grout Concrete, dry, dense, light grey, heterogeneous, with inclusions of gravel and boulders of rock	BH17_0.15 PID = 5.7 ppm	No odour, ACM or staining
	0.5	0.15	▨	Fill	Fill - Sandy Clay, grey with red / brown mottling, damp, heterogeneous, firm, medium plasticity, with inclusions of gravel and geofabric	BH17_0.50 PID = 3.6 ppm	No odour, ACM or staining
	1.0	0.80	▨	Fill	Fill - Silty Clay, grey with red / brown mottling, damp, heterogeneous, firm, medium plasticity, with inclusions of trace gravel	BH17_1.10 PID = 8.4 ppm	Very slight organic odour, no ACM or staining
	1.5 2.0	1.30	▧	CL	Clay, brown with dark grey mottling, hard, high plasticity, damp, homogeneous	BH17_1.60 PID = 4.4 ppm	No odour, ACM or staining End of hole at 2.0 m bgs
	2.5 3.0 3.5 4.0	2.00			Borehole BH17 terminated at 2m		

BH18

Project Number: 55579
Client: Pells Sullivan Meynink
Project Name: Chatswood Education Precinct
Site Address: Centennial Avenue, Chatswood

Date: 22/01/2019
Logged By: RC, MN
Contractor:
Total Hole Depth (mbgs): 1.3
Bore Diameter (mm): 150

Eastings (GDA 94):
Northings (GDA 94):
Zone/Area/Permit#:
Reference Level: Ground Surface
Elevation (m):

Method	Depth (mbgs)	Contact (mbgs)	Graphic Log	Lithological Class	Lithological Description	Samples Tests Remarks	Additional Observations
SFA			▨	Fill	Fill - Silty Gravel, grey, dry, homogeneous, dense, medium gravel, angular, with inclusions of geofabric	BH18_0.15 PID = 5.1 ppm	No odour, ACM or staining
	0.5	0.20	▨	Fill	Fill - Gravelly Sand, light grey, damp, medium dense, heterogeneous, with inclusions of shale, metal wire and geofabric	BH18_0.50 PID = 7.6 ppm	No odour, ACM or staining
	1.0	0.60	▨	Fill	Fill - Silty Clay, grey / brown, heterogeneous, damp, firm, medium plasticity, with inclusions of gravel, shale and metal wire	BH18_0.80 PID = 4.8 ppm	No odour, ACM or staining
		1.00	▨	CL	Clay, brown with grey mottling, heterogeneous, medium plasticity, stiff, with inclusions of trace shale	BH18_1.10 PID = 6.5 ppm	No odour, ACM or staining End of hole at 1.3 m bgs
	1.5 2.0 2.5 3.0 3.5 4.0	1.30			Borehole BH18 terminated at 1.3m		

BH19

Project Number: 55579
Client: Pells Sullivan Meynink
Project Name: Chatswood Education Precinct
Site Address: Centennial Avenue, Chatswood

Date: 22/01/2019
Logged By: RC, MN
Contractor:
Total Hole Depth (mbgs): 1.4
Bore Diameter (mm): 150

Eastings (GDA 94):
Northings (GDA 94):
Zone/Area/Permit#:
Reference Level: Ground Surface
Elevation (m):

Method	Depth (mbgs)	Contact (mbgs)	Graphic Log	Lithological Class	Lithological Description	Samples Tests Remarks	Additional Observations
SFA			▩	Fill	Fill - Crushed Concrete: Silty gravel, light grey, heterogeneous, dry, dense, with inclusions of asphalt	BH19_0.15 PID = 6.4 ppm	No odour, ACM or staining
	0.5	0.20	▩	Fill	Fill - Crushed Concrete, sandy, light grey, medium sand, medium dense, with inclusions of gravel, shale, metal wire and metal	BH19_0.50 PID = 7.4 ppm	No odour, ACM or staining
	1.0	0.70	▩	Fill	Fill - Sandy Clay, brown / grey, heterogeneous, damp, medium plasticity, firm, with inclusions of gravel and shale	BH19_0.80 PID = 6.2 ppm	No odour, ACM or staining
		1.00	▧	CL	Clay, brown with red mottling, damp, heterogeneous, hard, high plasticity, with inclusions of shale	BH19_1.10 PID = 2.6 ppm	No odour, ACM or staining End of hole at 1.4 m bgs
	1.5 2.0 2.5 3.0 3.5 4.0	1.40			Borehole BH19 terminated at 1.4m		

BH20

Project Number: 55579
Client: Pells Sullivan Meynink
Project Name: Chatswood Education Precinct
Site Address: Centennial Avenue, Chatswood

Date: 22/01/2019
Logged By: RC, MN
Contractor:
Total Hole Depth (mbgs): 1.6
Bore Diameter (mm): 150

Eastings (GDA 94):
Northings (GDA 94):
Zone/Area/Permit#:
Reference Level: Ground Surface
Elevation (m):

Method	Depth (mbgs)	Contact (mbgs)	Graphic Log	Lithological Class	Lithological Description	Samples Tests Remarks	Additional Observations
SFA			▩	Fill	Fill - Silty Gravel, light grey, heterogeneous, dry, dense, with inclusionsa of plastic and asphalt	BH20_0.15 PID = 3.2 ppm	No odour, ACM or staining
	0.5	0.20	▩	Fill	Fill - Gravelly Silty Sand, brown / light grey, damp, heterogeneous, medium dense, with inclusions of shale and cobbles of rock	BH20_0.50 PID = 4.1 ppm	No odour, ACM or staining
	1.0	0.60	▩	Fill	Fill - Silty Clay, brown / red with light grey mottling, damp, hard, medium plasticity, heterogeneous, with inclusions of trave shale	BH20_1.10 PID = 2.9 ppm	No odour, ACM or staining
	1.5	1.20	▨	CL-ML	Silty Clay, red with light grey mottling, damp, homogeneous, high plasticity, stiff	BH20_1.60 PID = 6.8 ppm	No odour, ACM or staining End of hole at 1.6 m bgs
	2.0 2.5 3.0 3.5 4.0	1.60			Borehole BH20 terminated at 1.6m		

BH21

Project Number: 55579
Client: Pells Sullivan Meynink
Project Name: Chatswood Education Precinct
Site Address: Centennial Avenue, Chatswood

Date: 22/01/2019
Logged By: RC, MN
Contractor:
Total Hole Depth (mbgs): 1.2
Bore Diameter (mm): 150

Eastings (GDA 94):
Northings (GDA 94):
Zone/Area/Permit#:
Reference Level: Ground Surface
Elevation (m):

Method	Depth (mbgs)	Contact (mbgs)	Graphic Log	Lithological Class	Lithological Description	Samples Tests Remarks	Additional Observations
SFA				Fill	Fill - Gravelly Silty Sand, medium dense, grey, sub-angular, with inclusions of rootlets	BH21_0.15 PID = 1.8 ppm	No odour, ACM or staining
		0.20		Fill	Fill - Gravelly Silty Clay, brown / red with white mottling, heterogeneous, stiff, medium plasticity, with inclusions of trace sandstone and trace shale		
	0.5					BH21_0.5 PID = 2.1 ppm	No odour, ACM or staining
		0.50		SG-SM	Gravelly Silty Sand, brown, heterogeneous, moist, dense, with inclusions of shale		
	1.0					BH21_1.1 PID = 2.8 ppm	No odour, ACM or staining End of hole at 1.2 m bgs
		1.20			Borehole BH21 terminated at 1.2m		
	1.5						
	2.0						
	2.5						
	3.0						
	3.5						
	4.0						

BH22

Project Number: 55579
Client: Pells Sullivan Meynink
Project Name: Chatswood Education Precinct
Site Address: Centennial Avenue, Chatswood

Date: 22/01/2019
Logged By: RC, MN
Contractor:
Total Hole Depth (mbgs): 1.4
Bore Diameter (mm): 150

Eastings (GDA 94):
Northings (GDA 94):
Zone/Area/Permit#:
Reference Level: Ground Surface
Elevation (m):

Method	Depth (mbgs)	Contact (mbgs)	Graphic Log	Lithological Class	Lithological Description	Samples Tests Remarks	Additional Observations
SFA			▩	Fill	Fill - Sand, brown / yellow, damp, heterogeneous, soft, with inclusions of gravel and rootlets	BH22_0.15 PID = 8.4 ppm	No odour, ACM or staining
		0.15	▩	Fill	Fill - Silty Sand, dark brown / grey, damp, heterogeneous, soft, with inclusions of trave gravel		
	0.5		▩			BH22_0.5 PID = 2.4 ppm	No odour, ACM or staining
		0.80	▤	SHALE	Weathered Shale, red / yellow, damp, firm		
	1.0		▤			BH22_1.10 PID = 4.4 ppm	
			▤				No odour, ACM or staining End of hole at 1.4 m bgs
	1.5	1.40			Borehole BH22 terminated at 1.4m		
	2.0						
	2.5						
	3.0						
	3.5						
	4.0						

BH23

Project Number: 55579
Client: Pells Sullivan Meynink
Project Name: Chatswood Education Precinct
Site Address: Centennial Avenue, Chatswood

Date: 22/01/2019
Logged By: RC, MN
Contractor:
Total Hole Depth (mbgs): 2
Bore Diameter (mm): 150

Eastings (GDA 94):
Northings (GDA 94):
Zone/Area/Permit#:
Reference Level: Ground Surface
Elevation (m):

Method	Depth (mbgs)	Contact (mbgs)	Graphic Log	Lithological Class	Lithological Description	Samples Tests Remarks	Additional Observations
SFA			▩	Fill	Fill - Silty Sand, brown, heterogeneous, damp, very loose, with inclusions of rootlets and anthropotic	■ BH23_0.15 PID = 2.6 ppm	No odour, ACM or staining
	0.5	0.20	▩	Fill	Fill - Silty Clay, brown / white with grey / red mottling, medium plasticity, damp, homogeneous	■ BH23_0.5 PID = 4.4 ppm	No odour, ACM or staining
	1.0	0.60	▩	Fill	Fill - Silty Clayey Sand, brown, damp, homogeneous, loose, (firm clay)	■ BH23_1.1 PID = 4.3 ppm	No odour, ACM or staining
		1.20	▩	Fill	Fill - Silty Sand, dark brown / black, homogeneous, damp, very loose	■ BH23_1.4 PID = 3.5 ppm	No odour, ACM or staining
	1.5	1.40	▩	Fill	Fill - Silty Sand, dark brown / black, heterogeneous, damp, very loose, with inclusions of metal and cloats of clay		No odour, ACM or staining
	2.0	1.70	▨	CL-ML	Silty Clay, brown/ grey, damp, homogeneous, high plasticity, hard	■ BH23_1.8 PID = 6.1 ppm	No odour, ACM or staining End of hole 2.0 m bgs
	2.5 3.0 3.5 4.0	2.00			Borehole BH23 terminated at 2m		

BH24

Project Number: 55579
Client: Pells Sullivan Meynink
Project Name: Chatswood Education Precinct
Site Address: Centennial Avenue, Chatswood

Date: 22/01/2019
Logged By: RC, MN
Contractor:
Total Hole Depth (mbgs): 1.6
Bore Diameter (mm): 150

Eastings (GDA 94):
Northings (GDA 94):
Zone/Area/Permit#:
Reference Level: Ground Surface
Elevation (m):

Method	Depth (mbgs)	Contact (mbgs)	Graphic Log	Lithological Class	Lithological Description	Samples Tests Remarks	Additional Observations
SFA			▨	Fill	Fill - Silty Gravelly Sand, brown, damp, heterogeneous, medium dense, coarse gravel, with inclusions of trace brick, rootlets and bits of wood	BH24_0.1 PID = 6.8 ppm	No odour, ACM or staining
	0.5	0.20	▨	Fill	Fill - Silty Clay, brown / light grey mottling, heterogeneous, damp, hard, medium plasticity with inclusions of trace gravels	BH24_0.5 PID = 11.4 ppm	No odour, ACM or staining
	1.0	0.80	▥	CL-ML	Silty Clay, brown, damp, medium plasticity, hard, heterogeneous	BH24_1.1 PID = 2.5 ppm	No odour, ACM or staining
	1.5	1.30	▧	CL	Clay, brown, homogeneous, damp, hard, medium plasticity	BH24_1.5 PID = 1.4 ppm	No odour, ACM or staining End of hole at 1.6 m bgs
	2.0 2.5 3.0 3.5 4.0	1.60			Borehole BH24 terminated at 1.6m		

BH25

Project Number: 55579
Client: Pells Sullivan Meynink
Project Name: Chatswood Education Precinct
Site Address: Centennial Avenue, Chatswood

Date: 22/01/2019
Logged By: RC, MN
Contractor:
Total Hole Depth (mbgs): 1.5
Bore Diameter (mm): 150

Eastings (GDA 94):
Northings (GDA 94):
Zone/Area/Permit#:
Reference Level: Ground Surface
Elevation (m):

Method	Depth (mbgs)	Contact (mbgs)	Graphic Log	Lithological Class	Lithological Description	Samples Tests Remarks	Additional Observations
CC			▩	Fill	Fill - Concrete Slab		
SFA		0.20	▩	Fill	Fill - Silty Clay, brown / white with red mottling, damp, homogeneous, stiff, medium plasticity	BH25_0.3 PID = 3.4 ppm	No odour, ACM or staining
	0.5	0.50	▩	Fill	Fill - Clay, brown / red, damp, homogeneous, hard, high plastcity	BH25_0.6 PID = 3.7 ppm	No odour, ACM or staining
	1.0	1.00	▧	CL	Clay, damp, brown with light red mottling, homogeneous, hard, high plasticity	BH25_1.2 PID = 7.2 ppm	No odour, ACM or staining End of hole at 1.5 m bgs
	1.5	1.50			Borehole BH25 terminated at 1.5m		
	2.0						
	2.5						
	3.0						
	3.5						
	4.0						

BH26

Project Number: 55579
Client: Pells Sullivan Meynink
Project Name: Chatswood Education Precinct
Site Address: Centennial Avenue, Chatswood

Date: 22/01/2019
Logged By: RC, MN
Contractor:
Total Hole Depth (mbgs): 1.8
Bore Diameter (mm): 150

Eastings (GDA 94):
Northings (GDA 94):
Zone/Area/Permit#:
Reference Level: Ground Surface
Elevation (m):

Method	Depth (mbgs)	Contact (mbgs)	Graphic Log	Lithological Class	Lithological Description	Samples Tests Remarks	Additional Observations
SFA				Fill	Fill - Silty Clay, light grey with red mottling, damp, heterogeneous, hard, medim plasticity, with inclusions of gravel and asphalt	BH26_0.1 PID = 7 ppm	No odour, ACM or staining
	0.5 1.0 1.5	0.20		Fill	Fill - Silty Clay, light grey with red mottling, damp, heterogeneous, hard, medim plasticity, with inclusions of shale and brick	BH26_0.5 PID = 2.6 ppm BH26_1.1 PID = 6.4 ppm	No odour, ACM or staining
		1.50		CL-ML	Silty Clay, brown with red mottling, hard, heterogeneous, damp, medium plasticity, with inclusions of shale, colour change to grey with depth	BH26_1.6 PID = 5.5 ppm	No odour, ACM or staining End of hole at 1.8 m bgs
	2.0 2.5 3.0 3.5 4.0	1.80			Borehole BH26 terminated at 1.8m		

BH27

Project Number: 55579
Client: Pells Sullivan Meynink
Project Name: Chatswood Education Precinct
Site Address: Centennial Avenue, Chatswood

Date: 25/01/2019
Logged By: RC, MN
Contractor:
Total Hole Depth (mbgs): 1.5
Bore Diameter (mm): 150

Eastings (GDA 94):
Northings (GDA 94):
Zone/Area/Permit#:
Reference Level: Ground Surface
Elevation (m):

Method	Depth (mbgs)	Contact (mbgs)	Graphic Log	Lithological Class	Lithological Description	Samples Tests Remarks	Additional Observations
SFA			▩	Fill	Fill - Silty Sand (topsoil), dark brown, heterogeneous, loose, with inclusions of plastic, trace shale and rootlets	BH27_0.1 PID = 0.8 ppm	No odour, ACM or staining
	0.5	0.30	▩	Fill	Fill - Silty Sand, dark brown, heterogeneous, loose, with inclusions of trace shale and rootlets	BH27_0.5 PID = 0.9 ppm	No odour, ACM or staining
		0.60	▩	Fill	Fill - Gravelly Silty Sand, brown / grey, dry, heterogeneous, medium dense, with inclusions of rootlets and trace shale	BH27_0.8 PID = 1.8 ppm	No odour, ACM or staining
	1.0	0.90	▩	Fill	Fill - Silty Clayey Sand, brown / grey, stiff, homogeneous, dry	BH27_1.1 PID = 5 ppm	No odour, ACM or staining
	1.5	1.20	▨	CL-ML	Silty Clay, grey with light brown mottling, homogeneou, dry, hard, medium plasticity	BH27_1.4 PID = 5.3 ppm	End of hole 1.5 m bgs
		1.50			Borehole BH27 terminated at 1.5m		
	2.0						
	2.5						
	3.0						
	3.5						
	4.0						

BH28

Project Number: 55579
Client: Pells Sullivan Meynink
Project Name: Chatswood Education Precinct
Site Address: Centennial Avenue, Chatswood

Date: 22/01/2019
Logged By: RC, MN
Contractor:
Total Hole Depth (mbgs): 1.8
Bore Diameter (mm): 150

Eastings (GDA 94):
Northings (GDA 94):
Zone/Area/Permit#:
Reference Level: Ground Surface
Elevation (m):

Method	Depth (mbgs)	Contact (mbgs)	Graphic Log	Lithological Class	Lithological Description	Samples Tests Remarks	Additional Observations
SFA				Fill	Fill - Silty Sand, brown, heterogeneous, heterogeneous, medium dense, with inclusions of gravel, brick and plastic	BH28_0.1 PID = 1.6 ppm	No odour, ACM or staining
	0.5	0.20		Fill	Fill - Silty Sand, brown, heterogeneous, heterogeneous, medium dense, with inclusions of gravel	BH28_0.5 PID = 3.8 ppm	No odour, ACM or staining
	1.0	0.80		Fill	Fill - Silty Clay, brown / red, damp, heterogeneous, hard, medium plasticity, with inclusions of shale, metal rod and rootlets	BH28_1.1 PID = 2.6 ppm	No odour, ACM or staining
	1.5	1.40		CL	Clay, red / brown with grey mottling, homogeneous, damp, hard, medium plasticity	BH28_1.7 PID = 7.9 ppm	No odour, ACM or staining End of hole at 1.8 m bgs
	2.0 2.5 3.0 3.5 4.0	1.80			Borehole BH28 terminated at 1.8m		

BH29

Project Number: 55579
Client: Pells Sullivan Meynink
Project Name: Chatswood Education Precinct
Site Address: Centennial Avenue, Chatswood

Date: 24/01/2019
Logged By: RC, MN
Contractor:
Total Hole Depth (mbgs): 0.8
Bore Diameter (mm): 50

Eastings (GDA 94):
Northings (GDA 94):
Zone/Area/Permit#:
Reference Level: Ground Surface
Elevation (m):

Method	Depth (mbgs)	Contact (mbgs)	Graphic Log	Lithological Class	Lithological Description	Samples Tests Remarks	Additional Observations
HA			▨	Fill	Fill - Silty Sand, brown, heterogeneous, dry, medium dense, with inclusions of twigs and gravel	BH29_0.1 PID = 2.2 ppm	QA20190124RC_01 / QC20190124RC_01 No odour, ACM or staining
	0.5	0.30	▨	Fill	Fill - Silty Clayey Sand, light brown / yellow, heterogeneous, damp, loose, with inclusions of shale	BH29_0.5 PID = 1.2 ppm	No odour, ACM or staining End of hole at 0.8 m bgs
		0.80			Borehole BH29 terminated at 0.8m		
	1.0						
	1.5						
	2.0						
	2.5						
	3.0						
	3.5						
	4.0						

BH30

Project Number: 55579
Client: Pells Sullivan Meynink
Project Name: Chatswood Education Precinct
Site Address: Centennial Avenue, Chatswood

Date: 24/01/2019
Logged By: RC, MN
Contractor:
Total Hole Depth (mbgs): 0.8
Bore Diameter (mm): 50

Eastings (GDA 94):
Northings (GDA 94):
Zone/Area/Permit#:
Reference Level: Ground Surface
Elevation (m):

Method	Depth (mbgs)	Contact (mbgs)	Graphic Log	Lithological Class	Lithological Description	Samples Tests Remarks	Additional Observations
HA			▩	Fill	Fill - Silty Clayey Sand, brown , heterogeneous, dry, loose, with inclusions of twigs and trace shale	BH30_0.1 PID = 2 ppm	No odour, ACM or staining
		0.30	▩	Fill	Fill - Silty Sand, brown, dry, heterogeneous, with inclusions of shale, well graded		No odour, ACM or staining
	0.5	0.40	▨	CL-ML	Silty Clay, light grey / brown, heterogeneous, damp, stiff, low plasticity, with inclusions of shale	BH30_0.5 PID = 2.2 ppm	No odour, ACM or staining End of hole at 0.8 m bgs
		0.80			Borehole BH30 terminated at 0.8m		
	1.0						
	1.5						
	2.0						
	2.5						
	3.0						
	3.5						
	4.0						

Appendix E PID Calibration and Decontamination Field Forms

1/2

Field Equipment Calibration and Decontamination

JBS&G

PROJECT NAME: chatswood Education Precinct **PROJECT NO:** 55579

FIELD DATES: 21/1/19 - 25/1/19 **FIELD STAFF:** MN, RC

CALIBRATION SUMMARY

EQUIPMENT: PID

CALIBRATION STANDARD: 100ppm isobutylene.

DATE	TIME	READING (ppm$_v$)	COMMENTS
21/1/19	7:00am	0	Ambient
21/1/19	7:03am	100	isobutylene
21/1/19	7:05am	100.2	Bump.
22/1/19	7:00am	0	Ambient
22/1/19	7:02am	100	isobutylene
22/1/19	7:04am	100.5	bump.
23/1/19	7:00am	0	Ambient
23/1/19	7:03am	100	isobutylene
23/1/19	7:06am	99.8	bump
24/1/19	7:01am	0	Ambient.
24/1/19	7:02am	100	isobutylene
24/1/19	7:05am	100.1	Bump

DECONTAMINATION SUMMARY

EQUIPMENT: Auger.

Washed with decontamination water before collection of new sample. Nitrile gloves were changed for each sample collection.

1. Was the equipment decontaminated appropriately prior to sampling at each location? [✓ Y] N NA
2. Was excess soil removed by scraping, brushing or wiping with disposable towels? [✓ Y] N NA
3. Was the equipment contaminated with grease, tar or similar material? Y [✓ N] [✓ NA]
   If so, was the equipment steam cleaned or rinsed with pesticide-grade acetone:hexane? Y N
4. Was phosphate-free detergent used to wash the equipment? [✓ Y] N NA
5. Was the equipment rinsed with clean water? [✓ Y] N NA
6. Was the equipment then rinsed with deionised water? [✓ Y] N NA
7. Were all sample containers cleaned and acid or solvent washed prior to sample collection? Y N [✓ NA]

WERE ANY ADDITIONAL DECONTAMINATION MEASURES REQUIRED? PROVIDE DETAILS.

2/2

Field Equipment Calibration and Decontamination

JBS&G

PROJECT NAME: Chatswood Ed

PROJECT NO: 55579

FIELD DATES: 21/1/19 - 25/1/19

FIELD STAFF: MN, RC

CALIBRATION SUMMARY

EQUIPMENT: PID.

CALIBRATION STANDARD: 100ppm isobutylene

DATE	TIME	READING (ppm$_v$)	COMMENTS
25/1/19	7:00am	0	Ambient
25/1/19	7:05am	100	isobutylene
25/1/19	7:07am	100.2	bump.

DECONTAMINATION SUMMARY

EQUIPMENT: Auger washed with decontamination water before collection of new samples. Nitrile gloves were changed for each sample collection.

1. Was the equipment decontaminated appropriately prior to sampling at each location? [✓ Y] N NA
2. Was excess soil removed by scraping, brushing or wiping with disposable towels? [✓ Y] N NA
3. Was the equipment contaminated with grease, tar or similar material? Y [✓ N] [✓ NA]
   If so, was the equipment steam cleaned or rinsed with pesticide-grade acetone:hexane? Y N
4. Was phosphate-free detergent used to wash the equipment? [✓ Y] N NA
5. Was the equipment rinsed with clean water? [✓ Y] N NA
6. Was the equipment then rinsed with deionised water? [✓ Y] N NA
7. Were all sample containers cleaned and acid or solvent washed prior to sample collection? Y N [✓ NA]

WERE ANY ADDITIONAL DECONTAMINATION MEASURES REQUIRED? PROVIDE DETAILS.

Appendix F QAQC Assessment

Table 1 - QA/QC Results Summary

Data Quality Indicator	Results	DQI met?
Precision		
Soil		
Soil Blind duplicates (intra laboratory)	0-178% RPD Intra laboratory samples were analysed at a rate greater than 1 in 20 samples.	Partial[1]
Soil Blind triplicates (inter laboratory)	0-140% RPD Inter laboratory samples were analysed at a rate greater than 1 in 20 samples.	Partial[1]
Laboratory duplicates	0-110% RPD Intra laboratory samples were analysed at a rate greater than 1 in 20 samples.	Partial
Accuracy		
Soil		
Surrogate spikes	50-129% Recovery Surrogate spikes were completed for all organic samples	Partial[1]
Laboratory Control Samples	74-123% Recovery Laboratory control samples were completed for all organic and metals samples	Yes
Matrix spikes	49-130% Recovery Matrix spikes were completed for all organic and metals samples	Partial[1]
Representativeness		
Soil		
Sampling appropriate for media and analytes	All sampling conducted in accordance with JBS&G procedures	Yes
Laboratory blanks	<LOR	Yes
Samples extracted and analysed within holding times.	All samples were extracted and analysed within holding times less than 14 days.	Yes
Trip spikes	NA	No[1]
Trip blanks	NA	No[1]
Rinsate blank	<LOR, two results equal to LOR	Partial[1]
Comparability		
Standard operating procedures used for sample collection & handling	Field staff used same standard operating procedures throughout works	Yes
Standard analytical methods used	Standard analytical methods used.	Yes
Consistent field conditions, sampling staff and laboratory analysis	Sampling was conducted by a field scientist using standard operating procedures in the same conditions throughout the works. The laboratories remained consistent throughout the investigation.	Yes
Limits of reporting appropriate and consistent	Limits of reporting were consistent and appropriate.	Yes
Completeness		
Soil/water description & COCs completed	All bore logs and COCs were completed appropriately.	Yes
Appropriate documentation	All appropriate field documentation is included in the Appendices.	Yes
Satisfactory frequency/result for QC samples	The QC results are considered adequate for the purposes of the investigation.	Yes
Data from critical samples is considered valid	Data from critical samples is considered valid.	Yes

1. See discussion of DQI exceedances below.

QA/QC Discussion

Precision

Duplicates (intra-laboratory) and triplicate (Inter-laboratory) samples

The rate of duplicate and triplicate sampling and analysis was 2 duplicates/ triplicates per 30 primary samples for heavy metals, asbestos and PAH (6.7 %), 1 duplicate/ triplicate per 5 primary samples for TRH/BTEX, OCPs and OCPs (20 %), and 1 duplicate/ triplicate per 2 primary samples for PCBs (50%). As such, the frequency of duplicate sample analysis for all key contaminants of concern met/exceeded the nominated 5 % frequency.

Laboratory Duplicates

The laboratory completed a total of 9 laboratory duplicate samples, meeting the JBS&G acceptance criteria of 1 in 20 samples. Nine analyses from two laboratory duplicate samples exceeded the JBS&G DQI of 0%-50%. JBS&G note that reported RPDs pass the Eurofins | mgt's QC - Acceptance Criteria and as such are not considered to affect the precision of results.

Accuracy

Laboratory Control Samples

Laboratory control samples were generally within the range of 70-130% RPD for all analytes.

Soil Surrogate Spikes

Surrogate spike exceedances are considered acceptable as they are within the laboratory acceptance criteria of 50-150% recovery for surrogate spikes.

Soil Matrix Spikes

Matrix spike recoveries were within the acceptable range of 70-130% with the exception of sample S19-Ja24092 (benzene recovery 49% and toluene recovery 60%). These recoveries are not considered to be reflective of an unacceptable level of accuracy in the dataset as an acceptable recovery was obtained for the laboratory control sample indicating a sample matrix interference.

Representativeness

The extraction and analysis of selected samples was completed within the recommended holding times for all analytes.

JBS&G note that no trip spikes or trip blanks (TS/TB) were analysed as part of the assessment herein. Notwithstanding, JBS&G note that all sample handling procedures, including the storage of samples on ice were adhered to prior to, and during shipment to the testing laboratory. As such, JBS&G do not consider the omission of TB/TS samples adversely affect the representativeness of the data set. Furthermore, JBS&G note that the data set does not report the presence of any volatile hydrocarbons within samples.

All laboratory blanks analysed reported no concentrations above the laboratory LOR.

All field equipment was decontaminated and calibrated appropriately.

A rinsate sample was collected following decontamination of all non-disposable sampling equipment for the intrusive investigation. All analyte concentrations in the rinsate blanks were below the laboratory limit of reporting (LOR) with the exception of S19-Ja24422, which returned results equal to the LOR for 0.0001 for DDT+DDE+DDD (Total) and 4.4'-DDT. JBS&G does not consider this result indicative of contamination

Comparability

Eurofins|mgt, the primary laboratory, and Envirolab Services, the secondary laboratory, are NATA accredited for all analytical methods used. The laboratories used similar analytical methods and the analytical data were comparable between laboratories as indicated by the results of duplicate analysis. Where different LORs were adopted by the laboratories, consideration of the data set was not impacted.

The samples collected for assessment purposes are considered comparable as all samples were collected by experienced JBS&G personnel in accordance with standard JBS&G sampling methods.

Completeness

All laboratory and field documentation is complete and correct. Chain of custody documentation is provided with laboratory reports in **Appendix H**.

The frequency of analysis of all QC samples was considered appropriate and valid.

Sensitivity

The adopted analytical methods provided suitable LORs with respect to the adopted site assessment criteria for all mediums.

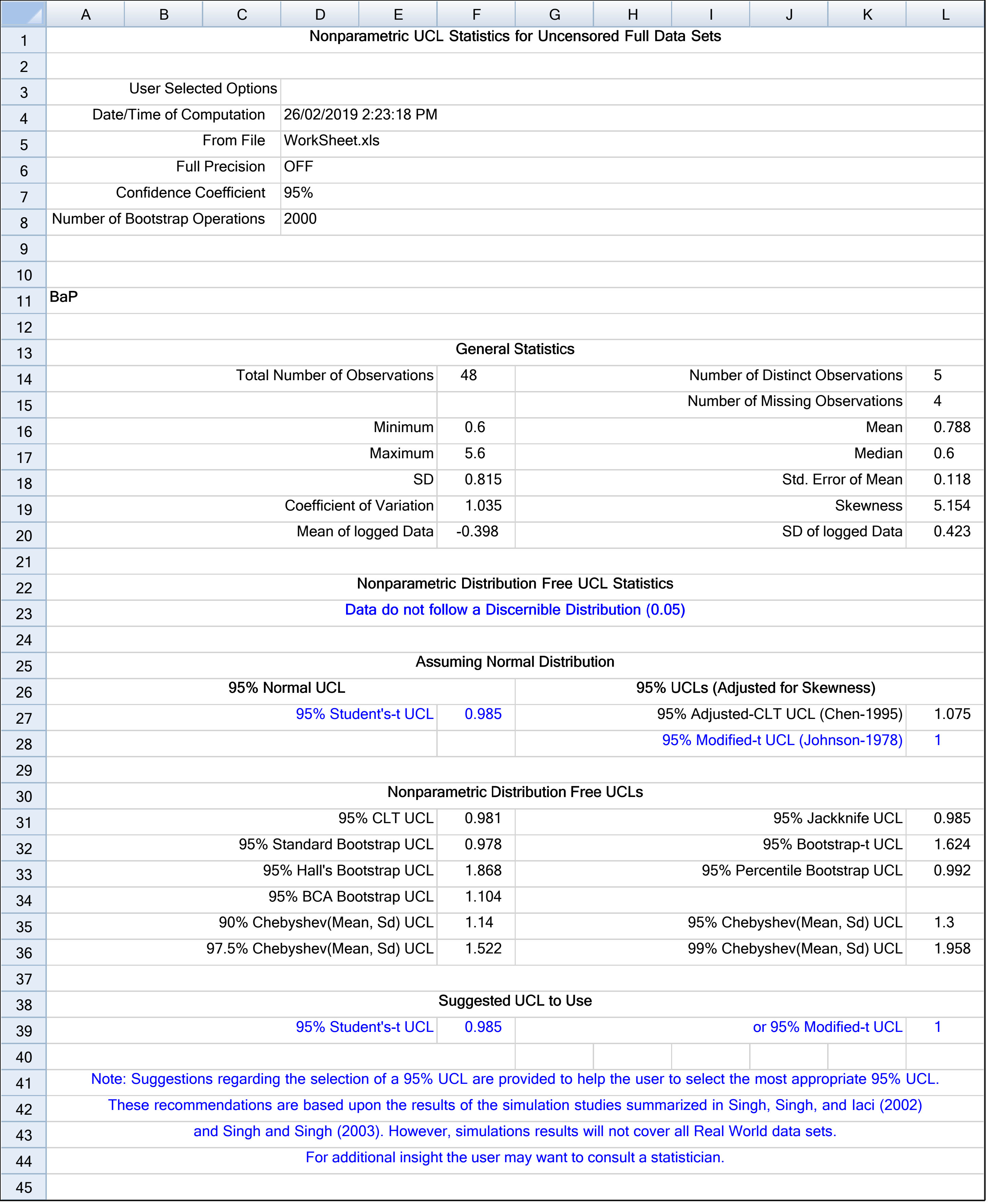
QA/QC Conclusions

The field sampling and handling procedures across the site produced QA/QC results which indicate that data collected is of an acceptable quality.

The NATA certified laboratory reports indicate that the project laboratories were achieving levels of performance within their recommended control limits during the period when the samples from this program were analysed.

On the basis of the results of the field and laboratory QA/QC program data is of an acceptable quality upon which to draw conclusions regarding the environmental condition of the site.

Appendix G Statistical Assessment of B(a)P



Nonparametric UCL Statistics for Uncensored Full Data Sets

User Selected Options	
Date/Time of Computation	26/02/2019 2:23:18 PM
From File	WorkSheet.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

BaP

General Statistics

Total Number of Observations	48	Number of Distinct Observations	5
		Number of Missing Observations	4
Minimum	0.6	Mean	0.788
Maximum	5.6	Median	0.6
SD	0.815	Std. Error of Mean	0.118
Coefficient of Variation	1.035	Skewness	5.154
Mean of logged Data	-0.398	SD of logged Data	0.423

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Assuming Normal Distribution

95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	0.985	95% Adjusted-CLT UCL (Chen-1995)	1.075
		95% Modified-t UCL (Johnson-1978)	1

Nonparametric Distribution Free UCLs

95% CLT UCL	0.981	95% Jackknife UCL	0.985
95% Standard Bootstrap UCL	0.978	95% Bootstrap-t UCL	1.624
95% Hall's Bootstrap UCL	1.868	95% Percentile Bootstrap UCL	0.992
95% BCA Bootstrap UCL	1.104		
90% Chebyshev(Mean, Sd) UCL	1.14	95% Chebyshev(Mean, Sd) UCL	1.3
97.5% Chebyshev(Mean, Sd) UCL	1.522	99% Chebyshev(Mean, Sd) UCL	1.958

Suggested UCL to Use

95% Student's-t UCL	0.985	or 95% Modified-t UCL	1

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Appendix H Laboratory Documentation

07563

Eurofins 1 of 1

CHAIN OF CUSTODY

JBS&G

PROJECT NO.: 55179

PROJECT NAME: Chatswood Education Precint Primary School

DATE NEEDED BY: STD

LABORATORY BATCH NO.:

SAMPLERS: RC/MN

QC LEVEL: NEPM (2013)

PHONE: Sydney: 02 8245 0300 | Perth: 08 9488 0100 | Brisbane: 07 3112 2688

SEND REPORT & INVOICE TO: (1) adminnsw@jbsg.com.au; (2) DDenzlo@jbsg.com.au; (3) mnawaim@jbsg.com.au Rchapman@jbsg.com.au

COMMENTS / SPECIAL HANDLING / STORAGE OR DISPOSAL:

SAMPLE ID	MATRIX	DATE	TIME	TYPE & PRESERVATIVE	pH	Metals	PAHs	TRH/BTEX	OCPs	PCB	TCLP metals/PAH	TYPE OF ASBESTOS ANALYSIS IDENTIFICATION	TYPE OF ASBESTOS ANALYSIS NEPM/WA	NOTES:
Rinsate	water	23/1/19		metal, semivolatile, volatile		X	X	X	X	X				
Rinsate	↓	25/1/19		↓		X	X	X	X	X				
QC 20190121 RC-01	Soil	21/1/19		bag, jar, ice		X	X	X	X	X			X	
QA 20190121 RC-01		↓		bag, jar, ice		Forward to envirolab								
QC 20190123 RC-01		23/1/19				X	X	X	X	X			X	
QA 20190123 RC-01		↓				Forward to envirolab								
QC 20190124 RC-01		24/1/19		↓		X	X	X	X	X			X	
QA 20190124 RC-01		↓		↓		Forward to envirolab								

RELINQUISHED BY:

NAME: DATE: 25/1/19

OF: JBS&G

NAME: DATE:

OF:

METHOD OF SHIPMENT:

CONSIGNMENT NOTE NO.

TRANSPORT CO.

CONSIGNMENT NOTE NO.

TRANSPORT CO

RECEIVED BY:

NAME: Ueca D

DATE: 23.01.19

OF: Eurofins MGT 5:50 pm

NAME: DATE:

OF:

FOR RECEIVING LAB USE ONLY:

COOLER SEAL – Yes....... No .... Intact .... Broken ....

COOLER TEMP .... deg C 3,5 °C

COOLER SEAL – Yes....... No .... Intact .... Broken ....

COOLER TEMP .... deg C

Container & Preservative Codes: P = Plastic; J = Soil Jar; B = Glass Bottle; N = Nitric Acid Prsvd.; C = Sodium Hydroxide Prsvd; VC = Hydrochloric Acid Prsvd Vial; VS = Sulfuric Acid Prsvd Vial; S = Sulfuric Acid Prsvd; Z = Zinc Prsvd; E = EDTA Prsvd; ST = Sterile Bottle; O = Other

IMSO FormsO13 - Chain of Custody - Generic

637848

Certificate of Analysis

JBS & G Australia (NSW) P/L
Level 1, 50 Margaret St
Sydney
NSW 2000

Attention:	Daniel Denaro
Report	637848-AID
Project Name	CHATSWOOD EDUCATION PRECINCT PRIMARY SCHOOL
Project ID	55579
Received Date	Jan 23, 2019
Date Reported	Feb 04, 2019

Methodology:

Asbestos Fibre Identification	Conducted in accordance with the Australian Standard AS 4964 – 2004: Method for the Qualitative Identification of Asbestos in Bulk Samples and in-house Method LTM-ASB-8020 by polarised light microscopy (PLM) and dispersion staining (DS) techniques. *NOTE: Positive Trace Analysis results indicate the sample contains detectable respirable fibres.*
Unknown Mineral Fibres	Mineral fibres of unknown type, as determined by PLM with DS, may require another analytical technique, such as Electron Microscopy, to confirm unequivocal identity. *NOTE: While Actinolite, Anthophyllite and Tremolite asbestos may be detected by PLM with DS, due to variability in the optical properties of these materials, AS4964 requires that these are reported as UMF unless confirmed by an independent technique.*
Subsampling Soil Samples	The whole sample submitted is first dried and then passed through a 10mm sieve followed by a 2mm sieve. All fibrous matter greater than 10mm, greater than 2mm as well as the material passing through the 2mm sieve are retained and analysed for the presence of asbestos. If the sub 2mm fraction is greater than approximately 30 to 60g then a sub-sampling routine based on ISO 3082:2009(E) is employed. *NOTE: Depending on the nature and size of the soil sample, the sub-2 mm residue material may need to be sub-sampled for trace analysis, in accordance with AS 4964-2004.*
Bonded asbestos-containing material (ACM)	The material is first examined and any fibres isolated for identification by PLM and DS. Where required, interfering matrices may be removed by disintegration using a range of heat, chemical or physical treatments, possibly in combination.The resultant material is then further examined in accordance with AS 4964 - 2004. *NOTE: Even after disintegration it may be difficult to detect the presence of asbestos in some asbestos-containing bulk materials using PLM and DS. This is due to the low grade or small length or diameter of the asbestos fibres present in the material, or to the fact that very fine fibres have been distributed intimately throughout the materials. Vinyl/asbestos floor tiles, some asbestos-containing sealants and mastics, asbestos-containing epoxy resins and some ore samples are examples of these types of material, which are difficult to analyse.*
Limit of Reporting	The performance limitation of the AS 4964 (2004) method for non-homogeneous samples is around 0.1 g/kg (equivalent to 0.01% (w/w)). Where no asbestos is found by PLM and DS, including Trace Analysis, this is considered to be at the nominal reporting limit of 0.01% (w/w). The NEPM screening level of 0.001% (w/w) is intended as an on-site determination, not a laboratory Limit of Reporting (LOR), per se. Examination of a large sample size (e.g. 500 mL) may improve the likelihood of detecting asbestos, particularly AF, to aid assessment against the NEPM criteria. Gravimetric determinations to this level of accuracy are outside of AS 4964 and hence NATA Accreditation does not cover the performance of this service (non-NATA results shown with an asterisk). *NOTE: NATA News March 2014, p.7, states in relation to AS 4964: "This is a qualitative method with a nominal reporting limit of 0.01 % " and that currently in Australia "there is no validated method available for the quantification of asbestos".This report is consistent with the analytical procedures and reporting recommendations in the NEPM and the WA DoH.*

Project Name	CHATSWOOD EDUCATION PRECINCT PRIMARY SCHOOL
Project ID	55579
Date Sampled	Jan 21, 2019 to Jan 24, 2019
Report	637848-AID

Client Sample ID	Eurofins | mgt Sample No.	Date Sampled	Sample Description	Result
QC20190121RC_01	19-Ja24424	Jan 21, 2019	Approximate Sample 887g Sample consisted of: Brown coarse-grained soil, rocks and bituminous fragments	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No respirable fibres detected.
QC20190123RC_01	19-Ja24425	Jan 23, 2019	Approximate Sample 668g Sample consisted of: Brown coarse-grained soil and rocks	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No respirable fibres detected.
QC20190124RC_01	19-Ja24426	Jan 24, 2019	Approximate Sample 635g Sample consisted of: Brown coarse-grained soil and rocks	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No respirable fibres detected.

Sample History

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

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

Description	Testing Site	Extracted	Holding Time
Asbestos - LTM-ASB-8020	Sydney	Jan 29, 2019	Indefinite

Company Name: JBS & G Australia (NSW) P/L
Address: Level 1, 50 Margaret St
Sydney
NSW 2000

Project Name: CHATSWOOD EDUCATION PRECINCT PRIMARY SCHOOL
Project ID: 55579

Order No.:
Report #: 637848
Phone: 02 8245 0300
Fax:

Received: Jan 25, 2019 5:50 PM
Due: Feb 4, 2019
Priority: 5 Day
Contact Name: Daniel Denaro

Eurofins | mgt Analytical Services Manager : Nibha Vaidya

Sample Detail						Asbestos - WA guidelines	HOLD	Moisture Set	JBS&G Suite 2
Melbourne Laboratory - NATA Site # 1254 & 14271							X	X	X
Sydney Laboratory - NATA Site # 18217						X			
Brisbane Laboratory - NATA Site # 20794									
Perth Laboratory - NATA Site # 23736									
External Laboratory									
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**				
1	RINSATE	Jan 23, 2019		Water	S19-Ja24422				X
2	RINSATE	Jan 25, 2019		Water	S19-Ja24423				X
3	QC20190121RC_01	Jan 21, 2019		Soil	S19-Ja24424	X		X	X
4	QC20190123RC_01	Jan 23, 2019		Soil	S19-Ja24425	X		X	X
5	QC20190124RC_01	Jan 24, 2019		Soil	S19-Ja24426	X		X	X
6	TRIP SPIKE	Jan 17, 2019		Water	S19-Ja24427		X		
7	TRIP BLANK	Jan 17, 2019		Water	S19-Ja24428		X		

Company Name: JBS & G Australia (NSW) P/L
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Sample Detail						Asbestos - WA guidelines	HOLD	Moisture Set	JBS&G Suite 2
Melbourne Laboratory - NATA Site # 1254 & 14271							X	X	X
Sydney Laboratory - NATA Site # 18217						X			
Brisbane Laboratory - NATA Site # 20794									
Perth Laboratory - NATA Site # 23736									
8	TRIP SPIKE	Jan 09, 2019		Water	S19-Ja24429		X		
9	TRIP BLANK	Jan 09, 2019		Water	S19-Ja24430		X		
Test Counts						3	4	3	5

Internal Quality Control Review and Glossary

General

1. QC data may be available on request.
2. All soil results are reported on a dry basis, unless otherwise stated.
3. Samples were analysed on an 'as received' basis.
4. This report replaces any interim results previously issued.

Holding Times

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

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

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

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

Units

% w/w: weight for weight basis	grams per kilogram
Filter loading:	fibres/100 graticule areas
Reported Concentration:	fibres/mL
Flowrate:	L/min

Terms

Dry	Sample is dried by heating prior to analysis
LOR	Limit of Reporting
COC	Chain of Custody
SRA	Sample Receipt Advice
ISO	International Standards Organisation
AS	Australian Standards
WA DOH	Reference document for the NEPM. Government of Western Australia, Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia (2009), including supporting document Recommended Procedures for Laboratory Analysis of Asbestos in Soil (2011)
NEPM	National Environment Protection (Assessment of Site Contamination) Measure, 2013 (as amended)
ACM	Asbestos Containing Materials. Asbestos contained within a non-asbestos matrix, typically presented in bonded and/or sound condition. For the purposes of the NEPM, ACM is generally restricted to those materials that do not pass a 7mm x 7mm sieve.
AF	Asbestos Fines. Asbestos containing materials, including friable, weathered and bonded materials, able to pass a 7mm x 7mm sieve. Considered under the NEPM as equivalent to “non-bonded / friable”.
FA	Fibrous Asbestos. Asbestos containing materials in a friable and/or severely weathered condition. For the purposes of the NEPM, FA is generally restricted to those materials that do not pass a 7mm x 7mm sieve.
Friable	Asbestos-containing materials of any size that may be broken or crumbled by hand pressure. For the purposes of the NEPM, this includes both AF and FA. It is outside of the laboratory’s remit to assess degree of friability.
Trace Analysis	Analytical procedure used to detect the presence of respirable fibres in the matrix.

Comments

Sample Integrity

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

Qualifier Codes/Comments

Code	Description
N/A	Not applicable

Asbestos Counter/Identifier:

Laxman Dias	Senior Analyst-Asbestos (NSW)

Authorised by:

Sayeed Abu	Senior Analyst-Asbestos (NSW)

Glenn Jackson
General Manager

- Indicates Not Requested

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

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

Certificate of Analysis

JBS & G Australia (NSW) P/L
Level 1, 50 Margaret St
Sydney
NSW 2000

Attention: **Daniel Denaro**

Report	**637848-S**
Project name	CHATSWOOD EDUCATION PRECINCT PRIMARY SCHOOL
Project ID	55579
Received Date	Jan 23, 2019

Client Sample ID			**QC20190121RC_01**	**QC20190123RC_01**	**QC20190124RC_01**
Sample Matrix			**Soil**	**Soil**	**Soil**
Eurofins | mgt Sample No.			**S19-Ja24424**	**S19-Ja24425**	**S19-Ja24426**
Date Sampled			**Jan 21, 2019**	**Jan 23, 2019**	**Jan 24, 2019**
Test/Reference	LOR	Unit			
Total Recoverable Hydrocarbons - 1999 NEPM Fractions					
TRH C6-C9	20	mg/kg	< 20	< 20	< 20
TRH C10-C14	20	mg/kg	< 20	< 20	< 20
TRH C15-C28	50	mg/kg	150	< 50	< 50
TRH C29-C36	50	mg/kg	410	< 50	< 50
TRH C10-36 (Total)	50	mg/kg	560	< 50	< 50
BTEX					
Benzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Toluene	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Ethylbenzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1
m&p-Xylenes	0.2	mg/kg	< 0.2	< 0.2	< 0.2
o-Xylene	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Xylenes - Total	0.3	mg/kg	< 0.3	< 0.3	< 0.3
4-Bromofluorobenzene (surr.)	1	%	74	69	67
Total Recoverable Hydrocarbons - 2013 NEPM Fractions					
Naphthalene[N02]	0.5	mg/kg	< 0.5	< 0.5	< 0.5
TRH C6-C10	20	mg/kg	< 20	< 20	< 20
TRH C6-C10 less BTEX (F1)[N04]	20	mg/kg	< 20	< 20	< 20
TRH >C10-C16	50	mg/kg	< 50	< 50	< 50
TRH >C10-C16 less Naphthalene (F2)[N01]	50	mg/kg	< 50	< 50	< 50
TRH >C16-C34	100	mg/kg	440	< 100	< 100
TRH >C34-C40	100	mg/kg	400	< 100	< 100
TRH >C10-C40 (total)*	100	mg/kg	840	< 100	< 100
Polycyclic Aromatic Hydrocarbons					
Benzo(a)pyrene TEQ (lower bound) *	0.5	mg/kg	< 0.5	< 0.5	< 0.5
Benzo(a)pyrene TEQ (medium bound) *	0.5	mg/kg	0.6	0.6	0.6
Benzo(a)pyrene TEQ (upper bound) *	0.5	mg/kg	1.2	1.2	1.2
Acenaphthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5
Acenaphthylene	0.5	mg/kg	< 0.5	< 0.5	< 0.5
Anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5
Benz(a)anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5
Benzo(a)pyrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5
Benzo(b&j)fluoranthene[N07]	0.5	mg/kg	< 0.5	< 0.5	< 0.5
Benzo(g.h.i)perylene	0.5	mg/kg	< 0.5	< 0.5	< 0.5
Benzo(k)fluoranthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5
Chrysene	0.5	mg/kg	< 0.5	< 0.5	< 0.5

Client Sample ID			**QC20190121RC_01**	**QC20190123RC_01**	**QC20190124RC_01**
Sample Matrix			**Soil**	**Soil**	**Soil**
Eurofins | mgt Sample No.			**S19-Ja24424**	**S19-Ja24425**	**S19-Ja24426**
Date Sampled			**Jan 21, 2019**	**Jan 23, 2019**	**Jan 24, 2019**
Test/Reference	LOR	Unit			
Polycyclic Aromatic Hydrocarbons					
Dibenz(a.h)anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5
Fluoranthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5
Fluorene	0.5	mg/kg	< 0.5	< 0.5	< 0.5
Indeno(1.2.3-cd)pyrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5
Naphthalene	0.5	mg/kg	< 0.5	< 0.5	< 0.5
Phenanthrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5
Pyrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5
Total PAH*	0.5	mg/kg	< 0.5	< 0.5	< 0.5
2-Fluorobiphenyl (surr.)	1	%	106	54	64
p-Terphenyl-d14 (surr.)	1	%	102	76	86
Organochlorine Pesticides					
Chlordanes - Total	0.1	mg/kg	< 0.1	< 0.1	< 0.1
4.4'-DDD	0.05	mg/kg	< 0.05	< 0.05	< 0.05
4.4'-DDE	0.05	mg/kg	< 0.05	< 0.05	< 0.05
4.4'-DDT	0.05	mg/kg	< 0.05	< 0.05	< 0.05
a-BHC	0.05	mg/kg	< 0.05	< 0.05	< 0.05
Aldrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05
b-BHC	0.05	mg/kg	< 0.05	< 0.05	< 0.05
d-BHC	0.05	mg/kg	< 0.05	< 0.05	< 0.05
Dieldrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05
Endosulfan I	0.05	mg/kg	< 0.05	< 0.05	< 0.05
Endosulfan II	0.05	mg/kg	< 0.05	< 0.05	< 0.05
Endosulfan sulphate	0.05	mg/kg	< 0.05	< 0.05	< 0.05
Endrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05
Endrin aldehyde	0.05	mg/kg	< 0.05	< 0.05	< 0.05
Endrin ketone	0.05	mg/kg	< 0.05	< 0.05	< 0.05
g-BHC (Lindane)	0.05	mg/kg	< 0.05	< 0.05	< 0.05
Heptachlor	0.05	mg/kg	< 0.05	< 0.05	< 0.05
Heptachlor epoxide	0.05	mg/kg	< 0.05	< 0.05	< 0.05
Hexachlorobenzene	0.05	mg/kg	< 0.05	< 0.05	< 0.05
Methoxychlor	0.05	mg/kg	< 0.05	< 0.05	< 0.05
Toxaphene	1	mg/kg	< 1	< 1	< 1
Aldrin and Dieldrin (Total)*	0.05	mg/kg	< 0.05	< 0.05	< 0.05
DDT + DDE + DDD (Total)*	0.05	mg/kg	< 0.05	< 0.05	< 0.05
Vic EPA IWRG 621 OCP (Total)*	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Vic EPA IWRG 621 Other OCP (Total)*	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Dibutylchlorendate (surr.)	1	%	124	70	56
Tetrachloro-m-xylene (surr.)	1	%	102	77	76
Polychlorinated Biphenyls					
Aroclor-1016	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Aroclor-1221	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Aroclor-1232	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Aroclor-1242	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Aroclor-1248	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Aroclor-1254	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Aroclor-1260	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Total PCB*	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Dibutylchlorendate (surr.)	1	%	124	70	56
Tetrachloro-m-xylene (surr.)	1	%	102	77	76

Client Sample ID			**QC20190121RC_01**	**QC20190123RC_01**	**QC20190124RC_01**
Sample Matrix			**Soil**	**Soil**	**Soil**
Eurofins | mgt Sample No.			**S19-Ja24424**	**S19-Ja24425**	**S19-Ja24426**
Date Sampled			**Jan 21, 2019**	**Jan 23, 2019**	**Jan 24, 2019**
Test/Reference	LOR	Unit			
Heavy Metals					
Arsenic	2	mg/kg	13	4.6	5.1
Cadmium	0.4	mg/kg	< 0.4	< 0.4	< 0.4
Chromium	5	mg/kg	14	9.7	42
Copper	5	mg/kg	33	8.6	24
Lead	5	mg/kg	17	11	31
Mercury	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Nickel	5	mg/kg	23	7.3	42
Zinc	5	mg/kg	59	14	41
% Moisture	1	%	8.8	9.1	11

Sample History

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

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

Description	Testing Site	Extracted	Holding Time
JBS&G Suite 2			
Total Recoverable Hydrocarbons - 1999 NEPM Fractions	Melbourne	Jan 30, 2019	14 Day
- Method: LTM-ORG-2010 TRH C6-C40			
BTEX	Melbourne	Jan 30, 2019	14 Day
- Method: LTM-ORG-2150 VOCs in Soils Liquid and other Aqueous Matrices			
Total Recoverable Hydrocarbons - 2013 NEPM Fractions	Melbourne	Jan 30, 2019	14 Day
- Method: LTM-ORG-2010 TRH C6-C40			
Total Recoverable Hydrocarbons - 2013 NEPM Fractions	Melbourne	Jan 30, 2019	14 Day
- Method: LTM-ORG-2010 TRH C6-C40			
Polycyclic Aromatic Hydrocarbons	Melbourne	Jan 30, 2019	14 Day
- Method: LTM-ORG-2130 PAH and Phenols in Soil and Water			
Organochlorine Pesticides	Melbourne	Jan 30, 2019	14 Day
- Method: LTM-ORG-2220 OCP & PCB in Soil and Water			
Polychlorinated Biphenyls	Melbourne	Jan 30, 2019	28 Days
- Method: LTM-ORG-2220 OCP & PCB in Soil and Water			
Metals M8	Melbourne	Jan 30, 2019	28 Days
- Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS			
% Moisture	Melbourne	Jan 30, 2019	14 Day
- Method: LTM-GEN-7080 Moisture			

Company Name: JBS & G Australia (NSW) P/L
Address: Level 1, 50 Margaret St
Sydney
NSW 2000

Order No.:
Report #: 637848
Phone: 02 8245 0300
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Received: Jan 25, 2019 5:50 PM
Due: Feb 4, 2019
Priority: 5 Day
Contact Name: Daniel Denaro

Project Name: CHATSWOOD EDUCATION PRECINCT PRIMARY SCHOOL
Project ID: 55579

Eurofins | mgt Analytical Services Manager : Nibha Vaidya

Sample Detail						Asbestos - WA guidelines	HOLD	Moisture Set	JBS&G Suite 2
Melbourne Laboratory - NATA Site # 1254 & 14271							X	X	X
Sydney Laboratory - NATA Site # 18217						X			
Brisbane Laboratory - NATA Site # 20794									
Perth Laboratory - NATA Site # 23736									
External Laboratory									
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**				
1	RINSATE	Jan 23, 2019		Water	S19-Ja24422				X
2	RINSATE	Jan 25, 2019		Water	S19-Ja24423				X
3	QC20190121RC_01	Jan 21, 2019		Soil	S19-Ja24424	X		X	X
4	QC20190123RC_01	Jan 23, 2019		Soil	S19-Ja24425	X		X	X
5	QC20190124RC_01	Jan 24, 2019		Soil	S19-Ja24426	X		X	X
6	TRIP SPIKE	Jan 17, 2019		Water	S19-Ja24427		X		
7	TRIP BLANK	Jan 17, 2019		Water	S19-Ja24428		X		

Company Name: JBS & G Australia (NSW) P/L
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Sample Detail						Asbestos - WA guidelines	HOLD	Moisture Set	JBS&G Suite 2
Melbourne Laboratory - NATA Site # 1254 & 14271							X	X	X
Sydney Laboratory - NATA Site # 18217						X			
Brisbane Laboratory - NATA Site # 20794									
Perth Laboratory - NATA Site # 23736									
8	TRIP SPIKE	Jan 09, 2019		Water	S19-Ja24429		X		
9	TRIP BLANK	Jan 09, 2019		Water	S19-Ja24430		X		
Test Counts						3	4	3	5

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure, April 2011 and are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. This report replaces any interim results previously issued.

Holding Times

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

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

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

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

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

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

Units

mg/kg: milligrams per kilogram
ppm: Parts per million
org/100mL: Organisms per 100 millilitres
mg/L: milligrams per litre
ppb: Parts per billion
NTU: Nephelometric Turbidity Units
ug/L: micrograms per litre
%: Percentage
MPN/100mL: Most Probable Number of organisms per 100 millilitres

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery.
CRM	Certified Reference Material - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
QSM	US Department of Defense Quality Systems Manual Version 5.2 2018
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

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

Results <10 times the LOR : No Limit

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

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

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

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.2 where no positive PFAS results have been reported have been reviewed and no data was affected.

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

QC Data General Comments

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

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions							
TRH C6-C9	mg/kg	< 20			20	Pass	
TRH C10-C14	mg/kg	< 20			20	Pass	
TRH C15-C28	mg/kg	< 50			50	Pass	
TRH C29-C36	mg/kg	< 50			50	Pass	
Method Blank							
BTEX							
Benzene	mg/kg	< 0.1			0.1	Pass	
Toluene	mg/kg	< 0.1			0.1	Pass	
Ethylbenzene	mg/kg	< 0.1			0.1	Pass	
m&p-Xylenes	mg/kg	< 0.2			0.2	Pass	
o-Xylene	mg/kg	< 0.1			0.1	Pass	
Xylenes - Total	mg/kg	< 0.3			0.3	Pass	
Method Blank							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	mg/kg	< 0.5			0.5	Pass	
TRH C6-C10	mg/kg	< 20			20	Pass	
TRH >C10-C16	mg/kg	< 50			50	Pass	
TRH >C16-C34	mg/kg	< 100			100	Pass	
TRH >C34-C40	mg/kg	< 100			100	Pass	
Method Blank							
Polycyclic Aromatic Hydrocarbons							
Acenaphthene	mg/kg	< 0.5			0.5	Pass	
Acenaphthylene	mg/kg	< 0.5			0.5	Pass	
Anthracene	mg/kg	< 0.5			0.5	Pass	
Benz(a)anthracene	mg/kg	< 0.5			0.5	Pass	
Benzo(a)pyrene	mg/kg	< 0.5			0.5	Pass	
Benzo(b&j)fluoranthene	mg/kg	< 0.5			0.5	Pass	
Benzo(g.h.i)perylene	mg/kg	< 0.5			0.5	Pass	
Benzo(k)fluoranthene	mg/kg	< 0.5			0.5	Pass	
Chrysene	mg/kg	< 0.5			0.5	Pass	
Dibenz(a.h)anthracene	mg/kg	< 0.5			0.5	Pass	
Fluoranthene	mg/kg	< 0.5			0.5	Pass	
Fluorene	mg/kg	< 0.5			0.5	Pass	
Indeno(1.2.3-cd)pyrene	mg/kg	< 0.5			0.5	Pass	
Naphthalene	mg/kg	< 0.5			0.5	Pass	
Phenanthrene	mg/kg	< 0.5			0.5	Pass	
Pyrene	mg/kg	< 0.5			0.5	Pass	
Method Blank							
Organochlorine Pesticides							
Chlordanes - Total	mg/kg	< 0.1			0.1	Pass	
4.4'-DDD	mg/kg	< 0.05			0.05	Pass	
4.4'-DDE	mg/kg	< 0.05			0.05	Pass	
4.4'-DDT	mg/kg	< 0.05			0.05	Pass	
a-BHC	mg/kg	< 0.05			0.05	Pass	
Aldrin	mg/kg	< 0.05			0.05	Pass	
b-BHC	mg/kg	< 0.05			0.05	Pass	
d-BHC	mg/kg	< 0.05			0.05	Pass	
Dieldrin	mg/kg	< 0.05			0.05	Pass	
Endosulfan I	mg/kg	< 0.05			0.05	Pass	
Endosulfan II	mg/kg	< 0.05			0.05	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Endosulfan sulphate	mg/kg	< 0.05			0.05	Pass	
Endrin	mg/kg	< 0.05			0.05	Pass	
Endrin aldehyde	mg/kg	< 0.05			0.05	Pass	
Endrin ketone	mg/kg	< 0.05			0.05	Pass	
g-BHC (Lindane)	mg/kg	< 0.05			0.05	Pass	
Heptachlor	mg/kg	< 0.05			0.05	Pass	
Heptachlor epoxide	mg/kg	< 0.05			0.05	Pass	
Hexachlorobenzene	mg/kg	< 0.05			0.05	Pass	
Methoxychlor	mg/kg	< 0.05			0.05	Pass	
Toxaphene	mg/kg	< 1			1	Pass	
Method Blank							
Polychlorinated Biphenyls							
Aroclor-1016	mg/kg	< 0.1			0.1	Pass	
Aroclor-1221	mg/kg	< 0.1			0.1	Pass	
Aroclor-1232	mg/kg	< 0.1			0.1	Pass	
Aroclor-1242	mg/kg	< 0.1			0.1	Pass	
Aroclor-1248	mg/kg	< 0.1			0.1	Pass	
Aroclor-1254	mg/kg	< 0.1			0.1	Pass	
Aroclor-1260	mg/kg	< 0.1			0.1	Pass	
Total PCB*	mg/kg	< 0.1			0.1	Pass	
Method Blank							
Heavy Metals							
Arsenic	mg/kg	< 2			2	Pass	
Cadmium	mg/kg	< 0.4			0.4	Pass	
Chromium	mg/kg	< 5			5	Pass	
Copper	mg/kg	< 5			5	Pass	
Lead	mg/kg	< 5			5	Pass	
Mercury	mg/kg	< 0.1			0.1	Pass	
Nickel	mg/kg	< 5			5	Pass	
Zinc	mg/kg	< 5			5	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions							
TRH C6-C9	%	96			70-130	Pass	
TRH C10-C14	%	106			70-130	Pass	
LCS - % Recovery							
BTEX							
Benzene	%	87			70-130	Pass	
Toluene	%	97			70-130	Pass	
Ethylbenzene	%	101			70-130	Pass	
m&p-Xylenes	%	99			70-130	Pass	
Xylenes - Total	%	98			70-130	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	%	78			70-130	Pass	
TRH C6-C10	%	92			70-130	Pass	
TRH >C10-C16	%	105			70-130	Pass	
LCS - % Recovery							
Polycyclic Aromatic Hydrocarbons							
Acenaphthene	%	125			70-130	Pass	
Acenaphthylene	%	119			70-130	Pass	
Anthracene	%	109			70-130	Pass	
Benz(a)anthracene	%	99			70-130	Pass	
Benzo(a)pyrene	%	84			70-130	Pass	
Benzo(b&j)fluoranthene	%	94			70-130	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Benzo(g.h.i)perylene	%	84			70-130	Pass	
Benzo(k)fluoranthene	%	83			70-130	Pass	
Chrysene	%	82			70-130	Pass	
Dibenz(a.h)anthracene	%	82			70-130	Pass	
Fluoranthene	%	115			70-130	Pass	
Fluorene	%	120			70-130	Pass	
Indeno(1.2.3-cd)pyrene	%	94			70-130	Pass	
Naphthalene	%	111			70-130	Pass	
Phenanthrene	%	112			70-130	Pass	
Pyrene	%	125			70-130	Pass	
LCS - % Recovery							
Organochlorine Pesticides							
Chlordanes - Total	%	100			70-130	Pass	
4.4'-DDE	%	108			70-130	Pass	
4.4'-DDT	%	88			70-130	Pass	
a-BHC	%	83			70-130	Pass	
Aldrin	%	100			70-130	Pass	
b-BHC	%	72			70-130	Pass	
d-BHC	%	75			70-130	Pass	
Dieldrin	%	117			70-130	Pass	
Endosulfan I	%	109			70-130	Pass	
Endosulfan II	%	86			70-130	Pass	
Endosulfan sulphate	%	71			70-130	Pass	
Endrin	%	120			70-130	Pass	
Endrin aldehyde	%	83			70-130	Pass	
Endrin ketone	%	88			70-130	Pass	
g-BHC (Lindane)	%	92			70-130	Pass	
Heptachlor	%	92			70-130	Pass	
Heptachlor epoxide	%	80			70-130	Pass	
Hexachlorobenzene	%	110			70-130	Pass	
Methoxychlor	%	76			70-130	Pass	
LCS - % Recovery							
Polychlorinated Biphenyls							
Aroclor-1260	%	87			70-130	Pass	
LCS - % Recovery							
Heavy Metals							
Arsenic	%	115			80-120	Pass	
Cadmium	%	104			80-120	Pass	
Chromium	%	120			80-120	Pass	
Copper	%	118			80-120	Pass	
Lead	%	116			80-120	Pass	
Mercury	%	109			75-125	Pass	
Nickel	%	115			80-120	Pass	
Zinc	%	114			80-120	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1					
TRH C6-C9	S19-Ja22195	NCP	%	84			70-130	Pass	
TRH C10-C14	M19-Ja23438	NCP	%	95			70-130	Pass	
Spike - % Recovery									
BTEX				Result 1					
Benzene	S19-Ja22195	NCP	%	82			70-130	Pass	
Toluene	S19-Ja22195	NCP	%	96			70-130	Pass	
Ethylbenzene	S19-Ja22195	NCP	%	102			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
m&p-Xylenes	S19-Ja22195	NCP	%	101			70-130	Pass	
o-Xylene	S19-Ja22195	NCP	%	102			70-130	Pass	
Xylenes - Total	S19-Ja22195	NCP	%	101			70-130	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1					
Naphthalene	S19-Ja22195	NCP	%	77			70-130	Pass	
TRH C6-C10	S19-Ja22195	NCP	%	82			70-130	Pass	
TRH >C10-C16	M19-Ja23438	NCP	%	94			70-130	Pass	
Spike - % Recovery									
Polycyclic Aromatic Hydrocarbons				Result 1					
Acenaphthene	P19-Ja24685	NCP	%	103			70-130	Pass	
Acenaphthylene	P19-Ja24685	NCP	%	103			70-130	Pass	
Anthracene	P19-Ja24685	NCP	%	84			70-130	Pass	
Benz(a)anthracene	P19-Ja24685	NCP	%	97			70-130	Pass	
Benzo(a)pyrene	P19-Ja24685	NCP	%	98			70-130	Pass	
Benzo(b&j)fluoranthene	P19-Ja24685	NCP	%	86			70-130	Pass	
Benzo(g.h.i)perylene	P19-Ja24685	NCP	%	80			70-130	Pass	
Benzo(k)fluoranthene	P19-Ja24685	NCP	%	102			70-130	Pass	
Chrysene	P19-Ja24685	NCP	%	79			70-130	Pass	
Dibenz(a.h)anthracene	P19-Ja24685	NCP	%	101			70-130	Pass	
Fluoranthene	P19-Ja24685	NCP	%	85			70-130	Pass	
Fluorene	P19-Ja24685	NCP	%	97			70-130	Pass	
Indeno(1.2.3-cd)pyrene	P19-Ja24685	NCP	%	88			70-130	Pass	
Naphthalene	P19-Ja24685	NCP	%	109			70-130	Pass	
Phenanthrene	P19-Ja24685	NCP	%	85			70-130	Pass	
Pyrene	P19-Ja24685	NCP	%	88			70-130	Pass	
Spike - % Recovery									
Organochlorine Pesticides				Result 1					
Chlordanes - Total	M19-Ja23309	NCP	%	111			70-130	Pass	
4.4'-DDE	M19-Ja23309	NCP	%	121			70-130	Pass	
a-BHC	M19-Ja23309	NCP	%	90			70-130	Pass	
Aldrin	M19-Ja23309	NCP	%	104			70-130	Pass	
b-BHC	M19-Ja23309	NCP	%	82			70-130	Pass	
d-BHC	M19-Ja23309	NCP	%	84			70-130	Pass	
Dieldrin	M19-Ja23309	NCP	%	124			70-130	Pass	
Endosulfan I	M19-Ja23309	NCP	%	103			70-130	Pass	
Endosulfan II	M19-Ja23309	NCP	%	106			70-130	Pass	
Endosulfan sulphate	M19-Ja23309	NCP	%	70			70-130	Pass	
Endrin	M19-Ja23309	NCP	%	125			70-130	Pass	
Endrin aldehyde	M19-Ja23309	NCP	%	89			70-130	Pass	
Endrin ketone	M19-Ja23309	NCP	%	114			70-130	Pass	
g-BHC (Lindane)	M19-Ja23309	NCP	%	99			70-130	Pass	
Heptachlor	M19-Ja23309	NCP	%	95			70-130	Pass	
Heptachlor epoxide	M19-Ja23309	NCP	%	85			70-130	Pass	
Hexachlorobenzene	M19-Ja23309	NCP	%	115			70-130	Pass	
Spike - % Recovery									
Polychlorinated Biphenyls				Result 1					
Aroclor-1016	M19-Ja24646	NCP	%	72			70-130	Pass	
Aroclor-1260	M19-Ja24646	NCP	%	92			70-130	Pass	
Spike - % Recovery									
Heavy Metals				Result 1					
Arsenic	M19-Ja24618	NCP	%	117			75-125	Pass	
Cadmium	M19-Ja24618	NCP	%	108			75-125	Pass	
Chromium	M19-Ja24618	NCP	%	117			75-125	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Copper	M19-Ja24618	NCP	%	170			75-125	Fail	Q08
Lead	M19-Ja24618	NCP	%	219			75-125	Fail	Q08
Mercury	M19-Ja24618	NCP	%	106			70-130	Pass	
Nickel	M19-Ja24618	NCP	%	115			75-125	Pass	
Zinc	M19-Ja24618	NCP	%	150			75-125	Fail	Q08
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Duplicate									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1	Result 2	RPD			
TRH C6-C9	S19-Ja22194	NCP	mg/kg	< 20	< 20	<1	30%	Pass	
TRH C10-C14	M19-Ja25129	NCP	mg/kg	< 20	< 20	<1	30%	Pass	
TRH C15-C28	M19-Ja25129	NCP	mg/kg	< 50	< 50	<1	30%	Pass	
TRH C29-C36	M19-Ja25129	NCP	mg/kg	< 50	< 50	<1	30%	Pass	
Duplicate									
BTEX				Result 1	Result 2	RPD			
Benzene	S19-Ja22194	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Toluene	S19-Ja22194	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Ethylbenzene	S19-Ja22194	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
m&p-Xylenes	S19-Ja22194	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
o-Xylene	S19-Ja22194	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Xylenes - Total	S19-Ja22194	NCP	mg/kg	< 0.3	< 0.3	<1	30%	Pass	
Duplicate									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1	Result 2	RPD			
Naphthalene	S19-Ja22194	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
TRH C6-C10	S19-Ja22194	NCP	mg/kg	< 20	< 20	<1	30%	Pass	
TRH >C10-C16	M19-Ja25129	NCP	mg/kg	< 50	< 50	<1	30%	Pass	
TRH >C16-C34	M19-Ja25129	NCP	mg/kg	< 100	< 100	<1	30%	Pass	
TRH >C34-C40	M19-Ja25129	NCP	mg/kg	< 100	< 100	<1	30%	Pass	
Duplicate									
Polycyclic Aromatic Hydrocarbons				Result 1	Result 2	RPD			
Acenaphthene	M19-Ja23308	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Acenaphthylene	M19-Ja23308	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Anthracene	M19-Ja23308	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benz(a)anthracene	M19-Ja23308	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(a)pyrene	M19-Ja23308	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(b&j)fluoranthene	M19-Ja23308	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(g.h.i)perylene	M19-Ja23308	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(k)fluoranthene	M19-Ja23308	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Chrysene	M19-Ja23308	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Dibenz(a.h)anthracene	M19-Ja23308	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Fluoranthene	M19-Ja23308	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Fluorene	M19-Ja23308	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Indeno(1.2.3-cd)pyrene	M19-Ja23308	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Naphthalene	M19-Ja23308	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Phenanthrene	M19-Ja23308	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Pyrene	M19-Ja23308	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Duplicate									
Organochlorine Pesticides				Result 1	Result 2	RPD			
Chlordanes - Total	M19-Ja23308	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
4.4'-DDD	M19-Ja23308	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
4.4'-DDE	M19-Ja23308	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
4.4'-DDT	M19-Ja23308	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
a-BHC	M19-Ja23308	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Aldrin	M19-Ja23308	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
b-BHC	M19-Ja23308	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	

Duplicate									
Organochlorine Pesticides				Result 1	Result 2	RPD			
d-BHC	M19-Ja23308	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Dieldrin	M19-Ja23308	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endosulfan I	M19-Ja23308	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endosulfan II	M19-Ja23308	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endosulfan sulphate	M19-Ja23308	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endrin	M19-Ja23308	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endrin aldehyde	M19-Ja23308	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endrin ketone	M19-Ja23308	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
g-BHC (Lindane)	M19-Ja23308	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Heptachlor	M19-Ja23308	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Heptachlor epoxide	M19-Ja23308	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Hexachlorobenzene	M19-Ja23308	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Methoxychlor	M19-Ja23308	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Arsenic	M19-Ja24617	NCP	mg/kg	< 2	< 2	<1	30%	Pass	
Cadmium	M19-Ja24617	NCP	mg/kg	< 0.4	< 0.4	<1	30%	Pass	
Chromium	M19-Ja24617	NCP	mg/kg	< 5	< 5	<1	30%	Pass	
Copper	M19-Ja24617	NCP	mg/kg	< 5	< 5	<1	30%	Pass	
Lead	M19-Ja24617	NCP	mg/kg	< 5	< 5	<1	30%	Pass	
Mercury	M19-Ja24617	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Nickel	M19-Ja24617	NCP	mg/kg	< 5	< 5	<1	30%	Pass	
Zinc	M19-Ja24617	NCP	mg/kg	< 5	< 5	<1	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
% Moisture	M19-Ja23454	NCP	%	14	15	3.0	30%	Pass	

Comments

Sample Integrity

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

Qualifier Codes/Comments

Code	Description
N01	F2 is determined by arithmetically subtracting the "naphthalene" value from the ">C10-C16" value. The naphthalene value used in this calculation is obtained from volatiles (Purge & Trap analysis).
N02	Where we have reported both volatile (P&T GCMS) and semivolatile (GCMS) naphthalene data, results may not be identical. Provided correct sample handling protocols have been followed, any observed differences in results are likely to be due to procedural differences within each methodology. Results determined by both techniques have passed all QAQC acceptance criteria, and are entirely technically valid.
N04	F1 is determined by arithmetically subtracting the "Total BTEX" value from the "C6-C10" value. The "Total BTEX" value is obtained by summing the concentrations of BTEX analytes. The "C6-C10" value is obtained by quantitating against a standard of mixed aromatic/aliphatic analytes.
N07	Please note:- These two PAH isomers closely co-elute using the most contemporary analytical methods and both the reported concentration (and the TEQ) apply specifically to the total of the two co-eluting PAHs
Q08	The matrix spike recovery is outside of the recommended acceptance criteria. An acceptable recovery was obtained for the laboratory control sample indicating a sample matrix interference

Authorised By

Nibha Vaidya	Analytical Services Manager
Joseph Edouard	Senior Analyst-Organic (VIC)
Harry Bacalis	Senior Analyst-Volatile (VIC)
Nibha Vaidya	Senior Analyst-Asbestos (NSW)
Emily Rosenberg	Senior Analyst-Metal (VIC)

Glenn Jackson
General Manager

- Indicates Not Requested

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

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

Certificate of Analysis

JBS & G Australia (NSW) P/L
Level 1, 50 Margaret St
Sydney
NSW 2000

Attention: **Daniel Denaro**

Report **637848-W**
Project name CHATSWOOD EDUCATION PRECINCT PRIMARY SCHOOL
Project ID 55579
Received Date Jan 23, 2019

Client Sample ID			**RINSATE**	**RINSATE**
Sample Matrix			**Water**	**Water**
Eurofins | mgt Sample No.			**S19-Ja24422**	**S19-Ja24423**
Date Sampled			**Jan 23, 2019**	**Jan 25, 2019**
Test/Reference	LOR	Unit		
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				
TRH C6-C9	0.02	mg/L	< 0.02	< 0.02
TRH C10-C14	0.05	mg/L	< 0.05	< 0.05
TRH C15-C28	0.1	mg/L	< 0.1	< 0.1
TRH C29-C36	0.1	mg/L	< 0.1	< 0.1
TRH C10-36 (Total)	0.1	mg/L	< 0.1	< 0.1
BTEX				
Benzene	0.001	mg/L	< 0.001	< 0.001
Toluene	0.001	mg/L	< 0.001	< 0.001
Ethylbenzene	0.001	mg/L	< 0.001	< 0.001
m&p-Xylenes	0.002	mg/L	< 0.002	< 0.002
o-Xylene	0.001	mg/L	< 0.001	< 0.001
Xylenes - Total	0.003	mg/L	< 0.003	< 0.003
4-Bromofluorobenzene (surr.)	1	%	99	107
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				
Naphthalene[N02]	0.01	mg/L	< 0.01	< 0.01
TRH C6-C10	0.02	mg/L	< 0.02	< 0.02
TRH C6-C10 less BTEX (F1)[N04]	0.02	mg/L	< 0.02	< 0.02
TRH >C10-C16	0.05	mg/L	< 0.05	< 0.05
TRH >C10-C16 less Naphthalene (F2)[N01]	0.05	mg/L	< 0.05	< 0.05
TRH >C16-C34	0.1	mg/L	< 0.1	< 0.1
TRH >C34-C40	0.1	mg/L	< 0.1	< 0.1
TRH >C10-C40 (total)*	0.1	mg/L	< 0.1	< 0.1
Polycyclic Aromatic Hydrocarbons				
Acenaphthene	0.001	mg/L	< 0.001	< 0.001
Acenaphthylene	0.001	mg/L	< 0.001	< 0.001
Anthracene	0.001	mg/L	< 0.001	< 0.001
Benz(a)anthracene	0.001	mg/L	< 0.001	< 0.001
Benzo(a)pyrene	0.001	mg/L	< 0.001	< 0.001
Benzo(b&j)fluoranthene[N07]	0.001	mg/L	< 0.001	< 0.001
Benzo(g.h.i)perylene	0.001	mg/L	< 0.001	< 0.001
Benzo(k)fluoranthene	0.001	mg/L	< 0.001	< 0.001
Chrysene	0.001	mg/L	< 0.001	< 0.001
Dibenz(a.h)anthracene	0.001	mg/L	< 0.001	< 0.001
Fluoranthene	0.001	mg/L	< 0.001	< 0.001
Fluorene	0.001	mg/L	< 0.001	< 0.001

Client Sample ID **Sample Matrix** **Eurofins | mgt Sample No.** **Date Sampled** Test/Reference	LOR	Unit	**RINSATE** **Water** **S19-Ja24422** **Jan 23, 2019**	**RINSATE** **Water** **S19-Ja24423** **Jan 25, 2019**
Polycyclic Aromatic Hydrocarbons				
Indeno(1.2.3-cd)pyrene	0.001	mg/L	< 0.001	< 0.001
Naphthalene	0.001	mg/L	< 0.001	< 0.001
Phenanthrene	0.001	mg/L	< 0.001	< 0.001
Pyrene	0.001	mg/L	< 0.001	< 0.001
Total PAH*	0.001	mg/L	< 0.001	< 0.001
2-Fluorobiphenyl (surr.)	1	%	62	54
p-Terphenyl-d14 (surr.)	1	%	91	96
Organochlorine Pesticides				
Chlordanes - Total	0.001	mg/L	< 0.001	< 0.001
4.4'-DDD	0.0001	mg/L	< 0.0001	< 0.0001
4.4'-DDE	0.0001	mg/L	< 0.0001	< 0.0001
4.4'-DDT	0.0001	mg/L	0.0001	< 0.0001
a-BHC	0.0001	mg/L	< 0.0001	< 0.0001
Aldrin	0.0001	mg/L	< 0.0001	< 0.0001
b-BHC	0.0001	mg/L	< 0.0001	< 0.0001
d-BHC	0.0001	mg/L	< 0.0001	< 0.0001
Dieldrin	0.0001	mg/L	< 0.0001	< 0.0001
Endosulfan I	0.0001	mg/L	< 0.0001	< 0.0001
Endosulfan II	0.0001	mg/L	< 0.0001	< 0.0001
Endosulfan sulphate	0.0001	mg/L	< 0.0001	< 0.0001
Endrin	0.0001	mg/L	< 0.0001	< 0.0001
Endrin aldehyde	0.0001	mg/L	< 0.0001	< 0.0001
Endrin ketone	0.0001	mg/L	< 0.0001	< 0.0001
g-BHC (Lindane)	0.0001	mg/L	< 0.0001	< 0.0001
Heptachlor	0.0001	mg/L	< 0.0001	< 0.0001
Heptachlor epoxide	0.0001	mg/L	< 0.0001	< 0.0001
Hexachlorobenzene	0.0001	mg/L	< 0.0001	< 0.0001
Methoxychlor	0.0001	mg/L	< 0.0001	< 0.0001
Toxaphene	0.01	mg/L	< 0.01	< 0.01
Aldrin and Dieldrin (Total)*	0.0001	mg/L	< 0.0001	< 0.0001
DDT + DDE + DDD (Total)*	0.0001	mg/L	0.0001	< 0.0001
Vic EPA IWRG 621 OCP (Total)*	0.001	mg/L	< 0.001	< 0.001
Vic EPA IWRG 621 Other OCP (Total)*	0.001	mg/L	< 0.001	< 0.001
Dibutylchlorendate (surr.)	1	%	90	75
Tetrachloro-m-xylene (surr.)	1	%	60	69
Polychlorinated Biphenyls				
Aroclor-1016	0.001	mg/L	< 0.001	< 0.001
Aroclor-1221	0.001	mg/L	< 0.001	< 0.001
Aroclor-1232	0.001	mg/L	< 0.001	< 0.001
Aroclor-1242	0.001	mg/L	< 0.001	< 0.001
Aroclor-1248	0.001	mg/L	< 0.001	< 0.001
Aroclor-1254	0.001	mg/L	< 0.001	< 0.001
Aroclor-1260	0.001	mg/L	< 0.001	< 0.001
Total PCB*	0.001	mg/L	< 0.001	< 0.001
Dibutylchlorendate (surr.)	1	%	90	75
Tetrachloro-m-xylene (surr.)	1	%	60	69

Client Sample ID **Sample Matrix** **Eurofins | mgt Sample No.** **Date Sampled** Test/Reference	LOR	Unit	**RINSATE** **Water** **S19-Ja24422** **Jan 23, 2019**	**RINSATE** **Water** **S19-Ja24423** **Jan 25, 2019**
Heavy Metals				
Arsenic	0.001	mg/L	< 0.001	< 0.001
Cadmium	0.0002	mg/L	< 0.0002	< 0.0002
Chromium	0.001	mg/L	< 0.001	< 0.001
Copper	0.001	mg/L	< 0.001	< 0.001
Lead	0.001	mg/L	< 0.001	< 0.001
Mercury	0.0001	mg/L	< 0.0001	< 0.0001
Nickel	0.001	mg/L	< 0.001	< 0.001
Zinc	0.005	mg/L	< 0.005	< 0.005

Sample History

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

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

Description	Testing Site	Extracted	Holding Time
JBS&G Suite 2			
Total Recoverable Hydrocarbons - 1999 NEPM Fractions	Melbourne	Feb 01, 2019	7 Day
- Method: LTM-ORG-2010 TRH C6-C40			
BTEX	Melbourne	Jan 31, 2019	14 Day
- Method: LTM-ORG-2150 VOCs in Soils Liquid and other Aqueous Matrices			
Total Recoverable Hydrocarbons - 2013 NEPM Fractions	Melbourne	Jan 31, 2019	7 Day
- Method: LTM-ORG-2010 TRH C6-C40			
Total Recoverable Hydrocarbons - 2013 NEPM Fractions	Melbourne	Feb 01, 2019	7 Day
- Method: LTM-ORG-2010 TRH C6-C40			
Polycyclic Aromatic Hydrocarbons	Melbourne	Feb 01, 2019	7 Day
- Method: LTM-ORG-2130 PAH and Phenols in Soil and Water			
Organochlorine Pesticides	Melbourne	Feb 04, 2019	7 Day
- Method: LTM-ORG-2220 OCP & PCB in Soil and Water			
Polychlorinated Biphenyls	Melbourne	Feb 01, 2019	7 Days
- Method: LTM-ORG-2220 OCP & PCB in Soil and Water			
Metals M8	Melbourne	Jan 31, 2019	28 Days
- Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS			

Company Name: JBS & G Australia (NSW) P/L
Address: Level 1, 50 Margaret St
Sydney
NSW 2000

Project Name: CHATSWOOD EDUCATION PRECINCT PRIMARY SCHOOL
Project ID: 55579

Order No.:
Report #: 637848
Phone: 02 8245 0300
Fax:

Received: Jan 25, 2019 5:50 PM
Due: Feb 4, 2019
Priority: 5 Day
Contact Name: Daniel Denaro

Eurofins | mgt Analytical Services Manager : Nibha Vaidya

Sample Detail						Asbestos - WA guidelines	HOLD	Moisture Set	JBS&G Suite 2
Melbourne Laboratory - NATA Site # 1254 & 14271							X	X	X
Sydney Laboratory - NATA Site # 18217						X			
Brisbane Laboratory - NATA Site # 20794									
Perth Laboratory - NATA Site # 23736									
External Laboratory									
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**				
1	RINSATE	Jan 23, 2019		Water	S19-Ja24422				X
2	RINSATE	Jan 25, 2019		Water	S19-Ja24423				X
3	QC20190121RC_01	Jan 21, 2019		Soil	S19-Ja24424	X		X	X
4	QC20190123RC_01	Jan 23, 2019		Soil	S19-Ja24425	X		X	X
5	QC20190124RC_01	Jan 24, 2019		Soil	S19-Ja24426	X		X	X
6	TRIP SPIKE	Jan 17, 2019		Water	S19-Ja24427		X		
7	TRIP BLANK	Jan 17, 2019		Water	S19-Ja24428		X		

Company Name:	JBS & G Australia (NSW) P/L	**Order No.:**		**Received:**	Jan 25, 2019 5:50 PM
Address:	Level 1, 50 Margaret St Sydney NSW 2000	**Report #:**	637848	**Due:**	Feb 4, 2019
		Phone:	02 8245 0300	**Priority:**	5 Day
		Fax:		**Contact Name:**	Daniel Denaro
Project Name:	CHATSWOOD EDUCATION PRECINCT PRIMARY SCHOOL				
Project ID:	55579				

Eurofins | mgt Analytical Services Manager : Nibha Vaidya

Sample Detail						Asbestos - WA guidelines	HOLD	Moisture Set	JBS&G Suite 2
Melbourne Laboratory - NATA Site # 1254 & 14271							X	X	X
Sydney Laboratory - NATA Site # 18217						X			
Brisbane Laboratory - NATA Site # 20794									
Perth Laboratory - NATA Site # 23736									
8	TRIP SPIKE	Jan 09, 2019		Water	S19-Ja24429		X		
9	TRIP BLANK	Jan 09, 2019		Water	S19-Ja24430		X		
Test Counts						3	4	3	5

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure, April 2011 and are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. This report replaces any interim results previously issued.

Holding Times

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

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

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

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

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

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

Units

mg/kg: milligrams per kilogram
ppm: Parts per million
org/100mL: Organisms per 100 millilitres
mg/L: milligrams per litre
ppb: Parts per billion
NTU: Nephelometric Turbidity Units
ug/L: micrograms per litre
%: Percentage
MPN/100mL: Most Probable Number of organisms per 100 millilitres

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery.
CRM	Certified Reference Material - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
QSM	US Department of Defense Quality Systems Manual Version 5.2 2018
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

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

Results <10 times the LOR : No Limit

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

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

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

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.2 where no positive PFAS results have been reported have been reviewed and no data was affected.

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

QC Data General Comments

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

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions							
TRH C6-C9	mg/L	< 0.02			0.02	Pass	
TRH C10-C14	mg/L	< 0.05			0.05	Pass	
TRH C15-C28	mg/L	< 0.1			0.1	Pass	
TRH C29-C36	mg/L	< 0.1			0.1	Pass	
Method Blank							
BTEX							
Benzene	mg/L	< 0.001			0.001	Pass	
Toluene	mg/L	< 0.001			0.001	Pass	
Ethylbenzene	mg/L	< 0.001			0.001	Pass	
m&p-Xylenes	mg/L	< 0.002			0.002	Pass	
o-Xylene	mg/L	< 0.001			0.001	Pass	
Xylenes - Total	mg/L	< 0.003			0.003	Pass	
Method Blank							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	mg/L	< 0.01			0.01	Pass	
TRH C6-C10	mg/L	< 0.02			0.02	Pass	
TRH >C10-C16	mg/L	< 0.05			0.05	Pass	
TRH >C16-C34	mg/L	< 0.1			0.1	Pass	
TRH >C34-C40	mg/L	< 0.1			0.1	Pass	
Method Blank							
Polycyclic Aromatic Hydrocarbons							
Acenaphthene	mg/L	< 0.001			0.001	Pass	
Acenaphthylene	mg/L	< 0.001			0.001	Pass	
Anthracene	mg/L	< 0.001			0.001	Pass	
Benz(a)anthracene	mg/L	< 0.001			0.001	Pass	
Benzo(a)pyrene	mg/L	< 0.001			0.001	Pass	
Benzo(b&j)fluoranthene	mg/L	< 0.001			0.001	Pass	
Benzo(g.h.i)perylene	mg/L	< 0.001			0.001	Pass	
Benzo(k)fluoranthene	mg/L	< 0.001			0.001	Pass	
Chrysene	mg/L	< 0.001			0.001	Pass	
Dibenz(a.h)anthracene	mg/L	< 0.001			0.001	Pass	
Fluoranthene	mg/L	< 0.001			0.001	Pass	
Fluorene	mg/L	< 0.001			0.001	Pass	
Indeno(1.2.3-cd)pyrene	mg/L	< 0.001			0.001	Pass	
Naphthalene	mg/L	< 0.001			0.001	Pass	
Phenanthrene	mg/L	< 0.001			0.001	Pass	
Pyrene	mg/L	< 0.001			0.001	Pass	
Method Blank							
Organochlorine Pesticides							
Chlordanes - Total	mg/L	< 0.001			0.001	Pass	
4.4'-DDD	mg/L	< 0.0001			0.0001	Pass	
4.4'-DDE	mg/L	< 0.0001			0.0001	Pass	
4.4'-DDT	mg/L	< 0.0001			0.0001	Pass	
a-BHC	mg/L	< 0.0001			0.0001	Pass	
Aldrin	mg/L	< 0.0001			0.0001	Pass	
b-BHC	mg/L	< 0.0001			0.0001	Pass	
d-BHC	mg/L	< 0.0001			0.0001	Pass	
Dieldrin	mg/L	< 0.0001			0.0001	Pass	
Endosulfan I	mg/L	< 0.0001			0.0001	Pass	
Endosulfan II	mg/L	< 0.0001			0.0001	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Endosulfan sulphate	mg/L	< 0.0001			0.0001	Pass	
Endrin	mg/L	< 0.0001			0.0001	Pass	
Endrin aldehyde	mg/L	< 0.0001			0.0001	Pass	
Endrin ketone	mg/L	< 0.0001			0.0001	Pass	
g-BHC (Lindane)	mg/L	< 0.0001			0.0001	Pass	
Heptachlor	mg/L	< 0.0001			0.0001	Pass	
Heptachlor epoxide	mg/L	< 0.0001			0.0001	Pass	
Hexachlorobenzene	mg/L	< 0.0001			0.0001	Pass	
Methoxychlor	mg/L	< 0.0001			0.0001	Pass	
Toxaphene	mg/L	< 0.01			0.01	Pass	
Method Blank							
Polychlorinated Biphenyls							
Aroclor-1016	mg/L	< 0.001			0.001	Pass	
Aroclor-1221	mg/L	< 0.001			0.001	Pass	
Aroclor-1232	mg/L	< 0.001			0.001	Pass	
Aroclor-1242	mg/L	< 0.001			0.001	Pass	
Aroclor-1248	mg/L	< 0.001			0.001	Pass	
Aroclor-1254	mg/L	< 0.001			0.001	Pass	
Aroclor-1260	mg/L	< 0.001			0.001	Pass	
Total PCB*	mg/L	< 0.001			0.001	Pass	
Method Blank							
Heavy Metals							
Arsenic	mg/L	< 0.001			0.001	Pass	
Cadmium	mg/L	< 0.0002			0.0002	Pass	
Chromium	mg/L	< 0.001			0.001	Pass	
Copper	mg/L	< 0.001			0.001	Pass	
Lead	mg/L	< 0.001			0.001	Pass	
Mercury	mg/L	< 0.0001			0.0001	Pass	
Nickel	mg/L	< 0.001			0.001	Pass	
Zinc	mg/L	< 0.005			0.005	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions							
TRH C6-C9	%	109			70-130	Pass	
TRH C10-C14	%	97			70-130	Pass	
LCS - % Recovery							
BTEX							
Benzene	%	83			70-130	Pass	
Toluene	%	88			70-130	Pass	
Ethylbenzene	%	106			70-130	Pass	
m&p-Xylenes	%	109			70-130	Pass	
Xylenes - Total	%	108			70-130	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	%	92			70-130	Pass	
TRH C6-C10	%	113			70-130	Pass	
TRH >C10-C16	%	99			70-130	Pass	
LCS - % Recovery							
Polycyclic Aromatic Hydrocarbons							
Acenaphthene	%	123			70-130	Pass	
Acenaphthylene	%	107			70-130	Pass	
Anthracene	%	124			70-130	Pass	
Benz(a)anthracene	%	91			70-130	Pass	
Benzo(a)pyrene	%	84			70-130	Pass	
Benzo(b&j)fluoranthene	%	86			70-130	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Benzo(g.h.i)perylene	%	80			70-130	Pass	
Benzo(k)fluoranthene	%	74			70-130	Pass	
Chrysene	%	88			70-130	Pass	
Dibenz(a.h)anthracene	%	92			70-130	Pass	
Fluoranthene	%	94			70-130	Pass	
Fluorene	%	103			70-130	Pass	
Indeno(1.2.3-cd)pyrene	%	115			70-130	Pass	
Naphthalene	%	96			70-130	Pass	
Phenanthrene	%	120			70-130	Pass	
Pyrene	%	95			70-130	Pass	
LCS - % Recovery							
Organochlorine Pesticides							
Chlordanes - Total	%	101			70-130	Pass	
4.4'-DDD	%	90			70-130	Pass	
4.4'-DDE	%	114			70-130	Pass	
4.4'-DDT	%	95			70-130	Pass	
a-BHC	%	79			70-130	Pass	
Aldrin	%	79			70-130	Pass	
b-BHC	%	88			70-130	Pass	
d-BHC	%	102			70-130	Pass	
Dieldrin	%	110			70-130	Pass	
Endosulfan I	%	78			70-130	Pass	
Endosulfan II	%	80			70-130	Pass	
Endosulfan sulphate	%	90			70-130	Pass	
Endrin	%	87			70-130	Pass	
Endrin aldehyde	%	75			70-130	Pass	
Endrin ketone	%	116			70-130	Pass	
g-BHC (Lindane)	%	79			70-130	Pass	
Heptachlor	%	74			70-130	Pass	
Heptachlor epoxide	%	84			70-130	Pass	
Hexachlorobenzene	%	80			70-130	Pass	
Methoxychlor	%	118			70-130	Pass	
LCS - % Recovery							
Heavy Metals							
Arsenic	%	88			80-120	Pass	
Cadmium	%	88			80-120	Pass	
Chromium	%	88			80-120	Pass	
Copper	%	87			80-120	Pass	
Lead	%	89			80-120	Pass	
Mercury	%	88			75-125	Pass	
Nickel	%	87			80-120	Pass	
Zinc	%	89			80-120	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1					
TRH C6-C9	S19-Ja22235	NCP	%	113			70-130	Pass	
TRH C10-C14	M19-Ja27601	NCP	%	110			70-130	Pass	
Spike - % Recovery									
BTEX				Result 1					
Benzene	S19-Ja22235	NCP	%	88			70-130	Pass	
Toluene	S19-Ja22235	NCP	%	95			70-130	Pass	
Ethylbenzene	S19-Ja22235	NCP	%	104			70-130	Pass	
m&p-Xylenes	S19-Ja22235	NCP	%	108			70-130	Pass	
o-Xylene	S19-Ja22235	NCP	%	105			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Xylenes - Total	S19-Ja22235	NCP	%	107			70-130	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1					
Naphthalene	S19-Ja22235	NCP	%	94			70-130	Pass	
TRH C6-C10	S19-Ja22235	NCP	%	114			70-130	Pass	
TRH >C10-C16	M19-Ja27601	NCP	%	115			70-130	Pass	
Spike - % Recovery									
Polycyclic Aromatic Hydrocarbons				Result 1					
Acenaphthene	M19-Ja19670	NCP	%	112			70-130	Pass	
Acenaphthylene	M19-Ja19670	NCP	%	95			70-130	Pass	
Anthracene	M19-Ja19670	NCP	%	81			70-130	Pass	
Benz(a)anthracene	M19-Ja19670	NCP	%	113			70-130	Pass	
Benzo(a)pyrene	M19-Ja19670	NCP	%	116			70-130	Pass	
Benzo(b&j)fluoranthene	M19-Ja19670	NCP	%	80			70-130	Pass	
Benzo(g.h.i)perylene	M19-Ja19670	NCP	%	100			70-130	Pass	
Benzo(k)fluoranthene	M19-Ja19670	NCP	%	93			70-130	Pass	
Chrysene	M19-Ja19670	NCP	%	103			70-130	Pass	
Dibenz(a.h)anthracene	M19-Ja19670	NCP	%	88			70-130	Pass	
Fluoranthene	M19-Ja19670	NCP	%	94			70-130	Pass	
Fluorene	M19-Ja19670	NCP	%	89			70-130	Pass	
Indeno(1.2.3-cd)pyrene	M19-Ja19670	NCP	%	114			70-130	Pass	
Naphthalene	M19-Ja19670	NCP	%	96			70-130	Pass	
Phenanthrene	M19-Ja19670	NCP	%	104			70-130	Pass	
Pyrene	M19-Ja19670	NCP	%	95			70-130	Pass	
Spike - % Recovery									
Heavy Metals				Result 1					
Arsenic	M19-Ja19906	NCP	%	102			75-125	Pass	
Cadmium	M19-Ja19906	NCP	%	102			75-125	Pass	
Chromium	M19-Ja19906	NCP	%	101			75-125	Pass	
Copper	M19-Ja19906	NCP	%	101			75-125	Pass	
Lead	M19-Ja19906	NCP	%	101			75-125	Pass	
Mercury	M19-Ja19906	NCP	%	104			70-130	Pass	
Nickel	M19-Ja19906	NCP	%	100			75-125	Pass	
Zinc	M19-Ja19906	NCP	%	104			75-125	Pass	
Spike - % Recovery									
Organochlorine Pesticides				Result 1					
Chlordanes - Total	M19-Ja23029	NCP	%	107			70-130	Pass	
4.4'-DDD	M19-Ja23029	NCP	%	89			70-130	Pass	
4.4'-DDE	M19-Ja23029	NCP	%	114			70-130	Pass	
4.4'-DDT	M19-Ja23029	NCP	%	98			70-130	Pass	
a-BHC	M19-Ja23029	NCP	%	92			70-130	Pass	
Aldrin	M19-Ja23029	NCP	%	81			70-130	Pass	
b-BHC	M19-Ja23029	NCP	%	91			70-130	Pass	
d-BHC	M19-Ja23029	NCP	%	96			70-130	Pass	
Dieldrin	M19-Ja23029	NCP	%	101			70-130	Pass	
Endosulfan I	M19-Ja23029	NCP	%	78			70-130	Pass	
Endosulfan II	M19-Ja23029	NCP	%	95			70-130	Pass	
Endosulfan sulphate	M19-Ja23029	NCP	%	77			70-130	Pass	
Endrin	M19-Ja23029	NCP	%	106			70-130	Pass	
Endrin aldehyde	M19-Fe01757	NCP	%	105			70-130	Pass	
Endrin ketone	M19-Ja23029	NCP	%	79			70-130	Pass	
g-BHC (Lindane)	M19-Ja23029	NCP	%	87			70-130	Pass	
Heptachlor	M19-Ja23029	NCP	%	79			70-130	Pass	
Heptachlor epoxide	M19-Ja23029	NCP	%	79			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Hexachlorobenzene	M19-Ja23029	NCP	%	82			70-130	Pass	
Methoxychlor	M19-Ja23029	NCP	%	120			70-130	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Duplicate									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1	Result 2	RPD			
TRH C6-C9	M19-Ja21481	NCP	mg/L	< 0.02	< 0.02	<1	30%	Pass	
TRH C10-C14	M19-Ja27069	NCP	mg/L	< 0.05	< 0.05	<1	30%	Pass	
TRH C15-C28	M19-Ja27069	NCP	mg/L	< 0.1	< 0.1	<1	30%	Pass	
TRH C29-C36	M19-Ja27069	NCP	mg/L	< 0.1	< 0.1	<1	30%	Pass	
Duplicate									
BTEX				Result 1	Result 2	RPD			
Benzene	M19-Ja21481	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Toluene	M19-Ja21481	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Ethylbenzene	M19-Ja21481	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
m&p-Xylenes	M19-Ja21481	NCP	mg/L	< 0.002	< 0.002	<1	30%	Pass	
o-Xylene	M19-Ja21481	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Xylenes - Total	M19-Ja21481	NCP	mg/L	< 0.003	< 0.003	<1	30%	Pass	
Duplicate									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1	Result 2	RPD			
Naphthalene	M19-Ja21481	NCP	mg/L	< 0.01	< 0.01	<1	30%	Pass	
TRH C6-C10	M19-Ja21481	NCP	mg/L	< 0.02	< 0.02	<1	30%	Pass	
TRH >C10-C16	M19-Ja27069	NCP	mg/L	< 0.05	< 0.05	<1	30%	Pass	
TRH >C16-C34	M19-Ja27069	NCP	mg/L	< 0.1	< 0.1	<1	30%	Pass	
TRH >C34-C40	M19-Ja27069	NCP	mg/L	< 0.1	< 0.1	<1	30%	Pass	
Duplicate									
Polycyclic Aromatic Hydrocarbons				Result 1	Result 2	RPD			
Acenaphthene	M19-Ja23872	NCP	mg/L	0.021	0.026	24	30%	Pass	
Acenaphthylene	M19-Ja23872	NCP	mg/L	0.049	0.065	29	30%	Pass	
Anthracene	M19-Ja23872	NCP	mg/L	0.018	0.022	21	30%	Pass	
Benz(a)anthracene	M19-Ja23872	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Benzo(a)pyrene	M19-Ja23872	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Benzo(b&j)fluoranthene	M19-Ja23872	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Benzo(g.h.i)perylene	M19-Ja23872	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Benzo(k)fluoranthene	M19-Ja23872	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Chrysene	M19-Ja23872	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Dibenz(a.h)anthracene	M19-Ja23872	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Fluoranthene	M19-Ja23872	NCP	mg/L	0.006	0.008	33	30%	Fail	Q15
Fluorene	M19-Ja23872	NCP	mg/L	0.070	0.10	39	30%	Fail	Q02
Indeno(1.2.3-cd)pyrene	M19-Ja23872	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Naphthalene	M19-Ja23872	NCP	mg/L	< 0.05	< 0.05	<1	30%	Pass	
Phenanthrene	M19-Ja23872	NCP	mg/L	0.057	0.073	25	30%	Pass	
Pyrene	M19-Ja23872	NCP	mg/L	0.005	0.007	44	30%	Fail	Q15
Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Arsenic	M19-Ja19906	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Cadmium	M19-Ja19906	NCP	mg/L	< 0.0002	< 0.0002	<1	30%	Pass	
Chromium	M19-Ja19906	NCP	mg/L	0.001	0.001	10	30%	Pass	
Copper	M19-Ja19906	NCP	mg/L	0.001	0.001	8.0	30%	Pass	
Lead	M19-Ja19906	NCP	mg/L	0.001	0.001	3.0	30%	Pass	
Mercury	M19-Ja19906	NCP	mg/L	< 0.0001	< 0.0001	<1	30%	Pass	
Nickel	M19-Ja19906	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Zinc	M19-Ja19906	NCP	mg/L	0.005	0.005	1.0	30%	Pass	

Duplicate									
Organochlorine Pesticides				Result 1	Result 2	RPD			
Chlordanes - Total	M19-Ja23028	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
4.4'-DDD	M19-Ja23028	NCP	mg/L	< 0.0001	< 0.0001	<1	30%	Pass	
4.4'-DDE	M19-Ja23028	NCP	mg/L	< 0.0001	< 0.0001	<1	30%	Pass	
4.4'-DDT	M19-Ja23028	NCP	mg/L	< 0.0001	< 0.0001	<1	30%	Pass	
a-BHC	M19-Ja23028	NCP	mg/L	< 0.0001	< 0.0001	<1	30%	Pass	
Aldrin	M19-Ja23028	NCP	mg/L	< 0.0001	< 0.0001	<1	30%	Pass	
b-BHC	M19-Ja23028	NCP	mg/L	< 0.0001	< 0.0001	<1	30%	Pass	
d-BHC	M19-Ja23028	NCP	mg/L	< 0.0001	< 0.0001	<1	30%	Pass	
Dieldrin	M19-Ja23028	NCP	mg/L	< 0.0001	< 0.0001	<1	30%	Pass	
Endosulfan I	M19-Ja23028	NCP	mg/L	< 0.0001	< 0.0001	<1	30%	Pass	
Endosulfan II	M19-Ja23028	NCP	mg/L	< 0.0001	< 0.0001	<1	30%	Pass	
Endosulfan sulphate	M19-Ja23028	NCP	mg/L	< 0.0001	< 0.0001	<1	30%	Pass	
Endrin	M19-Ja23028	NCP	mg/L	< 0.0001	< 0.0001	<1	30%	Pass	
Endrin aldehyde	M19-Ja23028	NCP	mg/L	< 0.0001	< 0.0001	<1	30%	Pass	
Endrin ketone	M19-Ja23028	NCP	mg/L	< 0.0001	< 0.0001	<1	30%	Pass	
g-BHC (Lindane)	M19-Ja23028	NCP	mg/L	< 0.0001	< 0.0001	<1	30%	Pass	
Heptachlor	M19-Ja23028	NCP	mg/L	< 0.0001	< 0.0001	<1	30%	Pass	
Heptachlor epoxide	M19-Ja23028	NCP	mg/L	< 0.0001	< 0.0001	<1	30%	Pass	
Hexachlorobenzene	M19-Ja23028	NCP	mg/L	< 0.0001	< 0.0001	<1	30%	Pass	
Methoxychlor	M19-Ja23028	NCP	mg/L	< 0.0001	< 0.0001	<1	30%	Pass	

Comments

Sample Integrity

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

Qualifier Codes/Comments

Code	Description
N01	F2 is determined by arithmetically subtracting the "naphthalene" value from the ">C10-C16" value. The naphthalene value used in this calculation is obtained from volatiles (Purge & Trap analysis).
N02	Where we have reported both volatile (P&T GCMS) and semivolatile (GCMS) naphthalene data, results may not be identical. Provided correct sample handling protocols have been followed, any observed differences in results are likely to be due to procedural differences within each methodology. Results determined by both techniques have passed all QAQC acceptance criteria, and are entirely technically valid.
N04	F1 is determined by arithmetically subtracting the "Total BTEX" value from the "C6-C10" value. The "Total BTEX" value is obtained by summing the concentrations of BTEX analytes. The "C6-C10" value is obtained by quantitating against a standard of mixed aromatic/aliphatic analytes.
N07	Please note:- These two PAH isomers closely co-elute using the most contemporary analytical methods and both the reported concentration (and the TEQ) apply specifically to the total of the two co-eluting PAHs
Q02	The duplicate %RPD is outside the recommended acceptance criteria. Further analysis indicates sample heterogeneity as the cause
Q15	The RPD reported passes Eurofins | mgt's QC - Acceptance Criteria as defined in the Internal Quality Control Review and Glossary page of this report.

Authorised By

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

Glenn Jackson
General Manager

- Indicates Not Requested

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

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

015559

CHAIN OF CUSTODY

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JBS&G

PROJECT NO.: 55579
PROJECT NAME: Chatswood Education Precinct High School
DATE NEEDED BY: STD
PHONE: Sydney: 02 8245 0300 | Perth: 08 9488 0100 | Brisbane: 07 3112 2688
SEND REPORT & INVOICE TO: (1) adminnsw@jbsg.com.au; (2) D.Denaro@jbsg.com.au; (3) M.Nouj.aim@jbsg.com.au RChapman@jbsg.com.au

LABORATORY BATCH NO.:
SAMPLERS: RC/MN
QC LEVEL: NEPM (2013)

COMMENTS / SPECIAL HANDLING / STORAGE OR DISPOSAL:

SAMPLE ID	MATRIX	DATE	TIME	TYPE & PRESERVATIVE	pH	Metals	PAHs	TRH/BTEX	OCPs	PCBs	TCLP metals/PAHs	TYPE OF ASBESTOS ANALYSIS: IDENTIFICATION	TYPE OF ASBESTOS ANALYSIS: NEPM/WA	NOTES: Place Remaining Samples on hold
BH01_0-0.15	Soil	21/1/19		500ml bag, Jar+ice		X	X	X					X	
BH01_0.4-0.5	↓	↓		↓										
BH01_1.0-1.1														
BH01-1.4-1.5				Jar + ice										
BH02_0-0.15		24/1/19		500ml bag, Jar+ice										
BH02a-0-015		↓		↓		X	X		X				X	
BH02a_0.4-0.5														
BH03_0-0.15		21/1/19												
BH03_0.4-0.5		↓				X	X						X	
BH03_1.0-1.1				Jar + ice										
BH04_0.2-0.3				500ml bag, Jar+ice		X	X	X					X	
BH04_0.4-0.5				↓										
BH04_1.0-1.1				Jar + ice										
BH05_0-0.15				500ml bag, Jar+ice										
BH05_0.4-0.5				↓										
BH05_1.0-1.1						X	X						X	
BH05_1.4-1.5														
BH06_0-0.15														
BH06_0.4-0.5	↓	↓		↓		X	X						X	

RELINQUISHED BY:
NAME: DATE: 25/1/19
OF: JBS&G
NAME: DATE:
OF:

METHOD OF SHIPMENT:
CONSIGNMENT NOTE NO.
TRANSPORT CO.
CONSIGNMENT NOTE NO.
TRANSPORT CO

RECEIVED BY:
NAME: R.TMUBA
DATE: 25/1/19
OF:
NAME: DATE:
OF:

FOR RECEIVING LAB USE ONLY:
COOLER SEAL – Yes....... No .... Intact .... Broken ....
COOLER TEMP .... deg C 1.5°C
COOLER SEAL – Yes....... No .... Intact .... Broken ....
COOLER TEMP .... deg C 637804

Container & Preservative Codes: P = Plastic; J = Soil Jar; B = Glass Bottle; N = Nitric Acid Prsvd.; C = Sodium Hydroxide Prsvd; VC = Hydrochloric Acid Prsvd Vial; VS = Sulfuric Acid Prsvd Vial; S = Sulfuric Acid Prsvd; Z = Zinc Prsvd; E = EDTA Prsvd; ST = Sterile Bottle; O = Other

015560

CHAIN OF CUSTODY

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JBS&G

PROJECT NO.: 55579
PROJECT NAME: chatswood Education Precinct High School
DATE NEEDED BY: STD
PHONE: Sydney: 02 8245 0300 | Perth: 08 9488 0100 | Brisbane: 07 3112 2688
SEND REPORT & INVOICE TO: (1) adminnsw@jbsg.com.au; (2) DDenaro@jbsg.com.au; (3) MNajaim@jbsg.com.au RChapman@jbsg.com.au
COMMENTS / SPECIAL HANDLING / STORAGE OR DISPOSAL:

LABORATORY BATCH NO.:
SAMPLERS: RC/MN
QC LEVEL: NEPM (2013)

SAMPLE ID	MATRIX	DATE	TIME	TYPE & PRESERVATIVE	pH	Metals	PAHs	TRH/BTEX	OCPs	PCBs	TCLP metals/PAHs	TYPE OF ASBESTOS ANALYSIS IDENTIFICATION	TYPE OF ASBESTOS ANALYSIS NEPM/WA	NOTES:
BH06_1-1.1	soil	21/1/19		Jar + ice										
BH07_0-0.15		24/1/19		500ml bag, Jar+ice										
BH07_0.5-0.6						X	X						X	
BH08_0-0.15		25/1/19				X	X	X					X	
BH08-0.4-0.5														
BH08_0.8-0.9														
BH08_1.2-1.3														
BH08_1.5-1.6				Jar + ice										
BH09_0-0.15		21/1/19		500ml bag, Jar+ice										
BH09_0.4-0.5						X	X		X				X	
BH09_1-1.1				~~Ja~~										
BH10_0.05-0.15														
BH10-0.4-0.5														
BH10-1-1.1						X	X	X					X	
BH10_1.6-1.7				Jar + ice										
BH11_0-0.15				500ml bag, Jar+ice		X	X						X	
BH11_0.4-0.5														
BH11-1.3-1.4				Jar + ice										
BH12_0-0.15				500ml bag, Jar+ice										

RELINQUISHED BY:
NAME: DATE: 25/1/19
OF: JBS&G
NAME: DATE:
OF:

METHOD OF SHIPMENT:
CONSIGNMENT NOTE NO.
TRANSPORT CO.
CONSIGNMENT NOTE NO.
TRANSPORT CO

RECEIVED BY:
NAME:
DATE: 25/1/19
OF:
NAME: DATE:
OF:

FOR RECEIVING LAB USE ONLY:
COOLER SEAL – Yes....... No .... Intact .... Broken ....
COOLER TEMP .... deg C 1.5°C
COOLER SEAL – Yes....... No .... Intact .... Broken ....
COOLER TEMP .... deg C 637804

Container & Preservative Codes: P = Plastic; J = Soil Jar; B = Glass Bottle; N = Nitric Acid Prsvd.; C = Sodium Hydroxide Prsvd; VC = Hydrochloric Acid Prsvd Vial; VS = Sulfuric Acid Prsvd Vial; S = Sulfuric Acid Prsvd; Z = Zinc Prsvd; E = EDTA Prsvd; ST = Sterile Bottle; O = Other

015561

E V Wf/n 3 of 6

CHAIN OF CUSTODY

PROJECT NO.: 55579
PROJECT NAME: Chatswood Education precinct High School
DATE NEEDED BY: STD
PHONE: Sydney: 02 8245 0300 | Perth: 08 9488 0100 | Brisbane: 07 3112 2688
SEND REPORT & INVOICE TO: (1) adminnsw@jbsg.com.au; (2) D.Denaro@jbsg.com.au; (3) M.Nouyaim@jbsg.com.au RChapman@jbsg.com.au
COMMENTS / SPECIAL HANDLING / STORAGE OR DISPOSAL:

LABORATORY BATCH NO.:
SAMPLERS: RC/MN
QC LEVEL: NEPM (2013)

SAMPLE ID	MATRIX	DATE	TIME	TYPE & PRESERVATIVE	pH	Metals	PAHs	TRH/BTEX	OCPs	PCB	TCLP metals/PAH	TYPE OF ASBESTOS ANALYSIS: IDENTIFICATION	TYPE OF ASBESTOS ANALYSIS: NEPM/WA	NOTES:
BH12-0.4-0.5	Soil	21/1/19		500ml bag; Jar+ice		X	X						X	
BH12-1-1.1														
BH13-0-0.15		25/1/19												
BH13-0.4-0.5														
BH13-0.7-0.8						X	X						X	
BH13-1.2-1.3				Jar + ice										
BH14-0-0.15				500 ml bag, Jar+ice		X	X						X	
BH14-0.6-0.7														
BH14-1-1.1														
BH15-0-0.15		21/1/19				X	X			X			X	
BH15-0.4-0.5														
BH15-1-1.1														
BH15-1.5-1.6														
BH15-2.2-2.3														
BH16-0-0.15		22/1/19												
BH16-0.4-0.5						X	X	X					X	
BH16-1-1.1														
BH16-1.5-1.6														
BH16-2.0-2.1				Jar + ice										

RELINQUISHED BY:
NAME: DATE: 25/1/19
OF: JBS&G
NAME: DATE:
OF:

METHOD OF SHIPMENT:
CONSIGNMENT NOTE NO.
TRANSPORT CO.
CONSIGNMENT NOTE NO.
TRANSPORT CO

RECEIVED BY:
NAME: R Timba
DATE: 28/1/19
OF:
NAME: DATE:
OF:

FOR RECEIVING LAB USE ONLY:
COOLER SEAL – Yes....... No .... Intact .... Broken ....
COOLER TEMP .... deg C 1.5°C
COOLER SEAL – Yes....... No .... Intact .... Broken ....
COOLER TEMP .... deg C
637804

Container & Preservative Codes: P = Plastic; J = Soil Jar; B = Glass Bottle; N = Nitric Acid Prsvd.; C = Sodium Hydroxide Prsvd; VC = Hydrochloric Acid Prsvd Vial; VS = Sulfuric Acid Prsvd Vial; S = Sulfuric Acid Prsvd; Z = Zinc Prsvd; E = EDTA Prsvd; ST = Sterile Bottle; O = Other

015562

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JBS&G

CHAIN OF CUSTODY

PROJECT NO.: 55579

PROJECT NAME: Chatswood Education Precinct High School

DATE NEEDED BY: STD

PHONE: Sydney: 02 8245 0300 | Perth: 08 9488 0100 | Brisbane: 07 3112 2688

LABORATORY BATCH NO.:

SAMPLERS: DC/MN

QC LEVEL: NEPM (2013)

SEND REPORT & INVOICE TO: (1) adminnsw@jbsg.com.au; (2) DDenaro..........@jbsg.com.au; (3) MNoujaim..........@jbsg.com.au RChapman@Jbsg.com.au.

COMMENTS / SPECIAL HANDLING / STORAGE OR DISPOSAL:

SAMPLE ID	MATRIX	DATE	TIME	TYPE & PRESERVATIVE	pH	Metals	PAHs	TRH/BTEX	OCPs	PCBs	TCLP Metals/PAHs													TYPE OF ASBESTOS ANALYSIS		NOTES:
																								IDENTIFICATION	NEPM/WA	
BH17-0-0.15	Soil	22/1/19		500ml bag, Jar+ice																						
BH17-0.4-0.5						X	X																		X	
BH17-1.0-1.1				↓																						
BH17-1.5-1.6				Jar+ice																						
BH18-0-0.15				500ml bag, Jar+ice																						
BH18-0.4-0.5																										
BH18-0.7-0.8				↓		X	X																		X	
BH18-1-1.1				Jar+ice																						
BH19-0-0.15				500ml bag, Jar+ice																						
BH19-0.4-0.5						X	X																		X	
BH19-0.7-0.8				↓																						
BH19-1.0-1.1				Jar+ice																						
BH20-0-0.15				500ml bag, Jar+ice																						
BH20-0.4-0.5																										
BH20-1-1.1				↓		X	X																		X	
BH20-1.5-1.6				Jar+ice																						
BH21-0-0.15				500ml bag, Jar+ice		X	X		X																X	
BH21-0.4-0.5																										
BH21-1-1.1	↓	↓		↓																						

RELINQUISHED BY:

NAME: DATE: 25/1/19

OF: JBS&G

NAME: DATE:

OF:

METHOD OF SHIPMENT:

CONSIGNMENT NOTE NO.

TRANSPORT CO.

CONSIGNMENT NOTE NO.

TRANSPORT CO

RECEIVED BY:

NAME: R TIMBER

DATE: 25/1/19

OF:

NAME: DATE:

OF:

FOR RECEIVING LAB USE ONLY:

COOLER SEAL – Yes....... No .... Intact .... Broken ....

COOLER TEMP .... deg C 1.5°C

COOLER SEAL – Yes....... No .... Intact .... Broken ....

COOLER TEMP .... deg C 637804

Container & Preservative Codes: P = Plastic; J = Soil Jar; B = Glass Bottle; N = Nitric Acid Prsvd.; C = Sodium Hydroxide Prsvd; VC = Hydrochloric Acid Prsvd Vial; VS = Sulfuric Acid Prsvd Vial; S = Sulfuric Acid Prsvd; Z = Zinc Prsvd; E = EDTA Prsvd; ST = Sterile Bottle; O = Other

015563

Eurofins 5of6

CHAIN OF CUSTODY

JBS&G

PROJECT NO.: 55579
PROJECT NAME: Chatswood Education Precinct High School
DATE NEEDED BY: STD
LABORATORY BATCH NO.:
SAMPLERS: RC/MN
QC LEVEL: NEPM (2013)
PHONE: Sydney: 02 8245 0300 | Perth: 08 9488 0100 | Brisbane: 07 3112 2688
SEND REPORT & INVOICE TO: (1) adminnsw@jbsg.com.au; (2) DDenaro@jbsg.com.au; (3) MNeujahm@jbsg.com.au RChapman@jbsg.com.au
COMMENTS / SPECIAL HANDLING / STORAGE OR DISPOSAL:

SAMPLE ID	MATRIX	DATE	TIME	TYPE & PRESERVATIVE	pH	Metals	PAHs	TRH/BTEX	OCPs	PCBs	TCLP metals/PAH	TYPE OF ASBESTOS ANALYSIS: IDENTIFICATION	TYPE OF ASBESTOS ANALYSIS: NEPM/WA	NOTES:
BH22_0-0.15	Soil	22/1/19		500ml bag, Jar + ice										
BH22-0.4-0.5	↓	↓		↓										
BH22-1-1.1														
BH23-0-0.15						X	X						X	
BH23-0.4-0.5														
BH23-1-1.1						X	X						X	
BH23-1.3-1.4														
BH23_1.7-1.8				Jar + ice										
BH24-0-0.15				500ml bag, Jar + ice										
BH24-0.4-0.5				↓		X	X	X					X	
BH24-1-1.1														
BH24-1.4-1.5				Jar + ice										
BH25-0-0.15				500ml bag, Jar + ice										
BH25-0.5-0.6				↓										
BH25-1.1-1.2				Jar + ice		X	X		X				X	
BH26_0-0.15				500ml bag, Jar + ice										
BH26_0.4-0.5				↓										
BH26-1-1.1														
BH26-1.5-1.6	↓	↓		Jar + ice		X	X						X	

RELINQUISHED BY:
NAME: MN DATE: 25/1/19
OF: JBS&G
NAME: DATE:
OF:

METHOD OF SHIPMENT:
CONSIGNMENT NOTE NO.
TRANSPORT CO.
CONSIGNMENT NOTE NO.
TRANSPORT CO

RECEIVED BY:
NAME: R TUMBA
DATE: 25/1/19
OF:
NAME: DATE:
OF:

FOR RECEIVING LAB USE ONLY:
COOLER SEAL – Yes....... No .... Intact .... Broken ....
COOLER TEMP .... deg C 1.5°C
COOLER SEAL – Yes....... No .... Intact .... Broken ....
COOLER TEMP .... deg C 637804

Container & Preservative Codes: P = Plastic; J = Soil Jar; B = Glass Bottle; N = Nitric Acid Prsvd.; C = Sodium Hydroxide Prsvd; VC = Hydrochloric Acid Prsvd Vial; VS = Sulfuric Acid Prsvd Vial; S = Sulfuric Acid Prsvd; Z = Zinc Prsvd; E = EDTA Prsvd; ST = Sterile Bottle; O = Other

015564

Eurofins 608

CHAIN OF CUSTODY

JBS&G

PROJECT NO.: 55579
PROJECT NAME: Chatswood Education Precinct High School
DATE NEEDED BY: STD
PHONE: Sydney: 02 8245 0300 | Perth: 08 9488 0100 | Brisbane: 07 3112 2688
SEND REPORT & INVOICE TO: (1) adminnsw@jbsg.com.au; (2) DDenaro@jbsg.com.au; (3) MNoryaim@jbsg.com.au RChapman@jbsg.com.au.
COMMENTS / SPECIAL HANDLING / STORAGE OR DISPOSAL:

LABORATORY BATCH NO.:
SAMPLERS: DC/MN
QC LEVEL: NEPM (2013)

SAMPLE ID	MATRIX	DATE	TIME	TYPE & PRESERVATIVE	pH	Metals	PAHs	TRH/BTEX	OCPs	PCBs	TCLP metals/PAHs	TYPE OF ASBESTOS ANALYSIS IDENTIFICATION	TYPE OF ASBESTOS ANALYSIS NEPM/WA	NOTES:
BH27-0-0.15	Soil	25/1/19		500ml bag, Jar+ice										
BH27-0.4-0.5						X	X						X	
BH27-1-1.1														
BH27-1.3-1.4				Jar + ice										
BH28-0-0.15		22/1/19		500ml bag, Jar+ice										
BH28-0.4-0.5														
BH28-1-1.1						X	X						X	
BH28-1.6-1.7		[illegible]		Jar + ice										
BH29-0-0.15		24/1/19		500ml bag, Jar+ice		X	X			X			X	
BH29-0.4-0.5														
BH30-0-0.15						X	X						X	
BH30-0.4-0.5														

RELINQUISHED BY:
NAME: DATE: 25/1/19
OF: JBS&G
NAME: DATE:
OF:

METHOD OF SHIPMENT:
CONSIGNMENT NOTE NO.
TRANSPORT CO.
CONSIGNMENT NOTE NO.
TRANSPORT CO

RECEIVED BY:
NAME: R TIMBO
DATE: 25/1/19
OF:
NAME: DATE:
OF:

FOR RECEIVING LAB USE ONLY:
COOLER SEAL – Yes....... No .... Intact .... Broken ....
COOLER TEMP .... deg C 1.5°C
COOLER SEAL – Yes....... No .... Intact .... Broken ....
COOLER TEMP .... deg C 637804

Container & Preservative Codes: P = Plastic; J = Soil Jar; B = Glass Bottle; N = Nitric Acid Prsvd.; C = Sodium Hydroxide Prsvd; VC = Hydrochloric Acid Prsvd Vial; VS = Sulfuric Acid Prsvd Vial; S = Sulfuric Acid Prsvd; Z = Zinc Prsvd; E = EDTA Prsvd; ST = Sterile Bottle; O = Other

Enviro Sample NSW

To: Nibha Vaidya; COC NSW
Subject: RE: **FW: COCs Job Number 55579

From: Milad Noujaim [mailto:mnoujaim@jbsg.com.au]
Sent: Friday, 25 January 2019 6:41 PM
To: Nibha Vaidya
Subject: Re: COCs Job Number 55579

#637804

EXTERNAL EMAIL*

Hey Nibha,

Can we also do asbestos identification on BH13-frag. It was left out of the COC.

Thank you

Get Outlook for iOS

From: Nibha Vaidya <nibhavaidya@eurofins.com>

Sent: Friday, January 25, 2019 5:50 PM

To: Milad Noujaim

Subject: RE: COCs Job Number 55579

Great, thanks Milad.

Kind Regards,

Nibha Vaidya

Phone : +61 2 9900 8415

Mobile : +61 499 900 805

Email : NibhaVaidya@eurofins.com

-----Original Message-----

From: Milad Noujaim [mailto:mnoujaim@jbsg.com.au]

Certificate of Analysis

NATA Accredited
Accreditation Number 1261
Site Number 18217

Accredited for compliance with ISO/IEC 17025–Testing
The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

JBS & G Australia (NSW) P/L
Level 1, 50 Margaret St
Sydney
NSW 2000

Attention:	Daniel Denaro
Report	637804-AID
Project Name	CHATSWOOD EDUCATION PRECINCT HIGH SCHOOL
Project ID	55579
Received Date	Jan 25, 2019
Date Reported	Feb 04, 2019

Methodology:

Asbestos Fibre Identification	Conducted in accordance with the Australian Standard AS 4964 – 2004: Method for the Qualitative Identification of Asbestos in Bulk Samples and in-house Method LTM-ASB-8020 by polarised light microscopy (PLM) and dispersion staining (DS) techniques. *NOTE: Positive Trace Analysis results indicate the sample contains detectable respirable fibres.*
Unknown Mineral Fibres	Mineral fibres of unknown type, as determined by PLM with DS, may require another analytical technique, such as Electron Microscopy, to confirm unequivocal identity. *NOTE: While Actinolite, Anthophyllite and Tremolite asbestos may be detected by PLM with DS, due to variability in the optical properties of these materials, AS4964 requires that these are reported as UMF unless confirmed by an independent technique.*
Subsampling Soil Samples	The whole sample submitted is first dried and then passed through a 10mm sieve followed by a 2mm sieve. All fibrous matter greater than 10mm, greater than 2mm as well as the material passing through the 2mm sieve are retained and analysed for the presence of asbestos. If the sub 2mm fraction is greater than approximately 30 to 60g then a sub-sampling routine based on ISO 3082:2009(E) is employed. *NOTE: Depending on the nature and size of the soil sample, the sub-2 mm residue material may need to be sub-sampled for trace analysis, in accordance with AS 4964-2004.*
Bonded asbestos-containing material (ACM)	The material is first examined and any fibres isolated for identification by PLM and DS. Where required, interfering matrices may be removed by disintegration using a range of heat, chemical or physical treatments, possibly in combination.The resultant material is then further examined in accordance with AS 4964 - 2004. *NOTE: Even after disintegration it may be difficult to detect the presence of asbestos in some asbestos-containing bulk materials using PLM and DS. This is due to the low grade or small length or diameter of the asbestos fibres present in the material, or to the fact that very fine fibres have been distributed intimately throughout the materials. Vinyl/asbestos floor tiles, some asbestos-containing sealants and mastics, asbestos-containing epoxy resins and some ore samples are examples of these types of material, which are difficult to analyse.*
Limit of Reporting	The performance limitation of the AS 4964 (2004) method for non-homogeneous samples is around 0.1 g/kg (equivalent to 0.01% (w/w)). Where no asbestos is found by PLM and DS, including Trace Analysis, this is considered to be at the nominal reporting limit of 0.01% (w/w). The NEPM screening level of 0.001% (w/w) is intended as an on-site determination, not a laboratory Limit of Reporting (LOR), per se. Examination of a large sample size (e.g. 500 mL) may improve the likelihood of detecting asbestos, particularly AF, to aid assessment against the NEPM criteria. Gravimetric determinations to this level of accuracy are outside of AS 4964 and hence NATA Accreditation does not cover the performance of this service (non-NATA results shown with an asterisk). *NOTE: NATA News March 2014, p.7, states in relation to AS 4964: "This is a qualitative method with a nominal reporting limit of 0.01 % " and that currently in Australia "there is no validated method available for the quantification of asbestos".This report is consistent with the analytical procedures and reporting recommendations in the NEPM and the WA DoH.*

Project Name CHATSWOOD EDUCATION PRECINCT HIGH SCHOOL
Project ID 55579
Date Sampled Jan 21, 2019 to Jan 25, 2019
Report 637804-AID

Client Sample ID	Eurofins | mgt Sample No.	Date Sampled	Sample Description	Result
BH01_0-0.15	19-Ja24069	Jan 21, 2019	Approximate Sample 617g Sample consisted of: Brown coarse-grained soil and rocks	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No respirable fibres detected.
BH02A_0-0.15	19-Ja24070	Jan 24, 2019	Approximate Sample 516g Sample consisted of: Dark brown coarse-grained soil and rocks	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No respirable fibres detected.
BH03_0.4-0.5	19-Ja24071	Jan 21, 2019	Approximate Sample 629g Sample consisted of: Brown coarse-grained soil and rocks	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No respirable fibres detected.
BH04_0.2-0.3	19-Ja24072	Jan 21, 2019	Approximate Sample 484g Sample consisted of: Brown coarse-grained soil and rocks	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No respirable fibres detected.
BH05_1.0-1.1	19-Ja24073	Jan 21, 2019	Approximate Sample 874g Sample consisted of: Brown coarse-grained soil and rocks	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No respirable fibres detected.
BH06_0.4-0.5	19-Ja24074	Jan 21, 2019	Approximate Sample 669g Sample consisted of: Brown coarse-grained soil and rocks	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No respirable fibres detected.
BH07_0.5-0.6	19-Ja24075	Jan 24, 2019	Approximate Sample 763g Sample consisted of: Brown coarse-grained soil and rocks	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No respirable fibres detected.

Client Sample ID	Eurofins | mgt Sample No.	Date Sampled	Sample Description	Result
BH08_0-0.15	19-Ja24076	Jan 25, 2019	Approximate Sample 722g Sample consisted of: Brown coarse-grained soil and rocks	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No respirable fibres detected.
BH09_0.4-0.5	19-Ja24077	Jan 21, 2019	Approximate Sample 669g Sample consisted of: Brown coarse-grained soil and rocks	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No respirable fibres detected.
BH10_1-1.1	19-Ja24078	Jan 21, 2019	Approximate Sample 715g Sample consisted of: Brown coarse-grained soil and rocks	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No respirable fibres detected.
BH11_0-0.15	19-Ja24079	Jan 21, 2019	Approximate Sample 636g Sample consisted of: Brown coarse-grained soil and rocks	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No respirable fibres detected.
BH12_0.4-0.5	19-Ja24080	Jan 21, 2019	Approximate Sample 599g Sample consisted of: Brown coarse-grained soil and rocks	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No respirable fibres detected.
BH13_0.7-0.8	19-Ja24081	Jan 25, 2019	Approximate Sample 669g Sample consisted of: Brown coarse-grained soil and rocks	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No respirable fibres detected.
BH14_0-0.15	19-Ja24082	Jan 25, 2019	Approximate Sample 621g Sample consisted of: Brown coarse-grained soil and rocks	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No respirable fibres detected.
BH15_0-0.15	19-Ja24083	Jan 21, 2019	Approximate Sample 493g Sample consisted of: Dark brown coarse-grained soil and rocks	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No respirable fibres detected.
BH16_0.4-0.5	19-Ja24084	Jan 22, 2019	Approximate Sample 753g Sample consisted of: Brown coarse-grained soil and rocks	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No respirable fibres detected.
BH17_0.4-0.5	19-Ja24085	Jan 22, 2019	Approximate Sample 676g Sample consisted of: Brown coarse-grained soil and rocks	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No respirable fibres detected.
BH18_0.7-0.8	19-Ja24086	Jan 22, 2019	Approximate Sample 600g Sample consisted of: Brown coarse-grained soil and rocks	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No respirable fibres detected.

Client Sample ID	Eurofins | mgt Sample No.	Date Sampled	Sample Description	Result
BH19_0.4-0.5	19-Ja24087	Jan 22, 2019	Approximate Sample 742g Sample consisted of: Brown coarse-grained soil and rocks	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No respirable fibres detected.
BH20_1-1.1	19-Ja24088	Jan 22, 2019	Approximate Sample 609g Sample consisted of: Brown coarse-grained soil and rocks	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No respirable fibres detected.
BH21_0-0.15	19-Ja24089	Jan 22, 2019	Approximate Sample 708g Sample consisted of: Brown coarse-grained soil and rocks	No asbestos detected at the reporting limit of 0.001% w/w.* Synthetic mineral fibre detected. Organic fibre detected. No respirable fibres detected.
BH22_1-1.1	19-Ja24090	Jan 22, 2019	Approximate Sample 489g Sample consisted of: Brown coarse-grained soil and rocks	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No respirable fibres detected.
BH23_0.4-0.5	19-Ja24091	Jan 22, 2019	Approximate Sample 664g Sample consisted of: Brown coarse-grained soil and rocks	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No respirable fibres detected.
BH24_0-0.15	19-Ja24092	Jan 22, 2019	Approximate Sample 798g Sample consisted of: Brown coarse-grained soil and rocks	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No respirable fibres detected.
BH25_0.5-0.6	19-Ja24093	Jan 22, 2019	Approximate Sample 496g Sample consisted of: Brown coarse-grained soil and rocks	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No respirable fibres detected.
BH26_1-1.1	19-Ja24094	Jan 22, 2019	Approximate Sample 552g Sample consisted of: Brown coarse-grained soil and rocks	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No respirable fibres detected.
BH27_0.4-0.5	19-Ja24095	Jan 25, 2019	Approximate Sample 790g Sample consisted of: Brown coarse-grained soil and rocks	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No respirable fibres detected.
BH28_1-1.1	19-Ja24096	Jan 22, 2019	Approximate Sample 465g Sample consisted of: Brown coarse-grained soil and rocks	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No respirable fibres detected.
BH29_0-0.15	19-Ja24097	Jan 24, 2019	Approximate Sample 654g Sample consisted of: Brown coarse-grained soil and rocks	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No respirable fibres detected.

Client Sample ID	Eurofins | mgt Sample No.	Date Sampled	Sample Description	Result
BH30_0-0.15	19-Ja24098	Jan 24, 2019	Approximate Sample 542g Sample consisted of: Brown coarse-grained soil and rocks	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No respirable fibres detected.
BH13-FRAG	19-Ja24099	Jan 24, 2019	Approximate Sample 17g / 114x40x3mm Sample consisted of: Grey fibre cement material	Chrysotile and amosite asbestos detected.

Sample History

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

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

Description	**Testing Site**	**Extracted**	**Holding Time**
Asbestos - LTM-ASB-8020	Sydney	Jan 29, 2019	Indefinite
Asbestos - LTM-ASB-8020	Sydney	Jan 29, 2019	Indefinite

Company Name: JBS & G Australia (NSW) P/L
Address: Level 1, 50 Margaret St
Sydney
NSW 2000

Order No.:
Report #: 637804
Phone: 02 8245 0300
Fax:

Received: Jan 25, 2019 5:50 PM
Due: Feb 4, 2019
Priority: 5 Day
Contact Name: Daniel Denaro

Project Name: CHATSWOOD EDUCATION PRECINCT HIGH SCHOOL
Project ID: 55579

Eurofins | mgt Analytical Services Manager : Nibha Vaidya

Sample Detail						Asbestos - WA guidelines	Asbestos Absence /Presence	HOLD	Polycyclic Aromatic Hydrocarbons	Organochlorine Pesticides	Polychlorinated Biphenyls	Metals M8	BTEX	Moisture Set	Total Recoverable Hydrocarbons
Melbourne Laboratory - NATA Site # 1254 & 14271								X	X	X	X	X	X	X	X
Sydney Laboratory - NATA Site # 18217						X	X								
Brisbane Laboratory - NATA Site # 20794															
Perth Laboratory - NATA Site # 23736															
External Laboratory															
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**										
1	BH01_0-0.15	Jan 21, 2019		Soil	S19-Ja24069	X			X			X	X	X	X
2	BH02A_0-0.15	Jan 24, 2019		Soil	S19-Ja24070	X			X	X		X		X	
3	BH03_0.4-0.5	Jan 21, 2019		Soil	S19-Ja24071	X			X			X		X	
4	BH04_0.2-0.3	Jan 21, 2019		Soil	S19-Ja24072	X			X			X	X	X	X
5	BH05_1.0-1.1	Jan 21, 2019		Soil	S19-Ja24073	X			X			X		X	
6	BH06_0.4-0.5	Jan 21, 2019		Soil	S19-Ja24074	X			X			X		X	
7	BH07_0.5-0.6	Jan 24, 2019		Soil	S19-Ja24075	X			X			X		X	
8	BH08_0-0.15	Jan 25, 2019		Soil	S19-Ja24076	X			X			X	X	X	X
9	BH09_0.4-0.5	Jan 21, 2019		Soil	S19-Ja24077	X			X	X		X		X	

Company Name: JBS & G Australia (NSW) P/L
Address: Level 1, 50 Margaret St
Sydney
NSW 2000

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Project Name: CHATSWOOD EDUCATION PRECINCT HIGH SCHOOL
Project ID: 55579

Eurofins | mgt Analytical Services Manager : Nibha Vaidya

Sample Detail						Asbestos - WA guidelines	Asbestos Absence /Presence	HOLD	Polycyclic Aromatic Hydrocarbons	Organochlorine Pesticides	Polychlorinated Biphenyls	Metals M8	BTEX	Moisture Set	Total Recoverable Hydrocarbons
Melbourne Laboratory - NATA Site # 1254 & 14271								X	X	X	X	X	X	X	X
Sydney Laboratory - NATA Site # 18217						X	X								
Brisbane Laboratory - NATA Site # 20794															
Perth Laboratory - NATA Site # 23736															
10	BH10_1-1.1	Jan 21, 2019		Soil	S19-Ja24078	X			X			X	X	X	X
11	BH11_0-0.15	Jan 21, 2019		Soil	S19-Ja24079	X			X			X		X	
12	BH12_0.4-0.5	Jan 21, 2019		Soil	S19-Ja24080	X			X			X		X	
13	BH13_0.7-0.8	Jan 25, 2019		Soil	S19-Ja24081	X			X			X		X	
14	BH14_0-0.15	Jan 25, 2019		Soil	S19-Ja24082	X			X			X		X	
15	BH15_0-0.15	Jan 21, 2019		Soil	S19-Ja24083	X			X		X	X		X	
16	BH16_0.4-0.5	Jan 22, 2019		Soil	S19-Ja24084	X			X	X		X		X	
17	BH17_0.4-0.5	Jan 22, 2019		Soil	S19-Ja24085	X			X			X		X	
18	BH18_0.7-0.8	Jan 22, 2019		Soil	S19-Ja24086	X			X			X		X	
19	BH19_0.4-0.5	Jan 22, 2019		Soil	S19-Ja24087	X			X			X		X	
20	BH20_1-1.1	Jan 22, 2019		Soil	S19-Ja24088	X			X			X		X	
21	BH21_0-0.15	Jan 22, 2019		Soil	S19-Ja24089	X			X	X		X		X	

Company Name: JBS & G Australia (NSW) P/L
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Project ID: 55579

Eurofins | mgt Analytical Services Manager : Nibha Vaidya

Sample Detail						Asbestos - WA guidelines	Asbestos Absence /Presence	HOLD	Polycyclic Aromatic Hydrocarbons	Organochlorine Pesticides	Polychlorinated Biphenyls	Metals M8	BTEX	Moisture Set	Total Recoverable Hydrocarbons
Melbourne Laboratory - NATA Site # 1254 & 14271								X	X	X	X	X	X	X	X
Sydney Laboratory - NATA Site # 18217						X	X								
Brisbane Laboratory - NATA Site # 20794															
Perth Laboratory - NATA Site # 23736															
22	BH22_1-1.1	Jan 22, 2019		Soil	S19-Ja24090	X			X			X		X	
23	BH23_0.4-0.5	Jan 22, 2019		Soil	S19-Ja24091	X			X			X		X	
24	BH24_0-0.15	Jan 22, 2019		Soil	S19-Ja24092	X			X			X	X	X	X
25	BH25_0.5-0.6	Jan 22, 2019		Soil	S19-Ja24093	X			X	X		X		X	
26	BH26_1-1.1	Jan 22, 2019		Soil	S19-Ja24094	X			X			X		X	
27	BH27_0.4-0.5	Jan 25, 2019		Soil	S19-Ja24095	X			X			X		X	
28	BH28_1-1.1	Jan 22, 2019		Soil	S19-Ja24096	X			X			X		X	
29	BH29_0-0.15	Jan 24, 2019		Soil	S19-Ja24097	X			X		X	X		X	
30	BH30_0-0.15	Jan 24, 2019		Soil	S19-Ja24098	X			X			X		X	
31	BH13-FRAG	Jan 24, 2019		Building Materials	S19-Ja24099		X								
32	BH01_0.4-0.5	Jan 21, 2019		Soil	S19-Ja24100			X							

Company Name: JBS & G Australia (NSW) P/L
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NSW 2000

Project Name: CHATSWOOD EDUCATION PRECINCT HIGH SCHOOL
Project ID: 55579

Order No.:
Report #: 637804
Phone: 02 8245 0300
Fax:

Received: Jan 25, 2019 5:50 PM
Due: Feb 4, 2019
Priority: 5 Day
Contact Name: Daniel Denaro

Eurofins | mgt Analytical Services Manager : Nibha Vaidya

Sample Detail						Asbestos - WA guidelines	Asbestos Absence /Presence	HOLD	Polycyclic Aromatic Hydrocarbons	Organochlorine Pesticides	Polychlorinated Biphenyls	Metals M8	BTEX	Moisture Set	Total Recoverable Hydrocarbons
Melbourne Laboratory - NATA Site # 1254 & 14271								X	X	X	X	X	X	X	X
Sydney Laboratory - NATA Site # 18217						X	X								
Brisbane Laboratory - NATA Site # 20794															
Perth Laboratory - NATA Site # 23736															
33	BH01_1.0-1.1	Jan 21, 2019		Soil	S19-Ja24101			X							
34	BH01_1.4-1.5	Jan 21, 2019		Soil	S19-Ja24102			X							
35	BH02_0-0.15	Jan 24, 2019		Soil	S19-Ja24103			X							
36	BH02A_0.4-0.5	Jan 24, 2019		Soil	S19-Ja24104			X							
37	BH03_0-0.15	Jan 21, 2019		Soil	S19-Ja24105			X							
38	BH03_1.0-1.1	Jan 21, 2019		Soil	S19-Ja24106			X							
39	BH04_0.4-0.5	Jan 21, 2019		Soil	S19-Ja24107			X							
40	BH04_1.0-1.1	Jan 21, 2019		Soil	S19-Ja24108			X							
41	BH05_0-0.15	Jan 21, 2019		Soil	S19-Ja24109			X							
42	BH05_0.4-0.5	Jan 21, 2019		Soil	S19-Ja24110			X							
43	BH05_1.4-1.5	Jan 21, 2019		Soil	S19-Ja24111			X							

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Melbourne Laboratory - NATA Site # 1254 & 14271								X	X	X	X	X	X	X	X
Sydney Laboratory - NATA Site # 18217						X	X								
Brisbane Laboratory - NATA Site # 20794															
Perth Laboratory - NATA Site # 23736															
44	BH06_0-0.15	Jan 21, 2019		Soil	S19-Ja24112			X							
45	BH06_1-1.1	Jan 21, 2019		Soil	S19-Ja24113			X							
46	BH07_0-0.15	Jan 24, 2019		Soil	S19-Ja24114			X							
47	BH08_0.4-0.5	Jan 25, 2019		Soil	S19-Ja24115			X							
48	BH08_0.8-0.9	Jan 25, 2019		Soil	S19-Ja24116			X							
49	BH08_1.2-1.3	Jan 25, 2019		Soil	S19-Ja24117			X							
50	BH08_1.5-1.6	Jan 25, 2019		Soil	S19-Ja24118			X							
51	BH09_0-0.15	Jan 21, 2019		Soil	S19-Ja24119			X							
52	BH09_1-1.1	Jan 21, 2019		Soil	S19-Ja24120			X							
53	BH10_0.05-0.15	Jan 21, 2019		Soil	S19-Ja24121			X							
54	BH10_0.4-0.5	Jan 21, 2019		Soil	S19-Ja24122			X							

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Melbourne Laboratory - NATA Site # 1254 & 14271								X	X	X	X	X	X	X	X
Sydney Laboratory - NATA Site # 18217						X	X								
Brisbane Laboratory - NATA Site # 20794															
Perth Laboratory - NATA Site # 23736															
55	BH10_1.6-1.7	Jan 21, 2019		Soil	S19-Ja24123			X							
56	BH11_0.4-0.5	Jan 21, 2019		Soil	S19-Ja24124			X							
57	BH11_1.3-1.4	Jan 21, 2019		Soil	S19-Ja24125			X							
58	BH12_0-0.15	Jan 21, 2019		Soil	S19-Ja24126			X							
59	BH12_1-1.1	Jan 21, 2019		Soil	S19-Ja24127			X							
60	BH13_0-0.15	Jan 25, 2019		Soil	S19-Ja24128			X							
61	BH13_0.4-0.5	Jan 25, 2019		Soil	S19-Ja24129			X							
62	BH13_1.2-1.3	Jan 25, 2019		Soil	S19-Ja24130			X							
63	BH14_0.6-0.7	Jan 25, 2019		Soil	S19-Ja24131			X							
64	BH14_1-1.1	Jan 25, 2019		Soil	S19-Ja24132			X							
65	BH15_0.4-0.5	Jan 21, 2019		Soil	S19-Ja24133			X							
66	BH15_1-1.1	Jan 21, 2019		Soil	S19-Ja24134			X							

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Sample Detail						Asbestos - WA guidelines	Asbestos Absence /Presence	HOLD	Polycyclic Aromatic Hydrocarbons	Organochlorine Pesticides	Polychlorinated Biphenyls	Metals M8	BTEX	Moisture Set	Total Recoverable Hydrocarbons
Melbourne Laboratory - NATA Site # 1254 & 14271								X	X	X	X	X	X	X	X
Sydney Laboratory - NATA Site # 18217						X	X								
Brisbane Laboratory - NATA Site # 20794															
Perth Laboratory - NATA Site # 23736															
67	BH15_1.5-1.6	Jan 21, 2019		Soil	S19-Ja24135			X							
68	BH15_2.2-2.3	Jan 21, 2019		Soil	S19-Ja24136			X							
69	BH16_0-0.15	Jan 22, 2019		Soil	S19-Ja24137			X							
70	BH16_1-1.1	Jan 22, 2019		Soil	S19-Ja24138			X							
71	BH16_1.5-1.6	Jan 22, 2019		Soil	S19-Ja24139			X							
72	BH16_2.0-2.1	Jan 22, 2019		Soil	S19-Ja24140			X							
73	BH17_0-0.15	Jan 22, 2019		Soil	S19-Ja24141			X							
74	BH17_1.0-1.1	Jan 22, 2019		Soil	S19-Ja24142			X							
75	BH17_1.5-1.6	Jan 22, 2019		Soil	S19-Ja24143			X							
76	BH18_0-0.15	Jan 22, 2019		Soil	S19-Ja24144			X							
77	BH18_0.4-0.5	Jan 22, 2019		Soil	S19-Ja24145			X							
78	BH18_1-1.1	Jan 22, 2019		Soil	S19-Ja24146			X							

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Sample Detail						Asbestos - WA guidelines	Asbestos Absence /Presence	HOLD	Polycyclic Aromatic Hydrocarbons	Organochlorine Pesticides	Polychlorinated Biphenyls	Metals M8	BTEX	Moisture Set	Total Recoverable Hydrocarbons
Melbourne Laboratory - NATA Site # 1254 & 14271								X	X	X	X	X	X	X	X
Sydney Laboratory - NATA Site # 18217						X	X								
Brisbane Laboratory - NATA Site # 20794															
Perth Laboratory - NATA Site # 23736															
79	BH19_0-0.15	Jan 22, 2019		Soil	S19-Ja24147			X							
80	BH19_0.7-0.8	Jan 22, 2019		Soil	S19-Ja24148			X							
81	BH19_1-1.1	Jan 22, 2019		Soil	S19-Ja24149			X							
82	BH20_0-0.15	Jan 22, 2019		Soil	S19-Ja24150			X							
83	BH20_0.4-0.5	Jan 22, 2019		Soil	S19-Ja24151			X							
84	BH20_1.5-1.6	Jan 22, 2019		Soil	S19-Ja24152			X							
85	BH21_0.4-0.5	Jan 22, 2019		Soil	S19-Ja24153			X							
86	BH21_1-1.1	Jan 22, 2019		Soil	S19-Ja24154			X							
87	BH22_0-0.15	Jan 22, 2019		Soil	S19-Ja24155			X							
88	BH22_0.4-0.5	Jan 22, 2019		Soil	S19-Ja24156			X							
89	BH23_0-0.15	Jan 22, 2019		Soil	S19-Ja24157			X							
90	BH23_1-1.1	Jan 22, 2019		Soil	S19-Ja24158			X							

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Melbourne Laboratory - NATA Site # 1254 & 14271								X	X	X	X	X	X	X	X
Sydney Laboratory - NATA Site # 18217						X	X								
Brisbane Laboratory - NATA Site # 20794															
Perth Laboratory - NATA Site # 23736															
91	BH23_1.3-1.4	Jan 22, 2019		Soil	S19-Ja24159			X							
92	BH23_1.7-1.8	Jan 22, 2019		Soil	S19-Ja24160			X							
93	BH24_0.4-0.5	Jan 22, 2019		Soil	S19-Ja24161			X							
94	BH24_1-1.1	Jan 22, 2019		Soil	S19-Ja24162			X							
95	BH24_1.4-1.5	Jan 22, 2019		Soil	S19-Ja24163			X							
96	BH25_0-0.15	Jan 22, 2019		Soil	S19-Ja24164			X							
97	BH25_1.1-1.2	Jan 22, 2019		Soil	S19-Ja24165			X							
98	BH26_0-0.15	Jan 22, 2019		Soil	S19-Ja24166			X							
99	BH26_0.4-0.5	Jan 22, 2019		Soil	S19-Ja24167			X							
100	BH26_1.5-1.6	Jan 22, 2019		Soil	S19-Ja24168			X							
101	BH27_0-0.15	Jan 25, 2019		Soil	S19-Ja24169			X							
102	BH27_1-1.1	Jan 25, 2019		Soil	S19-Ja24170			X							

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Melbourne Laboratory - NATA Site # 1254 & 14271								X	X	X	X	X	X	X	X
Sydney Laboratory - NATA Site # 18217						X	X								
Brisbane Laboratory - NATA Site # 20794															
Perth Laboratory - NATA Site # 23736															
103	BH27_1.3-1.4	Jan 25, 2019		Soil	S19-Ja24171			X							
104	BH28_0-0.15	Jan 22, 2019		Soil	S19-Ja24172			X							
105	BH28_0.4-0.5	Jan 22, 2019		Soil	S19-Ja24173			X							
106	BH28_1.6-1.7	Jan 22, 2019		Soil	S19-Ja24174			X							
107	BH29_0.4-0.5	Jan 24, 2019		Soil	S19-Ja24175			X							
108	BH30_0.4-0.5	Jan 24, 2019		Soil	S19-Ja24176			X							
109	BH27_0.7-0.8	Jan 24, 2019		Soil	S19-Ja24177			X							
Test Counts						30	1	78	30	5	2	30	5	30	5

Internal Quality Control Review and Glossary

General

1. QC data may be available on request.
2. All soil results are reported on a dry basis, unless otherwise stated.
3. Samples were analysed on an 'as received' basis.
4. This report replaces any interim results previously issued.

Holding Times

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

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

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

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

Units

% w/w: weight for weight basis	grams per kilogram
Filter loading:	fibres/100 graticule areas
Reported Concentration:	fibres/mL
Flowrate:	L/min

Terms

Dry	Sample is dried by heating prior to analysis
LOR	Limit of Reporting
COC	Chain of Custody
SRA	Sample Receipt Advice
ISO	International Standards Organisation
AS	Australian Standards
WA DOH	Reference document for the NEPM. Government of Western Australia, Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia (2009), including supporting document Recommended Procedures for Laboratory Analysis of Asbestos in Soil (2011)
NEPM	National Environment Protection (Assessment of Site Contamination) Measure, 2013 (as amended)
ACM	Asbestos Containing Materials. Asbestos contained within a non-asbestos matrix, typically presented in bonded and/or sound condition. For the purposes of the NEPM, ACM is generally restricted to those materials that do not pass a 7mm x 7mm sieve.
AF	Asbestos Fines. Asbestos containing materials, including friable, weathered and bonded materials, able to pass a 7mm x 7mm sieve. Considered under the NEPM as equivalent to “non-bonded / friable”.
FA	Fibrous Asbestos. Asbestos containing materials in a friable and/or severely weathered condition. For the purposes of the NEPM, FA is generally restricted to those materials that do not pass a 7mm x 7mm sieve.
Friable	Asbestos-containing materials of any size that may be broken or crumbled by hand pressure. For the purposes of the NEPM, this includes both AF and FA. It is outside of the laboratory’s remit to assess degree of friability.
Trace Analysis	Analytical procedure used to detect the presence of respirable fibres in the matrix.

Comments

Ja24072, Ja24083, Ja24090. Ja24093, Ja24096: Sample received was less than the nominal 500mL as recommended in Section 4.10 of the NEPM Schedule B1 - Guideline on Investigation Levels for Soil and Groundwater.

Sample Integrity

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

Qualifier Codes/Comments

Code	Description
N/A	Not applicable

Asbestos Counter/Identifier:

Laxman Dias	Senior Analyst-Asbestos (NSW)

Authorised by:

Sayeed Abu	Senior Analyst-Asbestos (NSW)

Glenn Jackson
General Manager

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

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

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

Certificate of Analysis

NATA Accredited
Accreditation Number 1261
Site Number 18217

Accredited for compliance with ISO/IEC 17025 – Testing
The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

JBS & G Australia (NSW) P/L
Level 1, 50 Margaret St
Sydney
NSW 2000

Attention:	**Daniel Denaro**
Report	**637804-S**
Project name	CHATSWOOD EDUCATION PRECINCT HIGH SCHOOL
Project ID	55579
Received Date	Jan 25, 2019

Client Sample ID			**BH01_0-0.15**	**BH02A_0-0.15**	**BH03_0.4-0.5**	[G01]**BH04_0.2-0.3**
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins | mgt Sample No.			**S19-Ja24069**	**S19-Ja24070**	**S19-Ja24071**	**S19-Ja24072**
Date Sampled			**Jan 21, 2019**	**Jan 24, 2019**	**Jan 21, 2019**	**Jan 21, 2019**
Test/Reference	LOR	Unit				
Total Recoverable Hydrocarbons - 1999 NEPM Fractions						
TRH C6-C9	20	mg/kg	< 20	-	-	< 40
TRH C10-C14	20	mg/kg	< 20	-	-	< 20
TRH C15-C28	50	mg/kg	150	-	-	< 50
TRH C29-C36	50	mg/kg	110	-	-	< 50
TRH C10-36 (Total)	50	mg/kg	260	-	-	< 50
BTEX						
Benzene	0.1	mg/kg	< 0.1	-	-	< 0.2
Toluene	0.1	mg/kg	< 0.1	-	-	< 0.2
Ethylbenzene	0.1	mg/kg	< 0.1	-	-	< 0.2
m&p-Xylenes	0.2	mg/kg	< 0.2	-	-	< 0.4
o-Xylene	0.1	mg/kg	< 0.1	-	-	< 0.2
Xylenes - Total	0.3	mg/kg	< 0.3	-	-	< 0.6
4-Bromofluorobenzene (surr.)	1	%	92	-	-	76
Total Recoverable Hydrocarbons - 2013 NEPM Fractions						
Naphthalene[N02]	0.5	mg/kg	< 0.5	-	-	< 1
TRH C6-C10	20	mg/kg	< 20	-	-	< 40
TRH C6-C10 less BTEX (F1)[N04]	20	mg/kg	< 20	-	-	< 40
TRH >C10-C16	50	mg/kg	< 50	-	-	< 50
TRH >C10-C16 less Naphthalene (F2)[N01]	50	mg/kg	< 50	-	-	< 50
TRH >C16-C34	100	mg/kg	220	-	-	< 100
TRH >C34-C40	100	mg/kg	< 100	-	-	< 100
TRH >C10-C40 (total)*	100	mg/kg	220	-	-	< 100
Polycyclic Aromatic Hydrocarbons						
Benzo(a)pyrene TEQ (lower bound) *	0.5	mg/kg	1.3	< 0.5	< 0.5	< 0.5
Benzo(a)pyrene TEQ (medium bound) *	0.5	mg/kg	1.6	0.6	0.6	0.6
Benzo(a)pyrene TEQ (upper bound) *	0.5	mg/kg	1.8	1.2	1.2	1.2
Acenaphthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Acenaphthylene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benz(a)anthracene	0.5	mg/kg	1.3	< 0.5	< 0.5	< 0.5
Benzo(a)pyrene	0.5	mg/kg	1.0	< 0.5	< 0.5	< 0.5
Benzo(b&j)fluoranthene[N07]	0.5	mg/kg	0.6	< 0.5	< 0.5	< 0.5
Benzo(g.h.i)perylene	0.5	mg/kg	0.5	< 0.5	< 0.5	< 0.5
Benzo(k)fluoranthene	0.5	mg/kg	0.8	< 0.5	< 0.5	< 0.5
Chrysene	0.5	mg/kg	1.6	< 0.5	< 0.5	< 0.5

Client Sample ID			**BH01_0-0.15**	**BH02A_0-0.15**	**BH03_0.4-0.5**	^{G01}**BH04_0.2-0.3**
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins | mgt Sample No.			**S19-Ja24069**	**S19-Ja24070**	**S19-Ja24071**	**S19-Ja24072**
Date Sampled			**Jan 21, 2019**	**Jan 24, 2019**	**Jan 21, 2019**	**Jan 21, 2019**
Test/Reference	LOR	Unit				
Polycyclic Aromatic Hydrocarbons						
Dibenz(a.h)anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Fluoranthene	0.5	mg/kg	2.8	0.8	< 0.5	< 0.5
Fluorene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Indeno(1.2.3-cd)pyrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Naphthalene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Phenanthrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Pyrene	0.5	mg/kg	3.1	0.8	< 0.5	< 0.5
Total PAH*	0.5	mg/kg	11.7	1.6	< 0.5	< 0.5
2-Fluorobiphenyl (surr.)	1	%	53	53	53	83
p-Terphenyl-d14 (surr.)	1	%	65	92	71	63
Organochlorine Pesticides						
Chlordanes - Total	0.1	mg/kg	-	< 0.1	-	-
4.4'-DDD	0.05	mg/kg	-	< 0.05	-	-
4.4'-DDE	0.05	mg/kg	-	< 0.05	-	-
4.4'-DDT	0.05	mg/kg	-	< 0.05	-	-
a-BHC	0.05	mg/kg	-	< 0.05	-	-
Aldrin	0.05	mg/kg	-	< 0.05	-	-
b-BHC	0.05	mg/kg	-	< 0.05	-	-
d-BHC	0.05	mg/kg	-	< 0.05	-	-
Dieldrin	0.05	mg/kg	-	< 0.05	-	-
Endosulfan I	0.05	mg/kg	-	< 0.05	-	-
Endosulfan II	0.05	mg/kg	-	< 0.05	-	-
Endosulfan sulphate	0.05	mg/kg	-	< 0.05	-	-
Endrin	0.05	mg/kg	-	< 0.05	-	-
Endrin aldehyde	0.05	mg/kg	-	< 0.05	-	-
Endrin ketone	0.05	mg/kg	-	< 0.05	-	-
g-BHC (Lindane)	0.05	mg/kg	-	< 0.05	-	-
Heptachlor	0.05	mg/kg	-	< 0.05	-	-
Heptachlor epoxide	0.05	mg/kg	-	< 0.05	-	-
Hexachlorobenzene	0.05	mg/kg	-	< 0.05	-	-
Methoxychlor	0.05	mg/kg	-	< 0.05	-	-
Toxaphene	1	mg/kg	-	< 1	-	-
Aldrin and Dieldrin (Total)*	0.05	mg/kg	-	< 0.05	-	-
DDT + DDE + DDD (Total)*	0.05	mg/kg	-	< 0.05	-	-
Vic EPA IWRG 621 OCP (Total)*	0.1	mg/kg	-	< 0.1	-	-
Vic EPA IWRG 621 Other OCP (Total)*	0.1	mg/kg	-	< 0.1	-	-
Dibutylchlorendate (surr.)	1	%	-	98	-	-
Tetrachloro-m-xylene (surr.)	1	%	-	90	-	-
Heavy Metals						
Arsenic	2	mg/kg	5.1	5.3	2.8	3.9
Cadmium	0.4	mg/kg	< 0.4	< 0.4	< 0.4	< 0.4
Chromium	5	mg/kg	8.8	14	87	8.7
Copper	5	mg/kg	11	36	32	22
Lead	5	mg/kg	39	37	11	47
Mercury	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Nickel	5	mg/kg	< 5	5.8	97	8.9
Zinc	5	mg/kg	88	71	64	44
% Moisture	1	%	17	14	16	26

Client Sample ID			**BH05_1.0-1.1**	**BH06_0.4-0.5**	**BH07_0.5-0.6**	**BH08_0-0.15**
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins | mgt Sample No.			**S19-Ja24073**	**S19-Ja24074**	**S19-Ja24075**	**S19-Ja24076**
Date Sampled			**Jan 21, 2019**	**Jan 21, 2019**	**Jan 24, 2019**	**Jan 25, 2019**
Test/Reference	LOR	Unit				
Total Recoverable Hydrocarbons - 1999 NEPM Fractions						
TRH C6-C9	20	mg/kg	-	-	-	< 20
TRH C10-C14	20	mg/kg	-	-	-	< 20
TRH C15-C28	50	mg/kg	-	-	-	< 50
TRH C29-C36	50	mg/kg	-	-	-	< 50
TRH C10-36 (Total)	50	mg/kg	-	-	-	< 50
BTEX						
Benzene	0.1	mg/kg	-	-	-	< 0.1
Toluene	0.1	mg/kg	-	-	-	< 0.1
Ethylbenzene	0.1	mg/kg	-	-	-	< 0.1
m&p-Xylenes	0.2	mg/kg	-	-	-	< 0.2
o-Xylene	0.1	mg/kg	-	-	-	< 0.1
Xylenes - Total	0.3	mg/kg	-	-	-	< 0.3
4-Bromofluorobenzene (surr.)	1	%	-	-	-	87
Total Recoverable Hydrocarbons - 2013 NEPM Fractions						
Naphthalene^{N02}	0.5	mg/kg	-	-	-	< 0.5
TRH C6-C10	20	mg/kg	-	-	-	< 20
TRH C6-C10 less BTEX (F1)^{N04}	20	mg/kg	-	-	-	< 20
TRH >C10-C16	50	mg/kg	-	-	-	< 50
TRH >C10-C16 less Naphthalene (F2)^{N01}	50	mg/kg	-	-	-	< 50
TRH >C16-C34	100	mg/kg	-	-	-	< 100
TRH >C34-C40	100	mg/kg	-	-	-	< 100
TRH >C10-C40 (total)*	100	mg/kg	-	-	-	< 100
Polycyclic Aromatic Hydrocarbons						
Benzo(a)pyrene TEQ (lower bound) *	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(a)pyrene TEQ (medium bound) *	0.5	mg/kg	0.6	0.6	0.6	0.6
Benzo(a)pyrene TEQ (upper bound) *	0.5	mg/kg	1.2	1.2	1.2	1.2
Acenaphthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Acenaphthylene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benz(a)anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(a)pyrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(b&j)fluoranthene^{N07}	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(g.h.i)perylene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(k)fluoranthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Chrysene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Dibenz(a.h)anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Fluoranthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Fluorene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Indeno(1.2.3-cd)pyrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Naphthalene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Phenanthrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Pyrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Total PAH*	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
2-Fluorobiphenyl (surr.)	1	%	57	56	51	50
p-Terphenyl-d14 (surr.)	1	%	59	85	77	54

Client Sample ID **Sample Matrix** **Eurofins | mgt Sample No.** **Date Sampled** Test/Reference	LOR	Unit	**BH05_1.0-1.1** **Soil** **S19-Ja24073** **Jan 21, 2019**	**BH06_0.4-0.5** **Soil** **S19-Ja24074** **Jan 21, 2019**	**BH07_0.5-0.6** **Soil** **S19-Ja24075** **Jan 24, 2019**	**BH08_0-0.15** **Soil** **S19-Ja24076** **Jan 25, 2019**
Heavy Metals						
Arsenic	2	mg/kg	6.7	17	11	6.3
Cadmium	0.4	mg/kg	< 0.4	< 0.4	< 0.4	< 0.4
Chromium	5	mg/kg	< 5	32	14	15
Copper	5	mg/kg	18	11	23	27
Lead	5	mg/kg	23	60	24	40
Mercury	0.1	mg/kg	< 0.1	< 0.1	< 0.1	0.5
Nickel	5	mg/kg	< 5	6.6	5.6	< 5
Zinc	5	mg/kg	< 5	33	27	100
% Moisture	1	%	11	19	13	13

Client Sample ID **Sample Matrix** **Eurofins | mgt Sample No.** **Date Sampled** Test/Reference	LOR	Unit	**BH09_0.4-0.5** **Soil** **S19-Ja24077** **Jan 21, 2019**	**BH10_1-1.1** **Soil** **S19-Ja24078** **Jan 21, 2019**	**BH11_0-0.15** **Soil** **S19-Ja24079** **Jan 21, 2019**	**BH12_0.4-0.5** **Soil** **S19-Ja24080** **Jan 21, 2019**
Total Recoverable Hydrocarbons - 1999 NEPM Fractions						
TRH C6-C9	20	mg/kg	-	< 20	-	-
TRH C10-C14	20	mg/kg	-	< 20	-	-
TRH C15-C28	50	mg/kg	-	< 50	-	-
TRH C29-C36	50	mg/kg	-	< 50	-	-
TRH C10-36 (Total)	50	mg/kg	-	< 50	-	-
BTEX						
Benzene	0.1	mg/kg	-	< 0.1	-	-
Toluene	0.1	mg/kg	-	< 0.1	-	-
Ethylbenzene	0.1	mg/kg	-	< 0.1	-	-
m&p-Xylenes	0.2	mg/kg	-	< 0.2	-	-
o-Xylene	0.1	mg/kg	-	< 0.1	-	-
Xylenes - Total	0.3	mg/kg	-	< 0.3	-	-
4-Bromofluorobenzene (surr.)	1	%	-	92	-	-
Total Recoverable Hydrocarbons - 2013 NEPM Fractions						
Naphthalene[N02]	0.5	mg/kg	-	< 0.5	-	-
TRH C6-C10	20	mg/kg	-	< 20	-	-
TRH C6-C10 less BTEX (F1)[N04]	20	mg/kg	-	< 20	-	-
TRH >C10-C16	50	mg/kg	-	< 50	-	-
TRH >C10-C16 less Naphthalene (F2)[N01]	50	mg/kg	-	< 50	-	-
TRH >C16-C34	100	mg/kg	-	< 100	-	-
TRH >C34-C40	100	mg/kg	-	< 100	-	-
TRH >C10-C40 (total)*	100	mg/kg	-	< 100	-	-
Polycyclic Aromatic Hydrocarbons						
Benzo(a)pyrene TEQ (lower bound) *	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(a)pyrene TEQ (medium bound) *	0.5	mg/kg	0.6	0.6	0.6	0.6
Benzo(a)pyrene TEQ (upper bound) *	0.5	mg/kg	1.2	1.2	1.2	1.2
Acenaphthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Acenaphthylene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benz(a)anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(a)pyrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5

Client Sample ID			**BH09_0.4-0.5**	**BH10_1-1.1**	**BH11_0-0.15**	**BH12_0.4-0.5**
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins | mgt Sample No.			**S19-Ja24077**	**S19-Ja24078**	**S19-Ja24079**	**S19-Ja24080**
Date Sampled			**Jan 21, 2019**	**Jan 21, 2019**	**Jan 21, 2019**	**Jan 21, 2019**
Test/Reference	LOR	Unit				
Polycyclic Aromatic Hydrocarbons						
Benzo(b&j)fluoranthene^{N07}	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(g.h.i)perylene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(k)fluoranthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Chrysene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Dibenz(a.h)anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Fluoranthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Fluorene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Indeno(1.2.3-cd)pyrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Naphthalene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Phenanthrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Pyrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Total PAH*	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
2-Fluorobiphenyl (surr.)	1	%	84	53	72	95
p-Terphenyl-d14 (surr.)	1	%	72	95	66	110
Organochlorine Pesticides						
Chlordanes - Total	0.1	mg/kg	< 0.1	-	-	-
4.4'-DDD	0.05	mg/kg	< 0.05	-	-	-
4.4'-DDE	0.05	mg/kg	< 0.05	-	-	-
4.4'-DDT	0.05	mg/kg	< 0.05	-	-	-
a-BHC	0.05	mg/kg	< 0.05	-	-	-
Aldrin	0.05	mg/kg	< 0.05	-	-	-
b-BHC	0.05	mg/kg	< 0.05	-	-	-
d-BHC	0.05	mg/kg	< 0.05	-	-	-
Dieldrin	0.05	mg/kg	< 0.05	-	-	-
Endosulfan I	0.05	mg/kg	< 0.05	-	-	-
Endosulfan II	0.05	mg/kg	< 0.05	-	-	-
Endosulfan sulphate	0.05	mg/kg	< 0.05	-	-	-
Endrin	0.05	mg/kg	< 0.05	-	-	-
Endrin aldehyde	0.05	mg/kg	< 0.05	-	-	-
Endrin ketone	0.05	mg/kg	< 0.05	-	-	-
g-BHC (Lindane)	0.05	mg/kg	< 0.05	-	-	-
Heptachlor	0.05	mg/kg	< 0.05	-	-	-
Heptachlor epoxide	0.05	mg/kg	< 0.05	-	-	-
Hexachlorobenzene	0.05	mg/kg	< 0.05	-	-	-
Methoxychlor	0.05	mg/kg	< 0.05	-	-	-
Toxaphene	1	mg/kg	< 1	-	-	-
Aldrin and Dieldrin (Total)*	0.05	mg/kg	< 0.05	-	-	-
DDT + DDE + DDD (Total)*	0.05	mg/kg	< 0.05	-	-	-
Vic EPA IWRG 621 OCP (Total)*	0.1	mg/kg	< 0.1	-	-	-
Vic EPA IWRG 621 Other OCP (Total)*	0.1	mg/kg	< 0.1	-	-	-
Dibutylchlorendate (surr.)	1	%	119	-	-	-
Tetrachloro-m-xylene (surr.)	1	%	109	-	-	-
Heavy Metals						
Arsenic	2	mg/kg	7.0	13	5.0	9.2
Cadmium	0.4	mg/kg	< 0.4	1.0	< 0.4	< 0.4
Chromium	5	mg/kg	12	16	12	15
Copper	5	mg/kg	14	26	18	22
Lead	5	mg/kg	27	110	49	24
Mercury	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1

Client Sample ID **Sample Matrix** **Eurofins | mgt Sample No.** **Date Sampled** Test/Reference	LOR	Unit	**BH09_0.4-0.5** **Soil** **S19-Ja24077** **Jan 21, 2019**	**BH10_1-1.1** **Soil** **S19-Ja24078** **Jan 21, 2019**	**BH11_0-0.15** **Soil** **S19-Ja24079** **Jan 21, 2019**	**BH12_0.4-0.5** **Soil** **S19-Ja24080** **Jan 21, 2019**
Heavy Metals						
Nickel	5	mg/kg	6.8	7.9	12	10
Zinc	5	mg/kg	38	690	150	77
% Moisture	1	%	14	13	18	14

Client Sample ID **Sample Matrix** **Eurofins | mgt Sample No.** **Date Sampled** Test/Reference	LOR	Unit	**BH13_0.7-0.8** **Soil** **S19-Ja24081** **Jan 25, 2019**	**BH14_0-0.15** **Soil** **S19-Ja24082** **Jan 25, 2019**	**BH15_0-0.15** **Soil** **S19-Ja24083** **Jan 21, 2019**	**BH16_0.4-0.5** **Soil** **S19-Ja24084** **Jan 22, 2019**
Polycyclic Aromatic Hydrocarbons						
Benzo(a)pyrene TEQ (lower bound) *	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(a)pyrene TEQ (medium bound) *	0.5	mg/kg	0.6	0.6	0.6	0.6
Benzo(a)pyrene TEQ (upper bound) *	0.5	mg/kg	1.2	1.2	1.2	1.2
Acenaphthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Acenaphthylene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benz(a)anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(a)pyrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(b&j)fluoranthene[N07]	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(g.h.i)perylene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(k)fluoranthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Chrysene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Dibenz(a.h)anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Fluoranthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Fluorene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Indeno(1.2.3-cd)pyrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Naphthalene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Phenanthrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Pyrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Total PAH*	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
2-Fluorobiphenyl (surr.)	1	%	61	64	107	78
p-Terphenyl-d14 (surr.)	1	%	60	91	90	54
Organochlorine Pesticides						
Chlordanes - Total	0.1	mg/kg	-	-	-	< 0.1
4.4'-DDD	0.05	mg/kg	-	-	-	< 0.05
4.4'-DDE	0.05	mg/kg	-	-	-	< 0.05
4.4'-DDT	0.05	mg/kg	-	-	-	< 0.05
a-BHC	0.05	mg/kg	-	-	-	< 0.05
Aldrin	0.05	mg/kg	-	-	-	< 0.05
b-BHC	0.05	mg/kg	-	-	-	< 0.05
d-BHC	0.05	mg/kg	-	-	-	< 0.05
Dieldrin	0.05	mg/kg	-	-	-	< 0.05
Endosulfan I	0.05	mg/kg	-	-	-	< 0.05
Endosulfan II	0.05	mg/kg	-	-	-	< 0.05
Endosulfan sulphate	0.05	mg/kg	-	-	-	< 0.05
Endrin	0.05	mg/kg	-	-	-	< 0.05
Endrin aldehyde	0.05	mg/kg	-	-	-	< 0.05

Client Sample ID			**BH13_0.7-0.8**	**BH14_0-0.15**	**BH15_0-0.15**	**BH16_0.4-0.5**
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins | mgt Sample No.			**S19-Ja24081**	**S19-Ja24082**	**S19-Ja24083**	**S19-Ja24084**
Date Sampled			**Jan 25, 2019**	**Jan 25, 2019**	**Jan 21, 2019**	**Jan 22, 2019**
Test/Reference	LOR	Unit				
Organochlorine Pesticides						
Endrin ketone	0.05	mg/kg	-	-	-	< 0.05
g-BHC (Lindane)	0.05	mg/kg	-	-	-	< 0.05
Heptachlor	0.05	mg/kg	-	-	-	< 0.05
Heptachlor epoxide	0.05	mg/kg	-	-	-	< 0.05
Hexachlorobenzene	0.05	mg/kg	-	-	-	< 0.05
Methoxychlor	0.05	mg/kg	-	-	-	< 0.05
Toxaphene	1	mg/kg	-	-	-	< 1
Aldrin and Dieldrin (Total)*	0.05	mg/kg	-	-	-	< 0.05
DDT + DDE + DDD (Total)*	0.05	mg/kg	-	-	-	< 0.05
Vic EPA IWRG 621 OCP (Total)*	0.1	mg/kg	-	-	-	< 0.1
Vic EPA IWRG 621 Other OCP (Total)*	0.1	mg/kg	-	-	-	< 0.1
Dibutylchlorendate (surr.)	1	%	-	-	-	96
Tetrachloro-m-xylene (surr.)	1	%	-	-	-	110
Polychlorinated Biphenyls						
Aroclor-1016	0.1	mg/kg	-	-	< 0.1	-
Aroclor-1221	0.1	mg/kg	-	-	< 0.1	-
Aroclor-1232	0.1	mg/kg	-	-	< 0.1	-
Aroclor-1242	0.1	mg/kg	-	-	< 0.1	-
Aroclor-1248	0.1	mg/kg	-	-	< 0.1	-
Aroclor-1254	0.1	mg/kg	-	-	< 0.1	-
Aroclor-1260	0.1	mg/kg	-	-	< 0.1	-
Total PCB*	0.1	mg/kg	-	-	< 0.1	-
Dibutylchlorendate (surr.)	1	%	-	-	81	-
Tetrachloro-m-xylene (surr.)	1	%	-	-	90	-
Heavy Metals						
Arsenic	2	mg/kg	5.7	6.9	2.9	6.6
Cadmium	0.4	mg/kg	< 0.4	< 0.4	< 0.4	< 0.4
Chromium	5	mg/kg	14	17	10	11
Copper	5	mg/kg	17	21	18	26
Lead	5	mg/kg	17	43	22	37
Mercury	0.1	mg/kg	< 0.1	0.1	< 0.1	< 0.1
Nickel	5	mg/kg	6.7	9.7	6.1	5.8
Zinc	5	mg/kg	22	70	61	43
% Moisture	1	%	17	16	32	10

Client Sample ID			**BH17_0.4-0.5**	**BH18_0.7-0.8**	**BH19_0.4-0.5**	**BH20_1-1.1**
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins | mgt Sample No.			**S19-Ja24085**	**S19-Ja24086**	**S19-Ja24087**	**S19-Ja24088**
Date Sampled			**Jan 22, 2019**	**Jan 22, 2019**	**Jan 22, 2019**	**Jan 22, 2019**
Test/Reference	LOR	Unit				
Polycyclic Aromatic Hydrocarbons						
Benzo(a)pyrene TEQ (lower bound) *	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(a)pyrene TEQ (medium bound) *	0.5	mg/kg	0.6	0.6	0.6	0.6
Benzo(a)pyrene TEQ (upper bound) *	0.5	mg/kg	1.2	1.2	1.2	1.2
Acenaphthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Acenaphthylene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5

Client Sample ID			**BH17_0.4-0.5**	**BH18_0.7-0.8**	**BH19_0.4-0.5**	**BH20_1-1.1**
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins | mgt Sample No.			**S19-Ja24085**	**S19-Ja24086**	**S19-Ja24087**	**S19-Ja24088**
Date Sampled			**Jan 22, 2019**	**Jan 22, 2019**	**Jan 22, 2019**	**Jan 22, 2019**
Test/Reference	LOR	Unit				
Polycyclic Aromatic Hydrocarbons						
Benz(a)anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(a)pyrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(b&j)fluoranthene^{N07}	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(g.h.i)perylene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(k)fluoranthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Chrysene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Dibenz(a.h)anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Fluoranthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Fluorene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Indeno(1.2.3-cd)pyrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Naphthalene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Phenanthrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Pyrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Total PAH*	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
2-Fluorobiphenyl (surr.)	1	%	118	101	111	140
p-Terphenyl-d14 (surr.)	1	%	137	93	117	109
Heavy Metals						
Arsenic	2	mg/kg	4.6	4.8	2.1	15
Cadmium	0.4	mg/kg	< 0.4	< 0.4	< 0.4	< 0.4
Chromium	5	mg/kg	42	47	12	20
Copper	5	mg/kg	12	17	10	14
Lead	5	mg/kg	60	29	14	30
Mercury	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Nickel	5	mg/kg	< 5	41	11	< 5
Zinc	5	mg/kg	28	52	49	13
% Moisture	1	%	23	17	17	31

Client Sample ID			**BH21_0-0.15**	**BH22_1-1.1**	**BH23_0.4-0.5**	**BH24_0-0.15**
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins | mgt Sample No.			**S19-Ja24089**	**S19-Ja24090**	**S19-Ja24091**	**S19-Ja24092**
Date Sampled			**Jan 22, 2019**	**Jan 22, 2019**	**Jan 22, 2019**	**Jan 22, 2019**
Test/Reference	LOR	Unit				
Total Recoverable Hydrocarbons - 1999 NEPM Fractions						
TRH C6-C9	20	mg/kg	-	-	-	< 20
TRH C10-C14	20	mg/kg	-	-	-	< 20
TRH C15-C28	50	mg/kg	-	-	-	< 50
TRH C29-C36	50	mg/kg	-	-	-	130
TRH C10-36 (Total)	50	mg/kg	-	-	-	130
BTEX						
Benzene	0.1	mg/kg	-	-	-	< 0.1
Toluene	0.1	mg/kg	-	-	-	< 0.1
Ethylbenzene	0.1	mg/kg	-	-	-	< 0.1
m&p-Xylenes	0.2	mg/kg	-	-	-	< 0.2
o-Xylene	0.1	mg/kg	-	-	-	< 0.1
Xylenes - Total	0.3	mg/kg	-	-	-	< 0.3
4-Bromofluorobenzene (surr.)	1	%	-	-	-	75

Client Sample ID **Sample Matrix** **Eurofins | mgt Sample No.** **Date Sampled** Test/Reference	LOR	Unit	**BH21_0-0.15** **Soil** **S19-Ja24089** **Jan 22, 2019**	**BH22_1-1.1** **Soil** **S19-Ja24090** **Jan 22, 2019**	**BH23_0.4-0.5** **Soil** **S19-Ja24091** **Jan 22, 2019**	**BH24_0-0.15** **Soil** **S19-Ja24092** **Jan 22, 2019**
Total Recoverable Hydrocarbons - 2013 NEPM Fractions						
Naphthalene[N02]	0.5	mg/kg	-	-	-	< 0.5
TRH C6-C10	20	mg/kg	-	-	-	< 20
TRH C6-C10 less BTEX (F1)[N04]	20	mg/kg	-	-	-	< 20
TRH >C10-C16	50	mg/kg	-	-	-	< 50
TRH >C10-C16 less Naphthalene (F2)[N01]	50	mg/kg	-	-	-	< 50
TRH >C16-C34	100	mg/kg	-	-	-	120
TRH >C34-C40	100	mg/kg	-	-	-	130
TRH >C10-C40 (total)*	100	mg/kg	-	-	-	250
Polycyclic Aromatic Hydrocarbons						
Benzo(a)pyrene TEQ (lower bound) *	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(a)pyrene TEQ (medium bound) *	0.5	mg/kg	0.6	0.6	0.6	0.6
Benzo(a)pyrene TEQ (upper bound) *	0.5	mg/kg	1.2	1.2	1.2	1.2
Acenaphthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Acenaphthylene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benz(a)anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(a)pyrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(b&j)fluoranthene[N07]	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(g.h.i)perylene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(k)fluoranthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Chrysene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Dibenz(a.h)anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Fluoranthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Fluorene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Indeno(1.2.3-cd)pyrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Naphthalene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Phenanthrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Pyrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Total PAH*	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
2-Fluorobiphenyl (surr.)	1	%	73	53	68	76
p-Terphenyl-d14 (surr.)	1	%	63	93	77	88
Organochlorine Pesticides						
Chlordanes - Total	0.1	mg/kg	< 0.1	-	-	-
4.4'-DDD	0.05	mg/kg	< 0.05	-	-	-
4.4'-DDE	0.05	mg/kg	< 0.05	-	-	-
4.4'-DDT	0.05	mg/kg	< 0.05	-	-	-
a-BHC	0.05	mg/kg	< 0.05	-	-	-
Aldrin	0.05	mg/kg	< 0.05	-	-	-
b-BHC	0.05	mg/kg	< 0.05	-	-	-
d-BHC	0.05	mg/kg	< 0.05	-	-	-
Dieldrin	0.05	mg/kg	< 0.05	-	-	-
Endosulfan I	0.05	mg/kg	< 0.05	-	-	-
Endosulfan II	0.05	mg/kg	< 0.05	-	-	-
Endosulfan sulphate	0.05	mg/kg	< 0.05	-	-	-
Endrin	0.05	mg/kg	< 0.05	-	-	-
Endrin aldehyde	0.05	mg/kg	< 0.05	-	-	-
Endrin ketone	0.05	mg/kg	< 0.05	-	-	-
g-BHC (Lindane)	0.05	mg/kg	< 0.05	-	-	-
Heptachlor	0.05	mg/kg	< 0.05	-	-	-

Client Sample ID			**BH21_0-0.15**	**BH22_1-1.1**	**BH23_0.4-0.5**	**BH24_0-0.15**
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins | mgt Sample No.			**S19-Ja24089**	**S19-Ja24090**	**S19-Ja24091**	**S19-Ja24092**
Date Sampled			**Jan 22, 2019**	**Jan 22, 2019**	**Jan 22, 2019**	**Jan 22, 2019**
Test/Reference	LOR	Unit				
Organochlorine Pesticides						
Heptachlor epoxide	0.05	mg/kg	< 0.05	-	-	-
Hexachlorobenzene	0.05	mg/kg	< 0.05	-	-	-
Methoxychlor	0.05	mg/kg	< 0.05	-	-	-
Toxaphene	1	mg/kg	< 1	-	-	-
Aldrin and Dieldrin (Total)*	0.05	mg/kg	< 0.05	-	-	-
DDT + DDE + DDD (Total)*	0.05	mg/kg	< 0.05	-	-	-
Vic EPA IWRG 621 OCP (Total)*	0.1	mg/kg	< 0.1	-	-	-
Vic EPA IWRG 621 Other OCP (Total)*	0.1	mg/kg	< 0.1	-	-	-
Dibutylchlorendate (surr.)	1	%	83	-	-	-
Tetrachloro-m-xylene (surr.)	1	%	88	-	-	-
Heavy Metals						
Arsenic	2	mg/kg	6.2	15	12	2.6
Cadmium	0.4	mg/kg	< 0.4	< 0.4	< 0.4	< 0.4
Chromium	5	mg/kg	17	24	16	12
Copper	5	mg/kg	33	16	10	16
Lead	5	mg/kg	63	24	28	25
Mercury	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Nickel	5	mg/kg	9.6	< 5	< 5	7.5
Zinc	5	mg/kg	160	23	< 5	55
% Moisture	1	%	10	20	16	16

Client Sample ID			**BH25_0.5-0.6**	**BH26_1-1.1**	**BH27_0.4-0.5**	**BH28_1-1.1**
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins | mgt Sample No.			**S19-Ja24093**	**S19-Ja24094**	**S19-Ja24095**	**S19-Ja24096**
Date Sampled			**Jan 22, 2019**	**Jan 22, 2019**	**Jan 25, 2019**	**Jan 22, 2019**
Test/Reference	LOR	Unit				
Polycyclic Aromatic Hydrocarbons						
Benzo(a)pyrene TEQ (lower bound) *	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(a)pyrene TEQ (medium bound) *	0.5	mg/kg	0.6	0.6	0.6	0.6
Benzo(a)pyrene TEQ (upper bound) *	0.5	mg/kg	1.2	1.2	1.2	1.2
Acenaphthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Acenaphthylene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benz(a)anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(a)pyrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(b&j)fluoranthene^{N07}	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(g.h.i)perylene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(k)fluoranthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Chrysene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Dibenz(a.h)anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Fluoranthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Fluorene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Indeno(1.2.3-cd)pyrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Naphthalene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Phenanthrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Pyrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Total PAH*	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5

Client Sample ID			**BH25_0.5-0.6**	**BH26_1-1.1**	**BH27_0.4-0.5**	**BH28_1-1.1**
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins | mgt Sample No.			**S19-Ja24093**	**S19-Ja24094**	**S19-Ja24095**	**S19-Ja24096**
Date Sampled			**Jan 22, 2019**	**Jan 22, 2019**	**Jan 25, 2019**	**Jan 22, 2019**
Test/Reference	LOR	Unit				
Polycyclic Aromatic Hydrocarbons						
2-Fluorobiphenyl (surr.)	1	%	74	71	51	51
p-Terphenyl-d14 (surr.)	1	%	69	87	54	76
Organochlorine Pesticides						
Chlordanes - Total	0.1	mg/kg	< 0.1	-	-	-
4.4'-DDD	0.05	mg/kg	< 0.05	-	-	-
4.4'-DDE	0.05	mg/kg	< 0.05	-	-	-
4.4'-DDT	0.05	mg/kg	< 0.05	-	-	-
a-BHC	0.05	mg/kg	< 0.05	-	-	-
Aldrin	0.05	mg/kg	< 0.05	-	-	-
b-BHC	0.05	mg/kg	< 0.05	-	-	-
d-BHC	0.05	mg/kg	< 0.05	-	-	-
Dieldrin	0.05	mg/kg	< 0.05	-	-	-
Endosulfan I	0.05	mg/kg	< 0.05	-	-	-
Endosulfan II	0.05	mg/kg	< 0.05	-	-	-
Endosulfan sulphate	0.05	mg/kg	< 0.05	-	-	-
Endrin	0.05	mg/kg	< 0.05	-	-	-
Endrin aldehyde	0.05	mg/kg	< 0.05	-	-	-
Endrin ketone	0.05	mg/kg	< 0.05	-	-	-
g-BHC (Lindane)	0.05	mg/kg	< 0.05	-	-	-
Heptachlor	0.05	mg/kg	< 0.05	-	-	-
Heptachlor epoxide	0.05	mg/kg	< 0.05	-	-	-
Hexachlorobenzene	0.05	mg/kg	< 0.05	-	-	-
Methoxychlor	0.05	mg/kg	< 0.05	-	-	-
Toxaphene	1	mg/kg	< 1	-	-	-
Aldrin and Dieldrin (Total)*	0.05	mg/kg	< 0.05	-	-	-
DDT + DDE + DDD (Total)*	0.05	mg/kg	< 0.05	-	-	-
Vic EPA IWRG 621 OCP (Total)*	0.1	mg/kg	< 0.1	-	-	-
Vic EPA IWRG 621 Other OCP (Total)*	0.1	mg/kg	< 0.1	-	-	-
Dibutylchlorendate (surr.)	1	%	100	-	-	-
Tetrachloro-m-xylene (surr.)	1	%	91	-	-	-
Heavy Metals						
Arsenic	2	mg/kg	14	10	7.1	7.5
Cadmium	0.4	mg/kg	< 0.4	< 0.4	< 0.4	< 0.4
Chromium	5	mg/kg	27	17	16	14
Copper	5	mg/kg	14	18	20	10
Lead	5	mg/kg	26	44	47	22
Mercury	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Nickel	5	mg/kg	7.1	< 5	5.2	< 5
Zinc	5	mg/kg	15	21	60	5.2
% Moisture	1	%	20	27	12	18

Client Sample ID **Sample Matrix** **Eurofins | mgt Sample No.** **Date Sampled** Test/Reference	LOR	Unit	**BH29_0-0.15** **Soil** **S19-Ja24097** **Jan 24, 2019**	**BH30_0-0.15** **Soil** **S19-Ja24098** **Jan 24, 2019**
Polycyclic Aromatic Hydrocarbons				
Benzo(a)pyrene TEQ (lower bound) *	0.5	mg/kg	< 0.5	< 0.5
Benzo(a)pyrene TEQ (medium bound) *	0.5	mg/kg	0.6	0.6
Benzo(a)pyrene TEQ (upper bound) *	0.5	mg/kg	1.2	1.2
Acenaphthene	0.5	mg/kg	< 0.5	< 0.5
Acenaphthylene	0.5	mg/kg	< 0.5	< 0.5
Anthracene	0.5	mg/kg	< 0.5	< 0.5
Benz(a)anthracene	0.5	mg/kg	< 0.5	< 0.5
Benzo(a)pyrene	0.5	mg/kg	< 0.5	< 0.5
Benzo(b&j)fluoranthene^{N07}	0.5	mg/kg	< 0.5	< 0.5
Benzo(g.h.i)perylene	0.5	mg/kg	< 0.5	< 0.5
Benzo(k)fluoranthene	0.5	mg/kg	< 0.5	< 0.5
Chrysene	0.5	mg/kg	< 0.5	< 0.5
Dibenz(a.h)anthracene	0.5	mg/kg	< 0.5	< 0.5
Fluoranthene	0.5	mg/kg	< 0.5	< 0.5
Fluorene	0.5	mg/kg	< 0.5	< 0.5
Indeno(1.2.3-cd)pyrene	0.5	mg/kg	< 0.5	< 0.5
Naphthalene	0.5	mg/kg	< 0.5	< 0.5
Phenanthrene	0.5	mg/kg	< 0.5	< 0.5
Pyrene	0.5	mg/kg	< 0.5	< 0.5
Total PAH*	0.5	mg/kg	< 0.5	< 0.5
2-Fluorobiphenyl (surr.)	1	%	107	63
p-Terphenyl-d14 (surr.)	1	%	98	87
Polychlorinated Biphenyls				
Aroclor-1016	0.1	mg/kg	< 0.1	-
Aroclor-1221	0.1	mg/kg	< 0.1	-
Aroclor-1232	0.1	mg/kg	< 0.1	-
Aroclor-1242	0.1	mg/kg	< 0.1	-
Aroclor-1248	0.1	mg/kg	< 0.1	-
Aroclor-1254	0.1	mg/kg	< 0.1	-
Aroclor-1260	0.1	mg/kg	< 0.1	-
Total PCB*	0.1	mg/kg	< 0.1	-
Dibutylchlorendate (surr.)	1	%	129	-
Tetrachloro-m-xylene (surr.)	1	%	77	-
Heavy Metals				
Arsenic	2	mg/kg	4.5	8.4
Cadmium	0.4	mg/kg	< 0.4	< 0.4
Chromium	5	mg/kg	42	12
Copper	5	mg/kg	23	19
Lead	5	mg/kg	26	69
Mercury	0.1	mg/kg	< 0.1	< 0.1
Nickel	5	mg/kg	44	< 5
Zinc	5	mg/kg	41	51
% Moisture	1	%	9.7	16

Sample History

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

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

Description	Testing Site	Extracted	Holding Time
Total Recoverable Hydrocarbons - 1999 NEPM Fractions	Melbourne	Jan 31, 2019	14 Day
- Method: LTM-ORG-2010 TRH C6-C40			
Total Recoverable Hydrocarbons - 2013 NEPM Fractions	Melbourne	Jan 31, 2019	14 Day
- Method: LTM-ORG-2010 TRH C6-C40			
Total Recoverable Hydrocarbons - 2013 NEPM Fractions	Melbourne	Jan 31, 2019	14 Day
- Method: LTM-ORG-2010 TRH C6-C40			
BTEX	Melbourne	Jan 31, 2019	14 Day
- Method: LTM-ORG-2150 VOCs in Soils Liquid and other Aqueous Matrices			
Polycyclic Aromatic Hydrocarbons	Melbourne	Jan 31, 2019	14 Day
- Method: LTM-ORG-2130 PAH and Phenols in Soil and Water			
Organochlorine Pesticides	Melbourne	Jan 31, 2019	14 Day
- Method: LTM-ORG-2220 OCP & PCB in Soil and Water			
Polychlorinated Biphenyls	Melbourne	Jan 31, 2019	28 Days
- Method: LTM-ORG-2220 OCP & PCB in Soil and Water			
Metals M8	Melbourne	Jan 31, 2019	28 Days
- Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS			
% Moisture	Melbourne	Jan 29, 2019	14 Day
- Method: LTM-GEN-7080 Moisture			

Company Name: JBS & G Australia (NSW) P/L
Address: Level 1, 50 Margaret St
Sydney
NSW 2000

Order No.:
Report #: 637804
Phone: 02 8245 0300
Fax:

Received: Jan 25, 2019 5:50 PM
Due: Feb 4, 2019
Priority: 5 Day
Contact Name: Daniel Denaro

Project Name: CHATSWOOD EDUCATION PRECINCT HIGH SCHOOL
Project ID: 55579

Eurofins | mgt Analytical Services Manager : Nibha Vaidya

Sample Detail						Asbestos - WA guidelines	Asbestos Absence /Presence	HOLD	Polycyclic Aromatic Hydrocarbons	Organochlorine Pesticides	Polychlorinated Biphenyls	Metals M8	BTEX	Moisture Set	Total Recoverable Hydrocarbons
Melbourne Laboratory - NATA Site # 1254 & 14271								X	X	X	X	X	X	X	X
Sydney Laboratory - NATA Site # 18217						X	X								
Brisbane Laboratory - NATA Site # 20794															
Perth Laboratory - NATA Site # 23736															
External Laboratory															
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**										
1	BH01_0-0.15	Jan 21, 2019		Soil	S19-Ja24069	X			X			X	X	X	X
2	BH02A_0-0.15	Jan 24, 2019		Soil	S19-Ja24070	X			X	X		X		X	
3	BH03_0.4-0.5	Jan 21, 2019		Soil	S19-Ja24071	X			X			X		X	
4	BH04_0.2-0.3	Jan 21, 2019		Soil	S19-Ja24072	X			X			X	X	X	X
5	BH05_1.0-1.1	Jan 21, 2019		Soil	S19-Ja24073	X			X			X		X	
6	BH06_0.4-0.5	Jan 21, 2019		Soil	S19-Ja24074	X			X			X		X	
7	BH07_0.5-0.6	Jan 24, 2019		Soil	S19-Ja24075	X			X			X		X	
8	BH08_0-0.15	Jan 25, 2019		Soil	S19-Ja24076	X			X			X	X	X	X
9	BH09_0.4-0.5	Jan 21, 2019		Soil	S19-Ja24077	X			X	X		X		X	

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Priority: 5 Day
Contact Name: Daniel Denaro

Project Name: CHATSWOOD EDUCATION PRECINCT HIGH SCHOOL
Project ID: 55579

Eurofins | mgt Analytical Services Manager : Nibha Vaidya

Sample Detail						Asbestos - WA guidelines	Asbestos Absence /Presence	HOLD	Polycyclic Aromatic Hydrocarbons	Organochlorine Pesticides	Polychlorinated Biphenyls	Metals M8	BTEX	Moisture Set	Total Recoverable Hydrocarbons
Melbourne Laboratory - NATA Site # 1254 & 14271								X	X	X	X	X	X	X	X
Sydney Laboratory - NATA Site # 18217						X	X								
Brisbane Laboratory - NATA Site # 20794															
Perth Laboratory - NATA Site # 23736															
10	BH10_1-1.1	Jan 21, 2019		Soil	S19-Ja24078	X			X			X	X	X	X
11	BH11_0-0.15	Jan 21, 2019		Soil	S19-Ja24079	X			X			X		X	
12	BH12_0.4-0.5	Jan 21, 2019		Soil	S19-Ja24080	X			X			X		X	
13	BH13_0.7-0.8	Jan 25, 2019		Soil	S19-Ja24081	X			X			X		X	
14	BH14_0-0.15	Jan 25, 2019		Soil	S19-Ja24082	X			X			X		X	
15	BH15_0-0.15	Jan 21, 2019		Soil	S19-Ja24083	X			X		X	X		X	
16	BH16_0.4-0.5	Jan 22, 2019		Soil	S19-Ja24084	X			X	X		X		X	
17	BH17_0.4-0.5	Jan 22, 2019		Soil	S19-Ja24085	X			X			X		X	
18	BH18_0.7-0.8	Jan 22, 2019		Soil	S19-Ja24086	X			X			X		X	
19	BH19_0.4-0.5	Jan 22, 2019		Soil	S19-Ja24087	X			X			X		X	
20	BH20_1-1.1	Jan 22, 2019		Soil	S19-Ja24088	X			X			X		X	
21	BH21_0-0.15	Jan 22, 2019		Soil	S19-Ja24089	X			X	X		X		X	

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Melbourne Laboratory - NATA Site # 1254 & 14271								X	X	X	X	X	X	X	X
Sydney Laboratory - NATA Site # 18217						X	X								
Brisbane Laboratory - NATA Site # 20794															
Perth Laboratory - NATA Site # 23736															
22	BH22_1-1.1	Jan 22, 2019		Soil	S19-Ja24090	X			X			X		X	
23	BH23_0.4-0.5	Jan 22, 2019		Soil	S19-Ja24091	X			X			X		X	
24	BH24_0-0.15	Jan 22, 2019		Soil	S19-Ja24092	X			X			X	X	X	X
25	BH25_0.5-0.6	Jan 22, 2019		Soil	S19-Ja24093	X			X	X		X		X	
26	BH26_1-1.1	Jan 22, 2019		Soil	S19-Ja24094	X			X			X		X	
27	BH27_0.4-0.5	Jan 25, 2019		Soil	S19-Ja24095	X			X			X		X	
28	BH28_1-1.1	Jan 22, 2019		Soil	S19-Ja24096	X			X			X		X	
29	BH29_0-0.15	Jan 24, 2019		Soil	S19-Ja24097	X			X		X	X		X	
30	BH30_0-0.15	Jan 24, 2019		Soil	S19-Ja24098	X			X			X		X	
31	BH13-FRAG	Jan 24, 2019		Building Materials	S19-Ja24099		X								
32	BH01_0.4-0.5	Jan 21, 2019		Soil	S19-Ja24100			X							

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Melbourne Laboratory - NATA Site # 1254 & 14271								X	X	X	X	X	X	X	X
Sydney Laboratory - NATA Site # 18217						X	X								
Brisbane Laboratory - NATA Site # 20794															
Perth Laboratory - NATA Site # 23736															
33	BH01_1.0-1.1	Jan 21, 2019		Soil	S19-Ja24101			X							
34	BH01_1.4-1.5	Jan 21, 2019		Soil	S19-Ja24102			X							
35	BH02_0-0.15	Jan 24, 2019		Soil	S19-Ja24103			X							
36	BH02A_0.4-0.5	Jan 24, 2019		Soil	S19-Ja24104			X							
37	BH03_0-0.15	Jan 21, 2019		Soil	S19-Ja24105			X							
38	BH03_1.0-1.1	Jan 21, 2019		Soil	S19-Ja24106			X							
39	BH04_0.4-0.5	Jan 21, 2019		Soil	S19-Ja24107			X							
40	BH04_1.0-1.1	Jan 21, 2019		Soil	S19-Ja24108			X							
41	BH05_0-0.15	Jan 21, 2019		Soil	S19-Ja24109			X							
42	BH05_0.4-0.5	Jan 21, 2019		Soil	S19-Ja24110			X							
43	BH05_1.4-1.5	Jan 21, 2019		Soil	S19-Ja24111			X							

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Melbourne Laboratory - NATA Site # 1254 & 14271								X	X	X	X	X	X	X	X
Sydney Laboratory - NATA Site # 18217						X	X								
Brisbane Laboratory - NATA Site # 20794															
Perth Laboratory - NATA Site # 23736															
44	BH06_0-0.15	Jan 21, 2019		Soil	S19-Ja24112			X							
45	BH06_1-1.1	Jan 21, 2019		Soil	S19-Ja24113			X							
46	BH07_0-0.15	Jan 24, 2019		Soil	S19-Ja24114			X							
47	BH08_0.4-0.5	Jan 25, 2019		Soil	S19-Ja24115			X							
48	BH08_0.8-0.9	Jan 25, 2019		Soil	S19-Ja24116			X							
49	BH08_1.2-1.3	Jan 25, 2019		Soil	S19-Ja24117			X							
50	BH08_1.5-1.6	Jan 25, 2019		Soil	S19-Ja24118			X							
51	BH09_0-0.15	Jan 21, 2019		Soil	S19-Ja24119			X							
52	BH09_1-1.1	Jan 21, 2019		Soil	S19-Ja24120			X							
53	BH10_0.05-0.15	Jan 21, 2019		Soil	S19-Ja24121			X							
54	BH10_0.4-0.5	Jan 21, 2019		Soil	S19-Ja24122			X							

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Melbourne Laboratory - NATA Site # 1254 & 14271								X	X	X	X	X	X	X	X
Sydney Laboratory - NATA Site # 18217						X	X								
Brisbane Laboratory - NATA Site # 20794															
Perth Laboratory - NATA Site # 23736															
55	BH10_1.6-1.7	Jan 21, 2019		Soil	S19-Ja24123			X							
56	BH11_0.4-0.5	Jan 21, 2019		Soil	S19-Ja24124			X							
57	BH11_1.3-1.4	Jan 21, 2019		Soil	S19-Ja24125			X							
58	BH12_0-0.15	Jan 21, 2019		Soil	S19-Ja24126			X							
59	BH12_1-1.1	Jan 21, 2019		Soil	S19-Ja24127			X							
60	BH13_0-0.15	Jan 25, 2019		Soil	S19-Ja24128			X							
61	BH13_0.4-0.5	Jan 25, 2019		Soil	S19-Ja24129			X							
62	BH13_1.2-1.3	Jan 25, 2019		Soil	S19-Ja24130			X							
63	BH14_0.6-0.7	Jan 25, 2019		Soil	S19-Ja24131			X							
64	BH14_1-1.1	Jan 25, 2019		Soil	S19-Ja24132			X							
65	BH15_0.4-0.5	Jan 21, 2019		Soil	S19-Ja24133			X							
66	BH15_1-1.1	Jan 21, 2019		Soil	S19-Ja24134			X							

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Melbourne Laboratory - NATA Site # 1254 & 14271								X	X	X	X	X	X	X	X
Sydney Laboratory - NATA Site # 18217						X	X								
Brisbane Laboratory - NATA Site # 20794															
Perth Laboratory - NATA Site # 23736															
67	BH15_1.5-1.6	Jan 21, 2019		Soil	S19-Ja24135			X							
68	BH15_2.2-2.3	Jan 21, 2019		Soil	S19-Ja24136			X							
69	BH16_0-0.15	Jan 22, 2019		Soil	S19-Ja24137			X							
70	BH16_1-1.1	Jan 22, 2019		Soil	S19-Ja24138			X							
71	BH16_1.5-1.6	Jan 22, 2019		Soil	S19-Ja24139			X							
72	BH16_2.0-2.1	Jan 22, 2019		Soil	S19-Ja24140			X							
73	BH17_0-0.15	Jan 22, 2019		Soil	S19-Ja24141			X							
74	BH17_1.0-1.1	Jan 22, 2019		Soil	S19-Ja24142			X							
75	BH17_1.5-1.6	Jan 22, 2019		Soil	S19-Ja24143			X							
76	BH18_0-0.15	Jan 22, 2019		Soil	S19-Ja24144			X							
77	BH18_0.4-0.5	Jan 22, 2019		Soil	S19-Ja24145			X							
78	BH18_1-1.1	Jan 22, 2019		Soil	S19-Ja24146			X							

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Melbourne Laboratory - NATA Site # 1254 & 14271								X	X	X	X	X	X	X	X
Sydney Laboratory - NATA Site # 18217						X	X								
Brisbane Laboratory - NATA Site # 20794															
Perth Laboratory - NATA Site # 23736															
79	BH19_0-0.15	Jan 22, 2019		Soil	S19-Ja24147			X							
80	BH19_0.7-0.8	Jan 22, 2019		Soil	S19-Ja24148			X							
81	BH19_1-1.1	Jan 22, 2019		Soil	S19-Ja24149			X							
82	BH20_0-0.15	Jan 22, 2019		Soil	S19-Ja24150			X							
83	BH20_0.4-0.5	Jan 22, 2019		Soil	S19-Ja24151			X							
84	BH20_1.5-1.6	Jan 22, 2019		Soil	S19-Ja24152			X							
85	BH21_0.4-0.5	Jan 22, 2019		Soil	S19-Ja24153			X							
86	BH21_1-1.1	Jan 22, 2019		Soil	S19-Ja24154			X							
87	BH22_0-0.15	Jan 22, 2019		Soil	S19-Ja24155			X							
88	BH22_0.4-0.5	Jan 22, 2019		Soil	S19-Ja24156			X							
89	BH23_0-0.15	Jan 22, 2019		Soil	S19-Ja24157			X							
90	BH23_1-1.1	Jan 22, 2019		Soil	S19-Ja24158			X							

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Melbourne Laboratory - NATA Site # 1254 & 14271								X	X	X	X	X	X	X	X
Sydney Laboratory - NATA Site # 18217						X	X								
Brisbane Laboratory - NATA Site # 20794															
Perth Laboratory - NATA Site # 23736															
91	BH23_1.3-1.4	Jan 22, 2019		Soil	S19-Ja24159			X							
92	BH23_1.7-1.8	Jan 22, 2019		Soil	S19-Ja24160			X							
93	BH24_0.4-0.5	Jan 22, 2019		Soil	S19-Ja24161			X							
94	BH24_1-1.1	Jan 22, 2019		Soil	S19-Ja24162			X							
95	BH24_1.4-1.5	Jan 22, 2019		Soil	S19-Ja24163			X							
96	BH25_0-0.15	Jan 22, 2019		Soil	S19-Ja24164			X							
97	BH25_1.1-1.2	Jan 22, 2019		Soil	S19-Ja24165			X							
98	BH26_0-0.15	Jan 22, 2019		Soil	S19-Ja24166			X							
99	BH26_0.4-0.5	Jan 22, 2019		Soil	S19-Ja24167			X							
100	BH26_1.5-1.6	Jan 22, 2019		Soil	S19-Ja24168			X							
101	BH27_0-0.15	Jan 25, 2019		Soil	S19-Ja24169			X							
102	BH27_1-1.1	Jan 25, 2019		Soil	S19-Ja24170			X							

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Melbourne Laboratory - NATA Site # 1254 & 14271								X	X	X	X	X	X	X	X
Sydney Laboratory - NATA Site # 18217						X	X								
Brisbane Laboratory - NATA Site # 20794															
Perth Laboratory - NATA Site # 23736															
103	BH27_1.3-1.4	Jan 25, 2019		Soil	S19-Ja24171			X							
104	BH28_0-0.15	Jan 22, 2019		Soil	S19-Ja24172			X							
105	BH28_0.4-0.5	Jan 22, 2019		Soil	S19-Ja24173			X							
106	BH28_1.6-1.7	Jan 22, 2019		Soil	S19-Ja24174			X							
107	BH29_0.4-0.5	Jan 24, 2019		Soil	S19-Ja24175			X							
108	BH30_0.4-0.5	Jan 24, 2019		Soil	S19-Ja24176			X							
109	BH27_0.7-0.8	Jan 24, 2019		Soil	S19-Ja24177			X							
Test Counts						30	1	78	30	5	2	30	5	30	5

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure, April 2011 and are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. This report replaces any interim results previously issued.

Holding Times

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

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

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

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

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

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

Units

mg/kg: milligrams per kilogram	**mg/L:** milligrams per litre	**ug/L:** micrograms per litre
ppm: Parts per million	**ppb:** Parts per billion	**%:** Percentage
org/100mL: Organisms per 100 millilitres	**NTU:** Nephelometric Turbidity Units	**MPN/100mL:** Most Probable Number of organisms per 100 millilitres

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery.
CRM	Certified Reference Material - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
QSM	US Department of Defense Quality Systems Manual Version 5.2 2018
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

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

Results <10 times the LOR : No Limit

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

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

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

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.2 where no positive PFAS results have been reported have been reviewed and no data was affected.

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

QC Data General Comments

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

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions							
TRH C6-C9	mg/kg	< 20			20	Pass	
TRH C10-C14	mg/kg	< 20			20	Pass	
TRH C15-C28	mg/kg	< 50			50	Pass	
TRH C29-C36	mg/kg	< 50			50	Pass	
Method Blank							
BTEX							
Benzene	mg/kg	< 0.1			0.1	Pass	
Toluene	mg/kg	< 0.1			0.1	Pass	
Ethylbenzene	mg/kg	< 0.1			0.1	Pass	
m&p-Xylenes	mg/kg	< 0.2			0.2	Pass	
o-Xylene	mg/kg	< 0.1			0.1	Pass	
Xylenes - Total	mg/kg	< 0.3			0.3	Pass	
Method Blank							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	mg/kg	< 0.5			0.5	Pass	
TRH C6-C10	mg/kg	< 20			20	Pass	
TRH >C10-C16	mg/kg	< 50			50	Pass	
TRH >C16-C34	mg/kg	< 100			100	Pass	
TRH >C34-C40	mg/kg	< 100			100	Pass	
Method Blank							
Polycyclic Aromatic Hydrocarbons							
Acenaphthene	mg/kg	< 0.5			0.5	Pass	
Acenaphthylene	mg/kg	< 0.5			0.5	Pass	
Anthracene	mg/kg	< 0.5			0.5	Pass	
Benz(a)anthracene	mg/kg	< 0.5			0.5	Pass	
Benzo(a)pyrene	mg/kg	< 0.5			0.5	Pass	
Benzo(b&j)fluoranthene	mg/kg	< 0.5			0.5	Pass	
Benzo(g.h.i)perylene	mg/kg	< 0.5			0.5	Pass	
Benzo(k)fluoranthene	mg/kg	< 0.5			0.5	Pass	
Chrysene	mg/kg	< 0.5			0.5	Pass	
Dibenz(a.h)anthracene	mg/kg	< 0.5			0.5	Pass	
Fluoranthene	mg/kg	< 0.5			0.5	Pass	
Fluorene	mg/kg	< 0.5			0.5	Pass	
Indeno(1.2.3-cd)pyrene	mg/kg	< 0.5			0.5	Pass	
Naphthalene	mg/kg	< 0.5			0.5	Pass	
Phenanthrene	mg/kg	< 0.5			0.5	Pass	
Pyrene	mg/kg	< 0.5			0.5	Pass	
Method Blank							
Organochlorine Pesticides							
Chlordanes - Total	mg/kg	< 0.1			0.1	Pass	
4.4'-DDD	mg/kg	< 0.05			0.05	Pass	
4.4'-DDE	mg/kg	< 0.05			0.05	Pass	
4.4'-DDT	mg/kg	< 0.05			0.05	Pass	
a-BHC	mg/kg	< 0.05			0.05	Pass	
Aldrin	mg/kg	< 0.05			0.05	Pass	
b-BHC	mg/kg	< 0.05			0.05	Pass	
d-BHC	mg/kg	< 0.05			0.05	Pass	
Dieldrin	mg/kg	< 0.05			0.05	Pass	
Endosulfan I	mg/kg	< 0.05			0.05	Pass	
Endosulfan II	mg/kg	< 0.05			0.05	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Endosulfan sulphate	mg/kg	< 0.05			0.05	Pass	
Endrin	mg/kg	< 0.05			0.05	Pass	
Endrin aldehyde	mg/kg	< 0.05			0.05	Pass	
Endrin ketone	mg/kg	< 0.05			0.05	Pass	
g-BHC (Lindane)	mg/kg	< 0.05			0.05	Pass	
Heptachlor	mg/kg	< 0.05			0.05	Pass	
Heptachlor epoxide	mg/kg	< 0.05			0.05	Pass	
Hexachlorobenzene	mg/kg	< 0.05			0.05	Pass	
Methoxychlor	mg/kg	< 0.05			0.05	Pass	
Toxaphene	mg/kg	< 1			1	Pass	
Method Blank							
Polychlorinated Biphenyls							
Aroclor-1016	mg/kg	< 0.1			0.1	Pass	
Aroclor-1221	mg/kg	< 0.1			0.1	Pass	
Aroclor-1232	mg/kg	< 0.1			0.1	Pass	
Aroclor-1242	mg/kg	< 0.1			0.1	Pass	
Aroclor-1248	mg/kg	< 0.1			0.1	Pass	
Aroclor-1254	mg/kg	< 0.1			0.1	Pass	
Aroclor-1260	mg/kg	< 0.1			0.1	Pass	
Total PCB*	mg/kg	< 0.1			0.1	Pass	
Method Blank							
Heavy Metals							
Arsenic	mg/kg	< 2			2	Pass	
Cadmium	mg/kg	< 0.4			0.4	Pass	
Chromium	mg/kg	< 5			5	Pass	
Copper	mg/kg	< 5			5	Pass	
Lead	mg/kg	< 5			5	Pass	
Mercury	mg/kg	< 0.1			0.1	Pass	
Nickel	mg/kg	< 5			5	Pass	
Zinc	mg/kg	< 5			5	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions							
TRH C6-C9	%	115			70-130	Pass	
TRH C10-C14	%	116			70-130	Pass	
LCS - % Recovery							
BTEX							
Benzene	%	89			70-130	Pass	
Toluene	%	91			70-130	Pass	
Ethylbenzene	%	111			70-130	Pass	
m&p-Xylenes	%	114			70-130	Pass	
Xylenes - Total	%	114			70-130	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	%	117			70-130	Pass	
TRH C6-C10	%	112			70-130	Pass	
TRH >C10-C16	%	108			70-130	Pass	
LCS - % Recovery							
Polycyclic Aromatic Hydrocarbons							
Acenaphthene	%	108			70-130	Pass	
Acenaphthylene	%	101			70-130	Pass	
Anthracene	%	107			70-130	Pass	
Benz(a)anthracene	%	99			70-130	Pass	
Benzo(a)pyrene	%	102			70-130	Pass	
Benzo(b&j)fluoranthene	%	106			70-130	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Benzo(g.h.i)perylene	%	105			70-130	Pass	
Benzo(k)fluoranthene	%	100			70-130	Pass	
Chrysene	%	122			70-130	Pass	
Dibenz(a.h)anthracene	%	104			70-130	Pass	
Fluoranthene	%	125			70-130	Pass	
Fluorene	%	100			70-130	Pass	
Indeno(1.2.3-cd)pyrene	%	84			70-130	Pass	
Naphthalene	%	123			70-130	Pass	
Phenanthrene	%	90			70-130	Pass	
Pyrene	%	107			70-130	Pass	
LCS - % Recovery							
Organochlorine Pesticides							
Chlordanes - Total	%	117			70-130	Pass	
4.4'-DDD	%	95			70-130	Pass	
4.4'-DDE	%	125			70-130	Pass	
4.4'-DDT	%	91			70-130	Pass	
a-BHC	%	107			70-130	Pass	
Aldrin	%	106			70-130	Pass	
b-BHC	%	77			70-130	Pass	
d-BHC	%	92			70-130	Pass	
Dieldrin	%	122			70-130	Pass	
Endosulfan I	%	126			70-130	Pass	
Endosulfan II	%	94			70-130	Pass	
Endosulfan sulphate	%	98			70-130	Pass	
Endrin	%	78			70-130	Pass	
Endrin aldehyde	%	114			70-130	Pass	
Endrin ketone	%	106			70-130	Pass	
g-BHC (Lindane)	%	122			70-130	Pass	
Heptachlor	%	78			70-130	Pass	
Heptachlor epoxide	%	91			70-130	Pass	
Hexachlorobenzene	%	109			70-130	Pass	
Methoxychlor	%	74			70-130	Pass	
LCS - % Recovery							
Polychlorinated Biphenyls							
Aroclor-1260	%	124			70-130	Pass	
LCS - % Recovery							
Heavy Metals							
Arsenic	%	111			80-120	Pass	
Cadmium	%	107			80-120	Pass	
Chromium	%	112			80-120	Pass	
Copper	%	114			80-120	Pass	
Lead	%	119			80-120	Pass	
Mercury	%	110			75-125	Pass	
Nickel	%	112			80-120	Pass	
Zinc	%	110			80-120	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1					
TRH C6-C9	S19-Ja24069	CP	%	103			70-130	Pass	
TRH C10-C14	M19-Ja23097	NCP	%	107			70-130	Pass	
Spike - % Recovery									
BTEX				Result 1					
Benzene	S19-Ja24069	CP	%	76			70-130	Pass	
Toluene	S19-Ja24069	CP	%	85			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Ethylbenzene	S19-Ja24069	CP	%	97			70-130	Pass	
m&p-Xylenes	S19-Ja24069	CP	%	99			70-130	Pass	
o-Xylene	S19-Ja24069	CP	%	100			70-130	Pass	
Xylenes - Total	S19-Ja24069	CP	%	99			70-130	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1					
Naphthalene	S19-Ja24069	CP	%	87			70-130	Pass	
TRH C6-C10	S19-Ja24069	CP	%	114			70-130	Pass	
TRH >C10-C16	M19-Ja23097	NCP	%	111			70-130	Pass	
Spike - % Recovery									
Organochlorine Pesticides				Result 1					
Chlordanes - Total	M19-Ja23929	NCP	%	115			70-130	Pass	
4.4'-DDD	M19-Ja23929	NCP	%	102			70-130	Pass	
4.4'-DDE	M19-Ja23929	NCP	%	123			70-130	Pass	
4.4'-DDT	M19-Ja23929	NCP	%	80			70-130	Pass	
a-BHC	M19-Ja23929	NCP	%	100			70-130	Pass	
Aldrin	M19-Ja23929	NCP	%	127			70-130	Pass	
b-BHC	M19-Ja23929	NCP	%	103			70-130	Pass	
d-BHC	M19-Ja23929	NCP	%	113			70-130	Pass	
Dieldrin	M19-Ja23929	NCP	%	103			70-130	Pass	
Endosulfan I	M19-Ja23929	NCP	%	87			70-130	Pass	
Endosulfan II	M19-Ja23929	NCP	%	97			70-130	Pass	
Endosulfan sulphate	M19-Ja23929	NCP	%	89			70-130	Pass	
Endrin	M19-Ja24635	NCP	%	103			70-130	Pass	
Endrin aldehyde	M19-Ja23929	NCP	%	82			70-130	Pass	
Endrin ketone	M19-Ja23929	NCP	%	101			70-130	Pass	
g-BHC (Lindane)	M19-Ja23929	NCP	%	130			70-130	Pass	
Heptachlor	M19-Ja23929	NCP	%	86			70-130	Pass	
Heptachlor epoxide	M19-Ja23929	NCP	%	94			70-130	Pass	
Hexachlorobenzene	M19-Ja23929	NCP	%	118			70-130	Pass	
Methoxychlor	M19-Ja24635	NCP	%	75			70-130	Pass	
Spike - % Recovery									
Polychlorinated Biphenyls				Result 1					
Aroclor-1016	M19-Ja24633	NCP	%	85			70-130	Pass	
Aroclor-1260	M19-Ja24633	NCP	%	104			70-130	Pass	
Spike - % Recovery									
Polycyclic Aromatic Hydrocarbons				Result 1					
Acenaphthene	S19-Ja24084	CP	%	103			70-130	Pass	
Acenaphthylene	S19-Ja24084	CP	%	94			70-130	Pass	
Anthracene	S19-Ja24084	CP	%	94			70-130	Pass	
Benz(a)anthracene	S19-Ja24084	CP	%	76			70-130	Pass	
Benzo(a)pyrene	S19-Ja24084	CP	%	104			70-130	Pass	
Benzo(b&j)fluoranthene	S19-Ja24084	CP	%	83			70-130	Pass	
Benzo(g.h.i)perylene	S19-Ja24084	CP	%	81			70-130	Pass	
Benzo(k)fluoranthene	S19-Ja24084	CP	%	107			70-130	Pass	
Chrysene	S19-Ja24084	CP	%	130			70-130	Pass	
Dibenz(a.h)anthracene	S19-Ja24084	CP	%	81			70-130	Pass	
Fluoranthene	S19-Ja24084	CP	%	74			70-130	Pass	
Fluorene	S19-Ja24084	CP	%	97			70-130	Pass	
Indeno(1.2.3-cd)pyrene	S19-Ja24084	CP	%	114			70-130	Pass	
Naphthalene	S19-Ja24084	CP	%	107			70-130	Pass	
Phenanthrene	S19-Ja24084	CP	%	89			70-130	Pass	
Pyrene	S19-Ja24084	CP	%	80			70-130	Pass	
Spike - % Recovery									

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Heavy Metals				Result 1					
Arsenic	S19-Ja24087	CP	%	106			75-125	Pass	
Cadmium	S19-Ja24087	CP	%	105			75-125	Pass	
Chromium	S19-Ja24087	CP	%	107			75-125	Pass	
Copper	S19-Ja24087	CP	%	110			75-125	Pass	
Lead	S19-Ja24087	CP	%	108			75-125	Pass	
Mercury	S19-Ja24087	CP	%	104			70-130	Pass	
Nickel	S19-Ja24087	CP	%	106			75-125	Pass	
Zinc	S19-Ja24087	CP	%	81			75-125	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1					
TRH C6-C9	S19-Ja24092	CP	%	72			70-130	Pass	
Spike - % Recovery									
BTEX				Result 1					
Benzene	S19-Ja24092	CP	%	49			70-130	Fail	Q08
Toluene	S19-Ja24092	CP	%	60			70-130	Fail	Q08
Ethylbenzene	S19-Ja24092	CP	%	79			70-130	Pass	
m&p-Xylenes	S19-Ja24092	CP	%	80			70-130	Pass	
o-Xylene	S19-Ja24092	CP	%	84			70-130	Pass	
Xylenes - Total	S19-Ja24092	CP	%	81			70-130	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1					
Naphthalene	S19-Ja24092	CP	%	86			70-130	Pass	
TRH C6-C10	S19-Ja24092	CP	%	79			70-130	Pass	
Spike - % Recovery									
Polycyclic Aromatic Hydrocarbons				Result 1					
Acenaphthene	S19-Ja24094	CP	%	93			70-130	Pass	
Acenaphthylene	S19-Ja24094	CP	%	92			70-130	Pass	
Anthracene	S19-Ja24094	CP	%	82			70-130	Pass	
Benz(a)anthracene	S19-Ja24094	CP	%	80			70-130	Pass	
Benzo(a)pyrene	S19-Ja24094	CP	%	120			70-130	Pass	
Benzo(b&j)fluoranthene	S19-Ja24094	CP	%	88			70-130	Pass	
Benzo(g.h.i)perylene	S19-Ja24094	CP	%	89			70-130	Pass	
Benzo(k)fluoranthene	S19-Ja24094	CP	%	101			70-130	Pass	
Chrysene	S19-Ja24094	CP	%	89			70-130	Pass	
Dibenz(a.h)anthracene	S19-Ja24094	CP	%	71			70-130	Pass	
Fluoranthene	S19-Ja24094	CP	%	104			70-130	Pass	
Fluorene	S19-Ja24094	CP	%	88			70-130	Pass	
Indeno(1.2.3-cd)pyrene	S19-Ja24094	CP	%	81			70-130	Pass	
Naphthalene	S19-Ja24094	CP	%	90			70-130	Pass	
Phenanthrene	S19-Ja24094	CP	%	77			70-130	Pass	
Pyrene	S19-Ja24094	CP	%	107			70-130	Pass	
Spike - % Recovery									
Polycyclic Aromatic Hydrocarbons				Result 1					
Acenaphthene	S19-Ja24095	CP	%	88			70-130	Pass	
Acenaphthylene	S19-Ja24095	CP	%	87			70-130	Pass	
Anthracene	S19-Ja24095	CP	%	79			70-130	Pass	
Benz(a)anthracene	S19-Ja24095	CP	%	84			70-130	Pass	
Benzo(a)pyrene	S19-Ja24095	CP	%	75			70-130	Pass	
Benzo(b&j)fluoranthene	S19-Ja24095	CP	%	101			70-130	Pass	
Benzo(g.h.i)perylene	S19-Ja24095	CP	%	78			70-130	Pass	
Benzo(k)fluoranthene	S19-Ja24095	CP	%	91			70-130	Pass	
Chrysene	S19-Ja24095	CP	%	90			70-130	Pass	
Dibenz(a.h)anthracene	S19-Ja24095	CP	%	92			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Fluoranthene	S19-Ja24095	CP	%	101			70-130	Pass	
Fluorene	S19-Ja24095	CP	%	79			70-130	Pass	
Indeno(1.2.3-cd)pyrene	S19-Ja24095	CP	%	97			70-130	Pass	
Naphthalene	S19-Ja24095	CP	%	82			70-130	Pass	
Phenanthrene	S19-Ja24095	CP	%	76			70-130	Pass	
Pyrene	S19-Ja24095	CP	%	108			70-130	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Duplicate									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1	Result 2	RPD			
TRH C6-C9	S19-Ja24069	CP	mg/kg	< 20	< 20	<1	30%	Pass	
TRH C10-C14	S19-Ja24069	CP	mg/kg	< 20	< 20	<1	30%	Pass	
TRH C15-C28	S19-Ja24069	CP	mg/kg	150	130	18	30%	Pass	
TRH C29-C36	S19-Ja24069	CP	mg/kg	110	94	14	30%	Pass	
Duplicate									
BTEX				Result 1	Result 2	RPD			
Benzene	S19-Ja24069	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Toluene	S19-Ja24069	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Ethylbenzene	S19-Ja24069	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
m&p-Xylenes	S19-Ja24069	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
o-Xylene	S19-Ja24069	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Xylenes - Total	S19-Ja24069	CP	mg/kg	< 0.3	< 0.3	<1	30%	Pass	
Duplicate									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1	Result 2	RPD			
Naphthalene	S19-Ja24069	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
TRH C6-C10	S19-Ja24069	CP	mg/kg	< 20	< 20	<1	30%	Pass	
TRH >C10-C16	S19-Ja24069	CP	mg/kg	< 50	< 50	<1	30%	Pass	
TRH >C16-C34	S19-Ja24069	CP	mg/kg	220	180	16	30%	Pass	
TRH >C34-C40	S19-Ja24069	CP	mg/kg	< 100	< 100	<1	30%	Pass	
Duplicate									
Polycyclic Aromatic Hydrocarbons				Result 1	Result 2	RPD			
Acenaphthene	S19-Ja24069	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Acenaphthylene	S19-Ja24069	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Anthracene	S19-Ja24069	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benz(a)anthracene	S19-Ja24069	CP	mg/kg	1.3	< 0.5	110	30%	Fail	Q15
Benzo(a)pyrene	S19-Ja24069	CP	mg/kg	1.0	< 0.5	100	30%	Fail	Q15
Benzo(b&j)fluoranthene	S19-Ja24069	CP	mg/kg	0.6	< 0.5	96	30%	Fail	Q15
Benzo(g.h.i)perylene	S19-Ja24069	CP	mg/kg	0.5	< 0.5	95	30%	Fail	Q15
Benzo(k)fluoranthene	S19-Ja24069	CP	mg/kg	0.8	< 0.5	91	30%	Fail	Q15
Chrysene	S19-Ja24069	CP	mg/kg	1.6	0.6	95	30%	Fail	Q15
Dibenz(a.h)anthracene	S19-Ja24069	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Fluoranthene	S19-Ja24069	CP	mg/kg	2.8	0.9	100	30%	Fail	Q15
Fluorene	S19-Ja24069	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Indeno(1.2.3-cd)pyrene	S19-Ja24069	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Naphthalene	S19-Ja24069	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Phenanthrene	S19-Ja24069	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Pyrene	S19-Ja24069	CP	mg/kg	3.1	1.0	110	30%	Fail	Q15
Duplicate									
Polycyclic Aromatic Hydrocarbons				Result 1	Result 2	RPD			
Acenaphthene	S19-Ja24073	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Acenaphthylene	S19-Ja24073	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Anthracene	S19-Ja24073	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benz(a)anthracene	S19-Ja24073	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(a)pyrene	S19-Ja24073	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(b&j)fluoranthene	S19-Ja24073	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	

Duplicate									
Polycyclic Aromatic Hydrocarbons				Result 1	Result 2	RPD			
Benzo(g.h.i)perylene	S19-Ja24073	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(k)fluoranthene	S19-Ja24073	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Chrysene	S19-Ja24073	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Dibenz(a.h)anthracene	S19-Ja24073	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Fluoranthene	S19-Ja24073	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Fluorene	S19-Ja24073	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Indeno(1.2.3-cd)pyrene	S19-Ja24073	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Naphthalene	S19-Ja24073	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Phenanthrene	S19-Ja24073	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Pyrene	S19-Ja24073	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Duplicate									
Polycyclic Aromatic Hydrocarbons				Result 1	Result 2	RPD			
Acenaphthene	S19-Ja24074	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Acenaphthylene	S19-Ja24074	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Anthracene	S19-Ja24074	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benz(a)anthracene	S19-Ja24074	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(a)pyrene	S19-Ja24074	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(b&j)fluoranthene	S19-Ja24074	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(g.h.i)perylene	S19-Ja24074	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(k)fluoranthene	S19-Ja24074	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Chrysene	S19-Ja24074	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Dibenz(a.h)anthracene	S19-Ja24074	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Fluoranthene	S19-Ja24074	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Fluorene	S19-Ja24074	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Indeno(1.2.3-cd)pyrene	S19-Ja24074	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Naphthalene	S19-Ja24074	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Phenanthrene	S19-Ja24074	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Pyrene	S19-Ja24074	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
% Moisture	S19-Ja24074	CP	%	19	18	4.0	30%	Pass	
Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Arsenic	S19-Ja24076	CP	mg/kg	6.3	6.8	8.0	30%	Pass	
Cadmium	S19-Ja24076	CP	mg/kg	< 0.4	< 0.4	<1	30%	Pass	
Chromium	S19-Ja24076	CP	mg/kg	15	24	47	30%	Fail	Q15
Copper	S19-Ja24076	CP	mg/kg	27	24	10	30%	Pass	
Lead	S19-Ja24076	CP	mg/kg	40	40	1.0	30%	Pass	
Mercury	S19-Ja24076	CP	mg/kg	0.5	0.4	22	30%	Pass	
Nickel	S19-Ja24076	CP	mg/kg	< 5	5.1	23	30%	Pass	
Zinc	S19-Ja24076	CP	mg/kg	100	85	16	30%	Pass	
Duplicate									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1	Result 2	RPD			
TRH C6-C9	S19-Ja24078	CP	mg/kg	< 20	< 20	<1	30%	Pass	
Duplicate									
BTEX				Result 1	Result 2	RPD			
Benzene	S19-Ja24078	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Toluene	S19-Ja24078	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Ethylbenzene	S19-Ja24078	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
m&p-Xylenes	S19-Ja24078	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
o-Xylene	S19-Ja24078	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Xylenes - Total	S19-Ja24078	CP	mg/kg	< 0.3	< 0.3	<1	30%	Pass	

Duplicate									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1	Result 2	RPD			
Naphthalene	S19-Ja24078	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
TRH C6-C10	S19-Ja24078	CP	mg/kg	< 20	< 20	<1	30%	Pass	
Duplicate									
Polycyclic Aromatic Hydrocarbons				Result 1	Result 2	RPD			
Acenaphthene	S19-Ja24084	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Acenaphthylene	S19-Ja24084	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Anthracene	S19-Ja24084	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benz(a)anthracene	S19-Ja24084	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(a)pyrene	S19-Ja24084	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(b&j)fluoranthene	S19-Ja24084	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(g.h.i)perylene	S19-Ja24084	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(k)fluoranthene	S19-Ja24084	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Chrysene	S19-Ja24084	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Dibenz(a.h)anthracene	S19-Ja24084	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Fluoranthene	S19-Ja24084	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Fluorene	S19-Ja24084	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Indeno(1.2.3-cd)pyrene	S19-Ja24084	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Naphthalene	S19-Ja24084	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Phenanthrene	S19-Ja24084	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Pyrene	S19-Ja24084	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Duplicate									
Organochlorine Pesticides				Result 1	Result 2	RPD			
Chlordanes - Total	S19-Ja24084	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
4.4'-DDD	S19-Ja24084	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
4.4'-DDE	S19-Ja24084	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
4.4'-DDT	S19-Ja24084	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
a-BHC	S19-Ja24084	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Aldrin	S19-Ja24084	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
b-BHC	S19-Ja24084	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
d-BHC	S19-Ja24084	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Dieldrin	S19-Ja24084	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endosulfan I	S19-Ja24084	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endosulfan II	S19-Ja24084	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endosulfan sulphate	S19-Ja24084	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endrin	S19-Ja24084	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endrin aldehyde	S19-Ja24084	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endrin ketone	S19-Ja24084	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
g-BHC (Lindane)	S19-Ja24084	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Heptachlor	S19-Ja24084	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Heptachlor epoxide	S19-Ja24084	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Hexachlorobenzene	S19-Ja24084	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Methoxychlor	S19-Ja24084	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
% Moisture	S19-Ja24084	CP	%	10	11	9.0	30%	Pass	
Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Arsenic	S19-Ja24086	CP	mg/kg	4.8	4.8	<1	30%	Pass	
Cadmium	S19-Ja24086	CP	mg/kg	< 0.4	< 0.4	<1	30%	Pass	
Chromium	S19-Ja24086	CP	mg/kg	47	42	12	30%	Pass	
Copper	S19-Ja24086	CP	mg/kg	17	15	7.0	30%	Pass	
Lead	S19-Ja24086	CP	mg/kg	29	27	10	30%	Pass	
Mercury	S19-Ja24086	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Nickel	S19-Ja24086	CP	mg/kg	41	34	17	30%	Pass	
Zinc	S19-Ja24086	CP	mg/kg	52	57	9.0	30%	Pass	

Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Arsenic	S19-Ja24087	CP	mg/kg	2.1	2.1	1.0	30%	Pass	
Cadmium	S19-Ja24087	CP	mg/kg	< 0.4	< 0.4	<1	30%	Pass	
Chromium	S19-Ja24087	CP	mg/kg	12	12	2.0	30%	Pass	
Copper	S19-Ja24087	CP	mg/kg	10	11	2.0	30%	Pass	
Lead	S19-Ja24087	CP	mg/kg	14	14	1.0	30%	Pass	
Mercury	S19-Ja24087	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Nickel	S19-Ja24087	CP	mg/kg	11	11	2.0	30%	Pass	
Zinc	S19-Ja24087	CP	mg/kg	49	49	1.0	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
% Moisture	S19-Ja24094	CP	%	27	27	<1	30%	Pass	
Duplicate									
Polycyclic Aromatic Hydrocarbons				Result 1	Result 2	RPD			
Acenaphthene	S19-Ja24097	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Acenaphthylene	S19-Ja24097	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Anthracene	S19-Ja24097	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benz(a)anthracene	S19-Ja24097	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(a)pyrene	S19-Ja24097	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(b&j)fluoranthene	S19-Ja24097	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(g.h.i)perylene	S19-Ja24097	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(k)fluoranthene	S19-Ja24097	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Chrysene	S19-Ja24097	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Dibenz(a.h)anthracene	S19-Ja24097	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Fluoranthene	S19-Ja24097	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Fluorene	S19-Ja24097	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Indeno(1.2.3-cd)pyrene	S19-Ja24097	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Naphthalene	S19-Ja24097	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Phenanthrene	S19-Ja24097	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Pyrene	S19-Ja24097	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Duplicate									
Organochlorine Pesticides				Result 1	Result 2	RPD			
Chlordanes - Total	S19-Ja24097	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
4.4'-DDD	S19-Ja24097	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
4.4'-DDE	S19-Ja24097	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
4.4'-DDT	S19-Ja24097	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
a-BHC	S19-Ja24097	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Aldrin	S19-Ja24097	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
b-BHC	S19-Ja24097	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
d-BHC	S19-Ja24097	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Dieldrin	S19-Ja24097	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endosulfan I	S19-Ja24097	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endosulfan II	S19-Ja24097	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endosulfan sulphate	S19-Ja24097	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endrin	S19-Ja24097	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endrin aldehyde	S19-Ja24097	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endrin ketone	S19-Ja24097	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
g-BHC (Lindane)	S19-Ja24097	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Heptachlor	S19-Ja24097	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Heptachlor epoxide	S19-Ja24097	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Hexachlorobenzene	S19-Ja24097	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Methoxychlor	S19-Ja24097	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	

Comments

Sample Integrity

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

Qualifier Codes/Comments

Code	Description
G01	The LORs have been raised due to matrix interference
N01	F2 is determined by arithmetically subtracting the "naphthalene" value from the ">C10-C16" value. The naphthalene value used in this calculation is obtained from volatiles (Purge & Trap analysis).
N02	Where we have reported both volatile (P&T GCMS) and semivolatile (GCMS) naphthalene data, results may not be identical. Provided correct sample handling protocols have been followed, any observed differences in results are likely to be due to procedural differences within each methodology. Results determined by both techniques have passed all QAQC acceptance criteria, and are entirely technically valid.
N04	F1 is determined by arithmetically subtracting the "Total BTEX" value from the "C6-C10" value. The "Total BTEX" value is obtained by summing the concentrations of BTEX analytes. The "C6-C10" value is obtained by quantitating against a standard of mixed aromatic/aliphatic analytes.
N07	Please note:- These two PAH isomers closely co-elute using the most contemporary analytical methods and both the reported concentration (and the TEQ) apply specifically to the total of the two co-eluting PAHs
Q08	The matrix spike recovery is outside of the recommended acceptance criteria. An acceptable recovery was obtained for the laboratory control sample indicating a sample matrix interference
Q15	The RPD reported passes Eurofins | mgt's QC - Acceptance Criteria as defined in the Internal Quality Control Review and Glossary page of this report.

Authorised By

Nibha Vaidya	Analytical Services Manager
Joseph Edouard	Senior Analyst-Organic (VIC)
Harry Bacalis	Senior Analyst-Volatile (VIC)
Nibha Vaidya	Senior Analyst-Asbestos (NSW)
Emily Rosenberg	Senior Analyst-Metal (VIC)

Glenn Jackson
General Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

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

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

Enviro Sample Vic

From: Alena Bounkeua
Sent: Wednesday, 6 February 2019 4:34 PM
To: Enviro Sample Vic
Cc: Enviro Sample NSW; Nibha Vaidya
Subject: *1 DAY TAT ADDITIONAL* Report 637804 : Site CHATSWOOD EDUCATION PRECINCT HIGH SCHOOL (55579)
Attachments: image001.png; image002.jpg

6/2/14 4:34pm
L.F 639203

Hi Melbourne,

Additional analysis please – 1 day TAT.

Please let Sydney know once logged so we can label up the asbestos sample.

Thanks!

Kind Regards,

Alena Bounkeua
Eurofins | mgt
Phone: (02) 9900 8414
Email: AlenaBounkeua@eurofins.com

From: Rachel Gray
Sent: Wednesday, 6 February 2019 4:15:29 PM (UTC+10:00) Canberra, Melbourne, Sydney
To: Nibha Vaidya
Cc: Daniel Denaro; Milad Noujaim; Ruby Chapman
Subject: RE: Eurofins | mgt Test Results - Report 637804 : Site CHATSWOOD EDUCATION PRECINCT HIGH SCHOOL (55579)

EXTERNAL EMAIL*

Hi Nibha,

Can you please arrange analysis for sample BH10 0-0.15 to be analysed for the following on 24 hr turn-around time?

- Asbestos (WA Guidelines)
- PAHs
- Metals

D.S 21/01

Ja24121 - HOLD 1285

Thanks heaps,
Rachel

Rachel Gray | Environmental Consultant | JBS&G
Sydney | Melbourne | Adelaide | Perth | Brisbane | Canberra | Darwin | Wollongong
Level 1, 50 Margaret Street Sydney NSW 2000
T: 02 8245 0300 | M: 0435 442 131| E: rgray@jbsg.com.au | W: www.jbsg.com.au
Contaminated Land | Groundwater Remediation | Environmental Approvals | Auditing and Compliance | Hygiene and Hazardous Materials | Due Diligence and Liability | Stakeholder and Risk Management

Certificate of Analysis

NATA Accredited
Accreditation Number 1261
Site Number 1254

Accredited for compliance with ISO/IEC 17025–Testing
The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

JBS & G Australia (NSW) P/L
Level 1, 50 Margaret St
Sydney
NSW 2000

Attention:	Daniel Denaro
Report	639203-AID
Project Name	CHATSWOOD EDUCATION PRECINCT HIGH SCHOOL
Project ID	55579
Received Date	Feb 06, 2019
Date Reported	Feb 07, 2019

Methodology:

Asbestos Fibre Identification	Conducted in accordance with the Australian Standard AS 4964 – 2004: Method for the Qualitative Identification of Asbestos in Bulk Samples and in-house Method LTM-ASB-8020 by polarised light microscopy (PLM) and dispersion staining (DS) techniques. *NOTE: Positive Trace Analysis results indicate the sample contains detectable respirable fibres.*
Unknown Mineral Fibres	Mineral fibres of unknown type, as determined by PLM with DS, may require another analytical technique, such as Electron Microscopy, to confirm unequivocal identity. *NOTE: While Actinolite, Anthophyllite and Tremolite asbestos may be detected by PLM with DS, due to variability in the optical properties of these materials, AS4964 requires that these are reported as UMF unless confirmed by an independent technique.*
Subsampling Soil Samples	The whole sample submitted is first dried and then passed through a 10mm sieve followed by a 2mm sieve. All fibrous matter greater than 10mm, greater than 2mm as well as the material passing through the 2mm sieve are retained and analysed for the presence of asbestos. If the sub 2mm fraction is greater than approximately 30 to 60g then a sub-sampling routine based on ISO 3082:2009(E) is employed. *NOTE: Depending on the nature and size of the soil sample, the sub-2 mm residue material may need to be sub-sampled for trace analysis, in accordance with AS 4964-2004.*
Bonded asbestos-containing material (ACM)	The material is first examined and any fibres isolated for identification by PLM and DS. Where required, interfering matrices may be removed by disintegration using a range of heat, chemical or physical treatments, possibly in combination.The resultant material is then further examined in accordance with AS 4964 - 2004. *NOTE: Even after disintegration it may be difficult to detect the presence of asbestos in some asbestos-containing bulk materials using PLM and DS. This is due to the low grade or small length or diameter of the asbestos fibres present in the material, or to the fact that very fine fibres have been distributed intimately throughout the materials. Vinyl/asbestos floor tiles, some asbestos-containing sealants and mastics, asbestos-containing epoxy resins and some ore samples are examples of these types of material, which are difficult to analyse.*
Limit of Reporting	The performance limitation of the AS 4964 (2004) method for non-homogeneous samples is around 0.1 g/kg (equivalent to 0.01% (w/w)). Where no asbestos is found by PLM and DS, including Trace Analysis, this is considered to be at the nominal reporting limit of 0.01% (w/w). The NEPM screening level of 0.001% (w/w) is intended as an on-site determination, not a laboratory Limit of Reporting (LOR), per se. Examination of a large sample size (e.g. 500 mL) may improve the likelihood of detecting asbestos, particularly AF, to aid assessment against the NEPM criteria. Gravimetric determinations to this level of accuracy are outside of AS 4964 and hence NATA Accreditation does not cover the performance of this service (non-NATA results shown with an asterisk). *NOTE: NATA News March 2014, p.7, states in relation to AS 4964: "This is a qualitative method with a nominal reporting limit of 0.01 % " and that currently in Australia "there is no validated method available for the quantification of asbestos".This report is consistent with the analytical procedures and reporting recommendations in the NEPM and the WA DoH.*

Project Name	CHATSWOOD EDUCATION PRECINCT HIGH SCHOOL
Project ID	55579
Date Sampled	Jan 21, 2019
Report	639203-AID

Client Sample ID	Eurofins | mgt Sample No.	Date Sampled	Sample Description	Result
BH10_0.05-0.15	19-Fe06584	Jan 21, 2019	Approximate Sample 894g Sample consisted of: Brown coarse-grained soil, rocks and fragments of bitumin	FA: Chrysotile and amosite asbestos detected in weathered fibre cement fragments. Approximate raw weight of FA = 0.0046g Estimated asbestos content in FA = 0.0025g* Total estimated asbestos concentration in FA = 0.00028% w/w* No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No respirable fibres detected.

Sample History

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

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

Description	Testing Site	Extracted	Holding Time
Asbestos - LTM-ASB-8020	Sydney	Feb 06, 2019	Indefinite

Company Name: JBS & G Australia (NSW) P/L
Address: Level 1, 50 Margaret St
Sydney
NSW 2000

Order No.:
Report #: 639203
Phone: 02 8245 0300
Fax:

Received: Feb 6, 2019 4:34 PM
Due: Feb 7, 2019
Priority: 1 Day
Contact Name: Daniel Denaro

Project Name: CHATSWOOD EDUCATION PRECINCT HIGH SCHOOL
Project ID: 55579

Eurofins | mgt Analytical Services Manager : Nibha Vaidya

Sample Detail						Asbestos - WA guidelines	Polycyclic Aromatic Hydrocarbons	Metals IWRG 621 : Metals M12	Moisture Set
Melbourne Laboratory - NATA Site # 1254 & 14271							X	X	X
Sydney Laboratory - NATA Site # 18217						X			
Brisbane Laboratory - NATA Site # 20794									
Perth Laboratory - NATA Site # 23736									
External Laboratory									
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**				
1	BH10_0.05-0.15	Jan 21, 2019		Soil	M19-Fe06584	X	X	X	X
Test Counts						1	1	1	1

Internal Quality Control Review and Glossary

General

1. QC data may be available on request.
2. All soil results are reported on a dry basis, unless otherwise stated.
3. Samples were analysed on an 'as received' basis.
4. This report replaces any interim results previously issued.

Holding Times

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

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

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

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

Units

% w/w: weight for weight basis	grams per kilogram
Filter loading:	fibres/100 graticule areas
Reported Concentration:	fibres/mL
Flowrate:	L/min

Terms

Dry	Sample is dried by heating prior to analysis
LOR	Limit of Reporting
COC	Chain of Custody
SRA	Sample Receipt Advice
ISO	International Standards Organisation
AS	Australian Standards
WA DOH	Reference document for the NEPM. Government of Western Australia, Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia (2009), including supporting document Recommended Procedures for Laboratory Analysis of Asbestos in Soil (2011)
NEPM	National Environment Protection (Assessment of Site Contamination) Measure, 2013 (as amended)
ACM	Asbestos Containing Materials. Asbestos contained within a non-asbestos matrix, typically presented in bonded and/or sound condition. For the purposes of the NEPM, ACM is generally restricted to those materials that do not pass a 7mm x 7mm sieve.
AF	Asbestos Fines. Asbestos containing materials, including friable, weathered and bonded materials, able to pass a 7mm x 7mm sieve. Considered under the NEPM as equivalent to “non-bonded / friable”.
FA	Fibrous Asbestos. Asbestos containing materials in a friable and/or severely weathered condition. For the purposes of the NEPM, FA is generally restricted to those materials that do not pass a 7mm x 7mm sieve.
Friable	Asbestos-containing materials of any size that may be broken or crumbled by hand pressure. For the purposes of the NEPM, this includes both AF and FA. It is outside of the laboratory’s remit to assess degree of friability.
Trace Analysis	Analytical procedure used to detect the presence of respirable fibres in the matrix.

Comments

Sample Integrity

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

Qualifier Codes/Comments

Code	Description
N/A	Not applicable

Asbestos Counter/Identifier:

Laxman Dias	Senior Analyst-Asbestos (NSW)

Authorised by:

Sayeed Abu	Senior Analyst-Asbestos (NSW)

Glenn Jackson
General Manager

Final Report – this report replaces any previously issued Report

- Indicates Not Requested
* Indicates NATA accreditation does not cover the performance of this service
Measurement uncertainty of test data is available on request or please click here.

Certificate of Analysis

JBS & G Australia (NSW) P/L
Level 1, 50 Margaret St
Sydney
NSW 2000

NATA Accredited
Accreditation Number 1261
Site Number 1254

Accredited for compliance with ISO/IEC 17025 – Testing
The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

WORLD RECOGNISED ACCREDITATION

Attention: **Daniel Denaro**

Report **639203-S**
Project name CHATSWOOD EDUCATION PRECINCT HIGH SCHOOL
Project ID 55579
Received Date Feb 06, 2019

Client Sample ID			**BH10_0.05-0.15**
Sample Matrix			**Soil**
Eurofins | mgt Sample No.			**M19-Fe06584**
Date Sampled			**Jan 21, 2019**
Test/Reference	LOR	Unit	
Polycyclic Aromatic Hydrocarbons			
Benzo(a)pyrene TEQ (lower bound) *	0.5	mg/kg	< 0.5
Benzo(a)pyrene TEQ (medium bound) *	0.5	mg/kg	0.6
Benzo(a)pyrene TEQ (upper bound) *	0.5	mg/kg	1.2
Acenaphthene	0.5	mg/kg	< 0.5
Acenaphthylene	0.5	mg/kg	< 0.5
Anthracene	0.5	mg/kg	< 0.5
Benz(a)anthracene	0.5	mg/kg	< 0.5
Benzo(a)pyrene	0.5	mg/kg	< 0.5
Benzo(b&j)fluoranthene^{N07}	0.5	mg/kg	< 0.5
Benzo(g.h.i)perylene	0.5	mg/kg	< 0.5
Benzo(k)fluoranthene	0.5	mg/kg	< 0.5
Chrysene	0.5	mg/kg	< 0.5
Dibenz(a.h)anthracene	0.5	mg/kg	< 0.5
Fluoranthene	0.5	mg/kg	< 0.5
Fluorene	0.5	mg/kg	< 0.5
Indeno(1.2.3-cd)pyrene	0.5	mg/kg	< 0.5
Naphthalene	0.5	mg/kg	< 0.5
Phenanthrene	0.5	mg/kg	< 0.5
Pyrene	0.5	mg/kg	< 0.5
Total PAH*	0.5	mg/kg	< 0.5
2-Fluorobiphenyl (surr.)	1	%	101
p-Terphenyl-d14 (surr.)	1	%	120
Heavy Metals			
Arsenic	2	mg/kg	7.3
Cadmium	0.4	mg/kg	< 0.4
Chromium	5	mg/kg	10
Copper	5	mg/kg	19
Lead	5	mg/kg	23
Mercury	0.1	mg/kg	< 0.1
Molybdenum	5	mg/kg	< 5
Nickel	5	mg/kg	12
Selenium	2	mg/kg	< 2
Silver	0.2	mg/kg	< 0.2
Tin	10	mg/kg	< 10
Zinc	5	mg/kg	200

Client Sample ID			**BH10_0.05-0.15**
Sample Matrix			**Soil**
Eurofins | mgt Sample No.			**M19-Fe06584**
Date Sampled			**Jan 21, 2019**
Test/Reference	LOR	Unit	
% Moisture	1	%	15

Sample History

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

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

Description	Testing Site	Extracted	Holding Time
Polycyclic Aromatic Hydrocarbons	Melbourne	Feb 06, 2019	14 Day
- Method: LTM-ORG-2130 PAH and Phenols in Soil and Water			
Metals IWRG 621 : Metals M12	Melbourne	Feb 06, 2019	28 Day
- Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS			
% Moisture	Melbourne	Feb 06, 2019	14 Day
- Method: LTM-GEN-7080 Moisture			

Company Name: JBS & G Australia (NSW) P/L
Address: Level 1, 50 Margaret St
Sydney
NSW 2000

Project Name: CHATSWOOD EDUCATION PRECINCT HIGH SCHOOL
Project ID: 55579

Order No.:
Report #: 639203
Phone: 02 8245 0300
Fax:

Received: Feb 6, 2019 4:34 PM
Due: Feb 7, 2019
Priority: 1 Day
Contact Name: Daniel Denaro

Eurofins | mgt Analytical Services Manager : Nibha Vaidya

Sample Detail						Asbestos - WA guidelines	Polycyclic Aromatic Hydrocarbons	Metals IWRG 621 : Metals M12	Moisture Set
Melbourne Laboratory - NATA Site # 1254 & 14271							X	X	X
Sydney Laboratory - NATA Site # 18217						X			
Brisbane Laboratory - NATA Site # 20794									
Perth Laboratory - NATA Site # 23736									
External Laboratory									
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**				
1	BH10_0.05-0.15	Jan 21, 2019		Soil	M19-Fe06584	X	X	X	X
Test Counts						1	1	1	1

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure, April 2011 and are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. This report replaces any interim results previously issued.

Holding Times

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

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

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

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

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

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

Units

mg/kg: milligrams per kilogram	**mg/L:** milligrams per litre	**ug/L:** micrograms per litre
ppm: Parts per million	**ppb:** Parts per billion	**%:** Percentage
org/100mL: Organisms per 100 millilitres	**NTU:** Nephelometric Turbidity Units	**MPN/100mL:** Most Probable Number of organisms per 100 millilitres

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery.
CRM	Certified Reference Material - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
QSM	US Department of Defense Quality Systems Manual Version 5.2 2018
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

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

Results <10 times the LOR : No Limit

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

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

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

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.2 where no positive PFAS results have been reported have been reviewed and no data was affected.

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

QC Data General Comments

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

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Polycyclic Aromatic Hydrocarbons							
Acenaphthene	mg/kg	< 0.5			0.5	Pass	
Acenaphthylene	mg/kg	< 0.5			0.5	Pass	
Anthracene	mg/kg	< 0.5			0.5	Pass	
Benz(a)anthracene	mg/kg	< 0.5			0.5	Pass	
Benzo(a)pyrene	mg/kg	< 0.5			0.5	Pass	
Benzo(b&j)fluoranthene	mg/kg	< 0.5			0.5	Pass	
Benzo(g.h.i)perylene	mg/kg	< 0.5			0.5	Pass	
Benzo(k)fluoranthene	mg/kg	< 0.5			0.5	Pass	
Chrysene	mg/kg	< 0.5			0.5	Pass	
Dibenz(a.h)anthracene	mg/kg	< 0.5			0.5	Pass	
Fluoranthene	mg/kg	< 0.5			0.5	Pass	
Fluorene	mg/kg	< 0.5			0.5	Pass	
Indeno(1.2.3-cd)pyrene	mg/kg	< 0.5			0.5	Pass	
Naphthalene	mg/kg	< 0.5			0.5	Pass	
Phenanthrene	mg/kg	< 0.5			0.5	Pass	
Pyrene	mg/kg	< 0.5			0.5	Pass	
Method Blank							
Heavy Metals							
Arsenic	mg/kg	< 2			2	Pass	
Cadmium	mg/kg	< 0.4			0.4	Pass	
Chromium	mg/kg	< 5			5	Pass	
Copper	mg/kg	< 5			5	Pass	
Lead	mg/kg	< 5			5	Pass	
Mercury	mg/kg	< 0.1			0.1	Pass	
Molybdenum	mg/kg	< 5			5	Pass	
Nickel	mg/kg	< 5			5	Pass	
Selenium	mg/kg	< 2			2	Pass	
Silver	mg/kg	< 0.2			0.2	Pass	
Tin	mg/kg	< 10			10	Pass	
Zinc	mg/kg	< 5			5	Pass	
LCS - % Recovery							
Polycyclic Aromatic Hydrocarbons							
Acenaphthene	%	77			70-130	Pass	
Acenaphthylene	%	82			70-130	Pass	
Anthracene	%	80			70-130	Pass	
Benz(a)anthracene	%	72			70-130	Pass	
Benzo(a)pyrene	%	94			70-130	Pass	
Benzo(b&j)fluoranthene	%	80			70-130	Pass	
Benzo(g.h.i)perylene	%	86			70-130	Pass	
Benzo(k)fluoranthene	%	100			70-130	Pass	
Chrysene	%	71			70-130	Pass	
Dibenz(a.h)anthracene	%	77			70-130	Pass	
Fluoranthene	%	81			70-130	Pass	
Fluorene	%	83			70-130	Pass	
Indeno(1.2.3-cd)pyrene	%	80			70-130	Pass	
Naphthalene	%	77			70-130	Pass	
Phenanthrene	%	70			70-130	Pass	
Pyrene	%	75			70-130	Pass	
LCS - % Recovery							
Heavy Metals							

Test			Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Arsenic			%	87			80-120	Pass	
Cadmium			%	109			80-120	Pass	
Chromium			%	94			80-120	Pass	
Copper			%	89			80-120	Pass	
Lead			%	90			80-120	Pass	
Mercury			%	105			75-125	Pass	
Molybdenum			%	95			80-120	Pass	
Nickel			%	87			80-120	Pass	
Selenium			%	85			80-120	Pass	
Silver			%	114			80-120	Pass	
Tin			%	96			80-120	Pass	
Zinc			%	87			80-120	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Spike - % Recovery									
Polycyclic Aromatic Hydrocarbons				Result 1					
Acenaphthene	M19-Fe04977	NCP	%	90			70-130	Pass	
Acenaphthylene	M19-Fe04977	NCP	%	94			70-130	Pass	
Anthracene	M19-Fe04977	NCP	%	90			70-130	Pass	
Benz(a)anthracene	M19-Fe04977	NCP	%	82			70-130	Pass	
Benzo(a)pyrene	M19-Fe04977	NCP	%	117			70-130	Pass	
Benzo(b&j)fluoranthene	M19-Fe04977	NCP	%	118			70-130	Pass	
Benzo(g.h.i)perylene	M19-Fe04977	NCP	%	97			70-130	Pass	
Benzo(k)fluoranthene	M19-Fe04977	NCP	%	103			70-130	Pass	
Chrysene	M19-Fe04977	NCP	%	76			70-130	Pass	
Dibenz(a.h)anthracene	M19-Fe04977	NCP	%	98			70-130	Pass	
Fluoranthene	M19-Fe04977	NCP	%	92			70-130	Pass	
Fluorene	M19-Fe04977	NCP	%	88			70-130	Pass	
Indeno(1.2.3-cd)pyrene	M19-Fe04977	NCP	%	88			70-130	Pass	
Naphthalene	M19-Fe04977	NCP	%	76			70-130	Pass	
Phenanthrene	M19-Fe04977	NCP	%	82			70-130	Pass	
Pyrene	M19-Fe04977	NCP	%	91			70-130	Pass	
Spike - % Recovery									
Heavy Metals				Result 1					
Arsenic	M19-Fe05022	NCP	%	64			75-125	Fail	Q08
Cadmium	M19-Fe05022	NCP	%	85			75-125	Pass	
Chromium	M19-Fe05022	NCP	%	103			75-125	Pass	
Copper	M19-Fe05022	NCP	%	87			75-125	Pass	
Lead	M19-Fe05022	NCP	%	80			75-125	Pass	
Mercury	M19-Fe05022	NCP	%	81			70-130	Pass	
Molybdenum	M19-Fe05022	NCP	%	86			75-125	Pass	
Nickel	M19-Fe05022	NCP	%	96			75-125	Pass	
Selenium	M19-Fe05022	NCP	%	65			75-125	Fail	Q08
Silver	M19-Fe05022	NCP	%	91			75-125	Pass	
Tin	M19-Fe05022	NCP	%	88			75-125	Pass	
Zinc	M19-Fe05022	NCP	%	90			75-125	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Duplicate									
Polycyclic Aromatic Hydrocarbons				Result 1	Result 2	RPD			
Acenaphthene	M19-Fe04976	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Acenaphthylene	M19-Fe04976	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Anthracene	M19-Fe04976	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benz(a)anthracene	M19-Fe04976	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(a)pyrene	M19-Fe04976	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
Polycyclic Aromatic Hydrocarbons				Result 1	Result 2	RPD			
Benzo(b&j)fluoranthene	M19-Fe04976	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(g.h.i)perylene	M19-Fe04976	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(k)fluoranthene	M19-Fe04976	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Chrysene	M19-Fe04976	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Dibenz(a.h)anthracene	M19-Fe04976	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Fluoranthene	M19-Fe04976	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Fluorene	M19-Fe04976	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Indeno(1.2.3-cd)pyrene	M19-Fe04976	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Naphthalene	M19-Fe04976	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Phenanthrene	M19-Fe04976	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Pyrene	M19-Fe04976	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Arsenic	M19-Fe05022	NCP	mg/kg	< 2	< 2	<1	30%	Pass	
Cadmium	M19-Fe05022	NCP	mg/kg	< 0.4	< 0.4	<1	30%	Pass	
Chromium	M19-Fe05022	NCP	mg/kg	45	44	1.0	30%	Pass	
Copper	M19-Fe05022	NCP	mg/kg	13	12	1.0	30%	Pass	
Lead	M19-Fe05022	NCP	mg/kg	9.0	9.0	<1	30%	Pass	
Mercury	M19-Fe05022	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Molybdenum	M19-Fe05022	NCP	mg/kg	< 5	< 5	<1	30%	Pass	
Nickel	M19-Fe05022	NCP	mg/kg	38	37	2.0	30%	Pass	
Selenium	M19-Fe05022	NCP	mg/kg	< 2	< 2	<1	30%	Pass	
Silver	M19-Fe05022	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Tin	M19-Fe05022	NCP	mg/kg	< 10	< 10	<1	30%	Pass	
Zinc	M19-Fe05022	NCP	mg/kg	26	26	1.0	30%	Pass	

Comments

Sample Integrity

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

Qualifier Codes/Comments

Code	Description
N07	Please note:- These two PAH isomers closely co-elute using the most contemporary analytical methods and both the reported concentration (and the TEQ) apply specifically to the total of the two co-eluting PAHs
Q08	The matrix spike recovery is outside of the recommended acceptance criteria. An acceptable recovery was obtained for the laboratory control sample indicating a sample matrix interference

Authorised By

Nibha Vaidya	Analytical Services Manager
Emily Rosenberg	Senior Analyst-Metal (VIC)
Joseph Edouard	Senior Analyst-Organic (VIC)
Nibha Vaidya	Senior Analyst-Asbestos (NSW)

Glenn Jackson
General Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

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

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

Document Distribution

Rev No.	Copies	Recipient	Date
A	1 x electronic	Yun Bai (PSM)	01/03/2019

Document Status

Rev No.	Author	Reviewer	Approved for Issue		
		Name	Name	Signature	Date
A	Rachel Gray/ Daniel Denaro	Daniel Denaro	Matthew Bennett	DRAFT for client review	01/03/2019

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Appendix F2
Chatswood Public School

Chatswood Public School
Chatswood Education Precinct

Detailed Site Investigation

5 Centennial Avenue,
Chatswood NSW

28 October 2019

55579- 125420 (Rev B)

JBS&G Australia Pty Ltd

www.jbsg.com.au

Chatswood Public School
Chatswood Education Precinct

Detailed Site Investigation

5 Centennial Avenue,
Chatswood NSW

28 October 2019

55579- 125420 (Rev B)

JBS&G Australia Pty Ltd

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Appendices

Abbreviations

Term	Definition
ACM	Asbestos Containing Materials
AEC	Areas of Environmental Concern
AHD	Australian Height Datum
ASRIS	Australian Soil Resource Information System
ASS	Acid Sulfate Soils
BTEXN	Benzene, Toluene, Ethylbenzene, Xylenes and Naphthalene
CLM	Contaminated Land Management
COC	Chain of Custody
COPC	Contaminants of Potential Concern
CSM	Conceptual Site Model
DBYD	Dial Before You Dig
DO	Dissolved Oxygen
DP	Development Plan
DQI	Data Quality Indicators
DQO	Data Quality Objectives
DSI	Detailed Site Investigation
EIL	Ecological Investigation Levels
EPA	NSW Environmental Protection Authority
ESA	Environmental Site Assessment
ESLs	Ecological Screening Levels
Ha	Hectare
HILs	Health Investigation Levels
HSLs	Health Screening Levels
JBS&G	JBS&G Australia Pty Ltd
JRA	Job Risk Assessment
LEP	Local Environment Plan
LOR	Limit of Reporting
NATA	National Accreditation Testing Authority
OCP	Organochlorine Pesticides
OPP	Organophosphate Pesticides
PAH	Polycyclic Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyls
PID	Photoionisation Detector
POEO Act	Protection of Environment Operations Act
PSI	Preliminary Site Investigation
QA/QC	Quality Assurance/Quality Control
RPD	Relative Percentage Difference
SAQP	Sampling Analytical and Quality Plan
SWMS	Safe Work Method Statement
TRH	Total Recoverable Hydrocarbons
UCL	Upper Confidence Limit
VOC	Volatile Organic Compounds

Executive Summary

JBS&G Australia Pty Ltd (JBS&G) was engaged by Pells Sullivan Meynink (PSM, the client), on behalf of Johnstaff, to complete a Detailed Site Investigation (DSI) for the Chatswood Public School site, located at 5 Centennial Avenue, Chatswood, NSW (the site). The site is legally identified as Lot 1 in DP 812207 and Lot C in DP 346499. The site covers an area of approximately 1.4 ha. The site location and site layout are shown in **Figures 1** and **2**, respectively.

The site, along with Chatswood High School, forms the broader Chatswood Education Precinct. The Chatswood Education Precinct forms part of the NSW Government's investment in primary and secondary education to meet the increasing demand for educational facilities. It is understood by JBS&G that the site (current Chatswood Public School) will be repurposed for use as a senior campus for years 10 to 12.

In order to facilitate the further design and planning approvals for redevelopment works, Detailed Site Investigations (DSI) are required to be completed across the Chatswood Education Precinct to assess the suitability of the site for future use as an educational facility. The report documented herein relates to the current Chatswood Public School site and will assess site suitability, as required pursuant to the Planning Secretary's Environmental Assessment Requirements (SEARs) for the State Significant Development (SSD) application number SSD 9483, specifically relating to SEARs Key Issue 13 Contamination, being, to:

- Assess and quantify any soil and groundwater contamination and demonstrate that the site is suitable for the proposed use in accordance with SEPP 55.

The objectives of this DSI are to characterise potential contamination at the site, and to draw conclusions regarding the suitability of the site for the proposed land use, or, to make recommendations to enable such conclusions.

The review of the site's history indicated that the site was historically utilised as an orchard prior to the primary school's construction in 1895. The school has been subject to progressive renovations and additions of new structures since the 1890s.

Data utilised for the assessment of site suitability as documented herein were collected on the 23, 24 January, and 10, 11 October 2019. For a site of approximately 1.4 ha, Table A of NSW EPA (1995) recommend a minimum of 21 to 25 soil sampling locations. Previous investigations included sampling at 13 locations. As such, JBS&G undertook a comprehensive soil investigation at the site which involved the advancement of 16 boreholes utilising a combination of judgemental and systematic sampling regimes. The sample locations advanced by JBS&G were in addition to the 13 previously advanced during DP (2018).

All locations identified fill materials between the ground surface (or below hardstand) to a maximum depth of 1.2 m bgs. Fill materials generally comprised of brown silty sands and silty clays with gravels. Fill materials were noted to contain anthropogenic inclusions including asphalt, brick, shales and plastic. Inspection of fill materials did not identify fragments of suspected asbestos containing materials. Natural material underlying the site comprised of brown/grey clay and silty clay overlying shale bedrock.

The results of the analytical data indicate that there are potentially unacceptable risks to human and ecological health at several locations resulting from PAHs, heavy metals and TRH. However, JBS&G note that the likely source of these materials is attributed to bitumen and blue metal gravels identified in the fill profile. JBS&G did not identify any risks relating to the migration of contamination from the site.

In relation to the current use of the site as a primary school, noting that the school is currently covered by hardstand and is expected to operate in a condition similar to those observed during the investigation at the site, JBS&G do not consider there to be a complete contamination source-receptor pathway that would present a potentially unacceptable risk to current users of the site. As such, JBS&G consider the site is suitable for the current use. In the event that excavation works are required prior to redevelopment of the school, JBS&G recommend the development of a Construction Environmental Management Plan (CEMP), or similar, to ensure that the current site configuration that enables the site to be considered suitable under the current site uses, are maintained.

Based on the identified contamination, JBS&G recommend the development of a RAP to guide the required management of identified soil contamination during and following redevelopment such that the site can be considered suitable for the proposed educational land use.

1. Introduction

1.1 Background

JBS&G Australia Pty Ltd (JBS&G) was engaged by Pells Sullivan Meynink (PSM, the client), on behalf of Johnstaff, to complete a Detailed Site Investigation (DSI) for the Chatswood Public School site, located at 5 Centennial Avenue, Chatswood, NSW (the site). The site is legally identified as Lot 1 in DP 812207 and Lot C in DP 346499. The site covers an area of approximately 1.4 ha. The site location and site layout are shown in **Figures 1** and **2**, respectively.

The site, along with Chatswood High School, forms the broader Chatswood Education Precinct. The Chatswood Education Precinct forms part of the NSW Government's investment in primary and secondary education to meet the increasing demand for educational facilities. It is understood by JBS&G that the site (current Chatswood Public School) will be repurposed for use as a senior campus for years 10 to 12.

In order to facilitate the further design and planning approvals for redevelopment works, Detailed Site Investigations (DSI) are required to be completed across the Chatswood Education Precinct to assess the suitability of the site for future use as an educational facility. The report documented herein relates to the current Chatswood Public School site and will assess site suitability, as required pursuant to the Planning Secretary's Environmental Assessment Requirements (SEARs) for the State Significant Development (SSD) application number SSD 9483, specifically relating to SEARs Key Issue 13 Contamination, being, to:

- Assess and quantify any soil and groundwater contamination and demonstrate that the site is suitable for the proposed use in accordance with SEPP 55.

A Preliminary Site Investigation with limited soil sampling was undertaken at the site by Douglas Partners in 2018 (DP 2018[1]), the findings of which recommend a detailed investigation to assess the suitability of the site for the proposed land uses. The DSI presented herein has been developed in accordance with guidelines made or approved by the NSW Environment Protection Authority (EPA), including the *National Environmental Protection Council* (NEPC) (2013) *National Environmental Protection (Assessment of Site Contamination) Measure* (NEPM), and relevant Australian Standards.

1.2 Objectives

The objectives of this DSI are to characterise potential contamination at the site, and to draw conclusions regarding the suitability of the site for the proposed land use, or, to make recommendations to enable such conclusions.

1.3 Scope of Works

The scope of works for the assessment included:

- A desktop review of available site history information, including:
  - Review of previously completed environmental assessment and geotechnical reports relating to the site and surrounding area, as provided by the client;
- A detailed site inspection to identify potential AECs;
- Development and documentation of a conceptual site model (CSM) based on the available information;

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[1] Report on Preliminary Site (Contamination) Investigation with Limited Sampling: Proposed Redevelopment Chatswood Public School, High School and Public School "Bush Campus", Chatswood, Douglas Partners 2018 (DP 2018)

- Development and documentation of the SAQP, with data quality objectives (DQOs) for the DSI in accordance with relevant EPA guidelines;
- Implementation of an intrusive investigation program based on the SAQP presented in this report;
- Analysis of collected soil samples at two NATA accredited laboratories: Eurofins MGT and Envirolab;
- Comparison of collected data against NSW EPA published / endorsed investigation criteria to facilitate an assessment of land use suitability; and
- Preparation of a DSI report in general accordance with relevant EPA guidelines.

2. Site Conditions and Surrounding Environment

2.1 Site Identification

The location of the site is shown in **Figure 1**, and the current layout is shown in **Figure 2**. The site details are summarised in **Table 2.1**.

Table 2.1: Site Details

Lot / DP Number	Lot 1, DP 812207 and Lot C, DP 346499
Street Address	5 Centennial Avenue, Chatswood
Local Government Authority	Willoughby City Council
Site Area	Approximate centre of site: 331312.749 E 6258715.294 N (GDA94-MGA56)
Current Zoning	R2 Low Density Residential
Geographic Coordinates	Approximately 1.4 ha
Previous Land Use	Primary School
Current Land Use	Primary School
Potential Future Use and Permissible Uses	High (Secondary) School

2.2 Site Description

A detailed site inspection was undertaken on 9 January 2019, and field works were completed on 23, 24 January, and 10, 11 October 2019, by two of JBS&G's trained and experienced field scientists. Site observations are discussed below, and a photographic log is included as **Appendix A**.

The site comprises an irregular shaped parcel of land, measuring approximately 1.4 ha. The site is secured with perimeter fencing, with three access points via locked gates located at the north-east (Pacific Highway, **Photo 1**), south-east (Centennial Avenue), and west boundaries of the site (Jenkins Street, **Photo 2**).

The site generally slopes in a westerly direction. Considering the substantially sloped topography, a degree of cut and fill is likely to have occurred at the site.

Five large buildings were present across the southern portion of the site, utilised as classrooms, offices, a library, and a canteen (**Photo 3** and **Photo 4**). Asphalt sealed playgrounds and an asphalt sealed carpark were located at the centre and north east corner of the site. Additional playgrounds were located at the north and north west portion of the site, which featured an open space sports field covered with synthetic grass (**Photo 5**), a basketball court and a tennis court.

Additionally, a complex of buildings was located in the southeast corner of the site (Lot C, DP 346499).

The site contained some vegetation in between hardstand areas including large gum and eucalyptus trees, some minor grass cover and perennial herbs. Vegetation was found sporadically throughout the site and its borders., All vegetation appeared unstressed and in good health.

No visible evidence of widespread contamination or significant areas of environmental concern were identified on readily visible/accessible ground surfaces during the site inspection.

2.3 Surrounding Land Use

Surrounding land-uses at the time of site inspection are described following:

- North – The northern boundary is formed by low to medium density residential land and commercial properties fronting the Highway. North along the Highway is a small public reserve (Kenneth Slessor Park) succeeded by Chatswood Toyota and Fullers Road;
- South – The southern boundary is formed by Centennial Avenue. This is succeeded by medium to high density residential apartments and Chatswood BMW;

- East – The eastern boundary is formed by the Pacific Highway. This is immediately succeeded by high density commercial buildings and residential apartments. This is followed by landmarks including Chatswood railway station, Dougherty Community Centre and Westfield Chatswood Shopping centre;
- West – The western boundary of the site was formed by Jenkins street and low density residential properties. Immediately adjacent and continuing westwards are low/medium residential properties and Chatswood High School along Centennial Avenue.

2.4 Environmental Setting

2.4.1 Topography

A review of topographical information available on Nearmap indicated the elevation of the site centre is approximately 109 m Australian Height Datum (AHD). The site slopes generally towards the west and south west, towards Ferndale Park and Swaines Creek at the western extent of Centennial Avenue.

The site appears to have undergone cut and fill activities based on observations made during the site inspection.

2.4.2 Geology & Soil

A review of the Soil Landscapes of the Sydney 1:100,000 Geological Series Sheet 9130 Sheet (1983[2]) indicates the site and surrounds are underlain by the Triassic Ashfield Shale of the Wianamatta Group, comprising dark grey to black which weathers to a residual clay profile of medium to high plasticity.

Reference to the online ESPADE tool hosted by the NSW Office of Environment and Heritage (OEH 2018[3]) indicated the site is underlain by the Blacktown Soil Landscape Group. These soils comprise shallow to moderately deep (<100 cm) red and brown podzolic soils in well-drained areas, and deep (150-300 cm) yellow podzolic soils and soloths on lower slopes and poorly drained areas. Limitations of this group include moderately reactive highly plastic subsoil, low soil fertility and poor soil drainage.

During the site investigation, 16 boreholes were advanced across the site, in which fill overlying natural materials was encountered from the ground surface to 1.2 m below ground surface (bgs). Natural materials encountered were observed to comprise a weathered shale profile consisting of clay grading to competent shale at varying depths.

2.4.3 Acid Sulfate Soils

A review of the *Acid Sulfate Soil Risk Map for Botany Bay*[4] indicates that the site is located in an area of no-known occurrences of ASS.

Based on observations made during the intrusive investigation across the site, sediments typical of potential and actual ASS were not observed (i.e. absence of grey, organic rich, hydrogen sulphide odour etc) in the lithological profile.

The Section 10.7 Planning Certificate (presented in DP, 2018) indicates that the site does not have the likelihood of occurrence of acid sulfate soils. This is consistent with the site's topographical and geological setting.

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[2] Soil Landscapes of the Sydney 1:100,000 Sheet (9130) Edition 2 (DECCW 2009)

[3] *ESAPDE*, NSW Office of Environment and Heritage, http://www.environment.nsw.gov.au/eSpade2Webapp, accessed 25 October 2019 (OEH 2018)

[4] *Acid Sulfate Soil Risk Map – Botany Bay, Edition 2, 1997.* 1:25 000 Ref: 91 30S3. NSW DLWC

2.4.4 Hydrology

Precipitation to fall onto buildings and paved areas will flow into engineered drainage lines and the local stormwater system. Rainfall will potentially penetrate the soft ground (e.g. garden beds, unpaved areas across the school grounds) and migrate as shallow/perched groundwater towards Swaines Creek, and/or to stormwater infrastructure. It is anticipated that surface run-off will flow to engineered stormwater infrastructure and towards the nearby Swaines Creek, located approximately 700 m west of the site.

2.4.5 Hydrogeology

A search for registered groundwater borehole information was undertaken on Water NSW[5] website indicated two groundwater bores within 500 m of the site (**Table 2.2**). Summary pages of groundwater bore information provided by Water NSW is presented in **Appendix B**.

Based on the reported geology and surrounding topography it is anticipated the direction of groundwater flow will be to the west towards the Lane Cove River. Groundwater at the site is not expected to occur within shale bedrock, however may be present within more permeable strata such as sandstone or highly fractured bedrock. Perched groundwater is expected to occur at existing at interfaces of soils and underlying bedrock.

Table 2.2: Groundwater Bore Search Summary

Bore ID	Depth (mbgs)	SWL (mbgs)	Distance from site (m)	Date Installed	Use	Lithology
GW029731	21.6	Unknown	480 E	01/04/1967	Recreation (Groundwater)	Clay to 6.7 m, shale to 17.98, sandstone to 21.6 m.
GW107757	162.6	25.6	490 E	29/07/2005	Recreation (Groundwater)	Fill to 1.4 m, clay to 5.1 m, shale to 5.1 m, clay to 16.7 m, sandstone to 65.7 m, shale to 66.7 m, sandstone with shale lenses to 162.6 m.

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[5] *Water NSW* website accessed 16/01/2019, https://realtimedata.waternsw.com.au/

3. Site History

The site history has been documented in DP (2018). JBS&G's review of the site history have identified additional searches that are relevant and applicable to understanding the historical and environmental setting.

3.1 EPA Per- and Poly- Fluoroalkyl Substances (PFAS) Register

A search of the EPA's PFAS register indicated that there were no records pertaining to the site. A record of the search is presented in **Appendix D**.

3.2 NSW Fair Trading Loose Fill Asbestos Insulation Register

A search of the NSW Fair Trading loose fill asbestos insulation register indicated that there were no records pertaining to the site. A record of the search is presented in **Appendix E**.

3.3 Summary of Site History and Integrity Assessment

The review of the site's history indicated that the site was historically utilised as an orchard prior to the primary school's construction in 1895. The school has been subject to progressive renovations and additions of new structures since the 1890s.

Based on the range of sources and the general consistency of the historical information, it is considered that the historical assessment has an acceptable level of accuracy with respect to the potentially contaminating activities historically occurring at the site.

4. Previous Investigations

4.1.1 Preliminary Site (Contamination) Investigation (DP 2018)

Douglas Partners (DP) completed a preliminary environmental site assessment (ESA; referred to as Preliminary Site Investigation (PSI) in this report) of Chatswood Public School and the Chatswood High School site and. The investigation entailed a desktop review of publicly available documents pertaining to the site history, and preliminary intrusive sampling associated with the geotechnical investigation.

The review of the site's history indicated that the site was historically utilised as an orchard prior to the primary school's construction in 1895. The school has been subject to progressive renovations and additions of new structures since the 1890s. Further review of the site's history indicated that a development application (DA) lodged by the school relating to works in a section of the playground known as the 'lowers' included information pertaining to an 'Incinerator Compound'. This is considered to represent a potential source of contamination at the site.

DP (2018) identified the following AECs at the site:

- Filling – potential for filling (likely from cut and fill of onsite soils) activities for the purpose of levelling the site for development. Associated contaminants of potential concern (COPC) identified were TRH, BTEX, PAHs, PCBs, OCPs, OPPs, phenols and asbestos;
- Previous land use: Public School site was an Orchard during the 1800s. COPCs include heavy metals, PCBs, OCPs/OPPs;
- Incinerator: COPCs include PAHs, BTEX, PCBs; and
- Soils and contaminants associated with surrounding land uses such as Chatswood Toyota. Associated COPCs identified were metals, TRH, BTEX, PAHs, PCBs, OCPs, OPPs, VOCs, phenols and asbestos.

DP (2018) undertook a limited intrusive assessment that was completed via solid flight auger and hand auger at 13 locations across the site. Fill materials were encountered from 0.15 m bgs to 2.0 m bgs (BH18) and was variably compacted predominantly silty clay material with various inclusions, which was observed to have "similar classification to the natural clay present at the site and in some instances was hard to distinguish from natural clays" (DP 2018). Inclusions within fill materials were observed to include gravels, ash, shale and some brick. Inclusions of asphalt were also observed within fill materials at the site. No asbestos was reported in soils by DP (2018).

DP (2018) adopted the most conservative human and ecological health assessment criteria, including; health investigation level (HIL) A for non-petroleum chemical contaminants, health screening levels (HSLs) A and B for vapour intrusion, HSL A for direct contact, and management limits for TRH.

The analytical data reported concentrations of COPCs in excess of the adopted site criteria at several locations. Exceedances of the adopted site criteria were reported for PAHs (HILs and ESLs), TRH (management limits for coarse grained soils, and ESLs) at the following locations; BH16, BH18, BH21, BH23, BH24 and BH27.

No groundwater was encountered at any location during the sampling event.

The report concluded that exceedances of adopted site criteria were observed and as such, remediation may be required pending results from subsequent detailed site investigations (DSIs).

5. Conceptual Site Model

Based on the desktop review and observations from the site inspection, the following conceptual site model (CSM) has been developed for the site.

5.1 Potential Areas of Environmental Concern

Based on the objectives of the assessment, desktop review and observations made during the site inspection, AECs and associated COPCs were identified at the site, as noted in **Table 5.1**.

Table 5.1: Areas of Environmental Concern and Associated Contaminants of Potential Concern

Area of Environmental Concern (AEC)	Potentially Affected Media	Contaminant of Potential Concern (COPC)	Risk Profile
Fill Materials Imported and/or reworked fill materials used to create site levels (comprising material of unknown character and/or origin)	Soil	Heavy metals, total recoverable hydrocarbons (TRH), benzene, toluene, ethylbenzene and xylenes (BTEX), PAHs, polychlorinated biphenyls (PCB), organochlorine pesticides (OCP), and asbestos	Moderate
Former Orchards Areas formerly used as market gardens/orchards	Soil	Heavy metals, pesticides/herbicides (OCPs/OPP), asbestos	Low
Incinerator Areas in proximity to the former Incinerator	Soil	Heavy metals, PAHs, PCBs, asbestos	Low

5.2 Potentially Contaminated Media

Potentially contaminated media comprise:

- Fill Materials;
- Underlying Natural Soils; and
- Groundwater

Review of site historical information, DP (2018) indicates that the site was historically utilised for market garden/orchards. The historical use of pesticides/herbicides at the site may present a potential risk for human and ecological health. However, JBS&G note that the land ceased to be an orchard in circa 1895 – noting the elapsed time since this use however, JBS&G do not consider this to be a significant risk for contamination at the site.

The review also identified the potential for cut and fill activities to have occurred at the site. Fill materials may contain COPCs at concentrations that exceed the applicable human and ecological assessment criteria and therefore may present an unacceptable risk to human and ecological receptors for the future use of the site.

Furthermore, DP (2018) note that a small incinerator was present at the site. JBS&G note that the incinerator was likely to incinerate waste generated by the school, and the development of large portions of the school (playground etc) pre-date the incinerator, and as such, any impacts from the incinerator are likely to be highly localised and not widespread.

A review of the site history did not identify point sources and/or liquid contaminants at the site that are likely to pose a significant risk for the migration of contamination to underlying natural materials and groundwater.

JBS&G consider the potential for contamination to the underlying natural lithologies/geology to be a function of the primary contamination in soil. Noting the historical and current site uses, JBS&G do not consider primary contamination in soils are likely to be in concentrations that would result in significant contamination to underlying strata.

Noting contaminants likely to exist at the site are in solid form and unlikely to be significantly leachable, contaminants within fill material and other surface soils, and the historical uses of the site, vertical migration through the fill profile into the underlying natural soils and groundwater is unlikely to have occurred.

5.3 Potential for Migration

Contaminants generally migrate from site via a combination of windblown dusts, rainwater infiltration, groundwater migration and surface water runoff. The propensity for contaminants to migrate is dependent on:

- The nature of the contaminants (solid/liquid/gas and mobility characteristics);
- The extent of the contaminants (isolated or widespread);
- The location of the contaminants (surface soils or at depth); and
- The site topography, geology, hydrology and hydrogeology.

The potential contaminants identified as part of the site area history review and previous investigation are generally in a solid form (e.g. heavy metals, asbestos, etc.).

As the site is primarily covered by structures and/or hardstand (concrete/asphalt), the potential for windblown dust migration of contamination from the site is generally very low. Further, the potential for contamination migration via surface water movement and infiltration of water and subsequent migration through the soil profile is considered generally to be low given the extent of impermeable pavements at the site. However, it is noted there is a potential for vertical migration of surface waters where hardstand pavements exhibit extensive cracking and / or along joints.

5.4 Potential Exposure Pathways

Potential human receptors of environmental impact include future site users (school students, users of open spaces), visitors and construction/maintenance contractors engaged to work at the site who may potentially be exposed to COPCs through inhalation, direct contact and/or ingestion (children) of impacted soils.

Exposure to windblown dusts may pose a potential risk to sensitive human receptors however these are also considered unlikely given the predominantly sealed site surfaces.

During redevelopment of the site, potential human receptors will include:

- Inhalation of potential COPC dust and migrating upwards from fill material of unknown origins; and/ or
- Potential dermal and oral contact to impacted soils as present at shallow depths and/ or accessible by future service excavations across the extent of the site; and/ or
- Surface water runoff.

The site contains limited areas covered by vegetation, presenting ongoing potential ecological receptors. Flora on site are potential receptors of shallow soil contamination if present. No vegetation stress relating to potential contamination from known AECs was observed during site inspection. Possible off-site ecological receptors include potential surface water receptors (i.e. Swains Creek to the southwest of the site).

5.5 Receptors

Potential human populations who may be exposed to site impacts in the future (if they are not remediated or appropriate management is not implemented prior to or during development) include:

- Potential future construction workers associated with the redevelopment of the site;
- Students and employees of the proposed secondary school;
- Future construction and site maintenance workers; and
- Future and current sub-surface excavation and intrusive workers.

Given the majority of the site is currently sealed with hardstand pavement (concrete / asphalt) and proposed redevelopment will consist of sealed on-grade infrastructure, on site ecological flora/fauna are not considered likely receptors.

5.6 Preferential Pathways

For the purpose of this assessment, preferential pathways have been identified as natural and/or man-made pathways that result in the preferential migration of COPC as either liquids or gasses.

Man-made preferential pathways may be present at the site, associated with areas of disturbed natural/fill material, service easements and stormwater/retention basins on site.

Natural preferential pathways are likely limited to natural lithological boundaries, such as between porous soils and weathered/residual bedrock, where infiltrating groundwater is vertically confined and begins to migrate laterally, and surface water drainage features.

6. Sampling and Analytical Plan

6.1 Data Quality Objectives

Data quality objectives (DQOs) are statements that define the confidence required in conclusions drawn for data produced for a project, and which must be set to realistically define and measure the quality of data needed.

DQOs have been developed for this DSI, as discussed in the following sections.

6.1.1 State the Problem

The site is proposed to be redeveloped for a high school campus providing facilities for students between the years of Year 11 and 12. As such, an assessment is required to characterise potential contamination at the site, and to assess whether potential contamination from historical activities at the site may pose an unacceptable risk to future receptors for the proposed high school campus, or, to make recommendations to enable such conclusions to be made.

6.1.2 Identify the Decision

The decisions below generally follow the EPA (2017[6]) decision making process for assessing urban redevelopment sites:

1. Are there any unacceptable risks to likely future on-site receptors?
2. Are there any issues relating to background soil concentrations that exceed appropriate site soil criteria?
3. Are there any impacts of chemical mixtures?
4. Are there any aesthetic issues at the site?
5. Is there any evidence of, or potential for, migration of contaminants from the site?
6. Is a site management strategy required?

6.1.3 Identify Inputs to the Decision

Inputs identified to provide sufficient data to make the decisions nominated above include:

- Historical site information and inspection of the site to identify and/or confirm potential AECs and COPCs at the site;
- The collection and interpretation of environmental data through collection and analysis of soil;
- Laboratory analysis of samples of potentially contaminated media for COPC; and
- Confirmation that data generated by sample analyses were of sufficient quality to allow reliable comparison to assessment criteria as undertaken by assessment of quality assurance / quality control (QA/QC).

Specifically, sufficient data needs to be collected from each of the identified potentially impacted media (e.g. fill material and natural soils) at the site relating to the in the identified AECs and associated COPC.

6.1.4 Define the Study Boundaries

The study boundaries are limited to site boundaries as described in **Section 2.1** and shown on **Figure 2**.

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[6] *Guidelines for the NSW Site Auditor Scheme* (3rd Edition). NSW Environment Protection Authority, October 2017, EPA 2017;

The vertical extent of the soil investigation was to 8.0 m bgs (BH_P_12) – the maximum depth to which investigations were undertaken.

Due to the project objectives, seasonality was not assessed as part of this investigation. Data are therefore representative of the timing and duration of the current investigation.

6.1.5 Develop a Decision Rule

Analytical data was assessed against NSW EPA endorsed criteria, presented in **Section 7**.

Statistical analyses of the data were undertaken, where required, in accordance with relevant guidance documents. The following statistical criteria was adopted:

- The upper 95% confidence limit on the average concentration for each analyte (calculated for samples collected from consistent soil horizons, stratigraphy or material types) must be below the adopted criterion;
- No single analyte concentration shall exceed 250% of the adopted criterion; and
- The standard deviation of the results must be less than 50% of the criterion.

The decision rules adopted to answer the decisions identified in **Section 6.1.2** are summarised in **Table 6.1**.

Table 6.1 Summary of Decision Rules

Decisions Required to be Made	Decision Rule
1. Are there any unacceptable risks to on-site future receptors?	Analytical data will be compared against EPA endorsed criteria. Statistical analysis of the data will be completed, where necessary, in accordance with relevant guidance documents, as appropriate, to facilitate the decisions. The criteria in **Section 7** were adopted with respect to soil. If the statistical criteria stated above were satisfied, the answer to the decision was **No**. If the statistical criteria were not satisfied, the answer to the decision was **Yes**.
2. Are there any issues relating to the local area background soil concentrations that exceed appropriate soil criteria?	If COPC concentrations in soils exceeded published background concentrations (NEPC 2013), the answer to the decision is **Yes**. Otherwise the answer to the decision is **No**.
3. Are there any chemical mixtures?	Were there more than one group of contaminants present which increase the risk of harm? If there is, the answer to the decision is **Yes**. Otherwise, the answer to the decision is **No**.
4. Are there any aesthetic issues?	If there were any asbestos containing material (ACM) fragments on the ground surface, any unacceptable odours or soil discolouration, or excessive extraneous/foreign/waste materials, the answer to the decision is **Yes**. Otherwise, the answer to the decision is **No**.
5. Is there any evidence of, or potential for, migration of contaminants from the site?	Based on assessment results, is there any evidence of, or the potential for, migration of unacceptable contaminant concentrations to migrate from the site? If yes, the answer to the decisions is **Yes**. Otherwise, the answer to the decision is **No**.
6. Is a site management strategy required?	Is the answer to any of the above decisions Yes? If yes, a site management strategy is required. If no, a site management strategy is not required.

This step is to establish the decision maker's tolerable limits on decision errors, which are used to establish performance goals for limiting uncertainty in the data. Data generated during this project must be appropriate to allow decisions to be made with confidence.

Specific limits for this project have been adopted in accordance with the appropriate guidance from the NSW EPA, NEPC (2013), appropriate indicators of data quality (DQIs used to assess QA/QC) and standard JBS&G procedures for field sampling and handling.

To assess the usability of the data prior to making decisions, the data will be assessed against pre-determined DQIs for completeness, comparability, representativeness, precision and accuracy.

The pre-determined Data Quality Indicators (DQIs) established for the project are discussed below in relation to precision, accuracy, representativeness, comparability, completeness and sensitivity (PARCCS parameters), and are shown in **Table 6.2**.

- **Precision** - measures the reproducibility of measurements under a given set of conditions. The precision of the laboratory data and sampling techniques is assessed by calculating the Relative Percent Difference (RPD) of duplicate samples.
- **Accuracy** - measures the bias in a measurement system. The accuracy of the laboratory data that are generated during this study is a measure of the closeness of the analytical results obtained by a method to the ‘true’ value. Accuracy is assessed by reference to the analytical results of laboratory control samples, laboratory spikes and analyses against reference standards.
- **Representativeness** –expresses the degree which sample data accurately and precisely represent a characteristic of a population or an environmental condition. Representativeness is achieved by collecting samples on a representative basis across the site, and by using an adequate number of sample locations to characterise the site to the required accuracy.
- **Comparability** - expresses the confidence with which one data set can be compared with another. This is achieved through maintaining a level of consistency in techniques used to collect samples; ensuring analysing laboratories use consistent analysis techniques and reporting methods.
- **Completeness** – is defined as the percentage of measurements made which are judged to be valid measurements. The completeness goal is set at there being sufficient valid data generated during the study.
- **Sensitivity** – expresses the appropriateness of the chosen laboratory methods, including the limits of reporting, in producing reliable data in relation to the adopted criteria.

If any of the DQIs are not met, further assessment of the data set is required to determine whether the non-conformance has significant effects on the usefulness of the data. Corrective action to correct an adverse impact on the reliability of the dataset may include, but is not limited to, the request of further information from samplers and/or analytical laboratories, downgrading of the quality of the data or alternatively, re-collection of the data.

Table 6.2: Summary of Data Quality Indicators

Data Quality Indicators	Frequency	Data Quality Criteria
Precision		
Duplicates (intra-laboratory)	1 / 20 samples	<50% RPD[1]
Triplicates (inter-laboratory)	1 / 20 samples	<50% RPD[1]
Laboratory Duplicates	1 / 20 samples	<50% RPD[1]
Accuracy		
Surrogate spikes	All organic samples	70-130% recovery
	Phenols	30-130% recovery
Laboratory control samples	1 per lab batch	70-130% recovery
Matrix spikes	1 per lab batch	70-130% recovery (phenols 30-130%)
Representativeness		
Sampling appropriate for media and analytes	All samples	-[2]
Samples extracted and analysed within holding times.	-	Organics (14 days), inorganics (6 months)
Laboratory Blanks	1 per lab batch	<LOR
Trip blanks	1 per lab batch	<LOR
Trip spike	1 per lab batch	70-130% recovery
Storage blank	1 per lab batch	<LOR
Rinsate sample	1 per sampling event/media	<LOR
Comparability		
Standard operating procedures for sample collection & handling	All Samples	All Samples
Standard analytical methods used for all analyses	All Samples	NATA accreditation
Consistent field conditions, sampling staff and laboratory analysis	All Samples	All samples[2]
Limits of reporting appropriate and consistent	All Samples	All samples[2]
Completeness		
Sample description and Chain of Custody (COCs) completed and appropriate	All Samples	All samples[2]
Appropriate documentation	All Samples	All samples[2]
Satisfactory frequency and result for QC samples		95% compliance
Data from critical samples is considered valid	-	Critical samples valid
Sensitivity		
Analytical methods and limits of recovery appropriate for media and adopted site assessment criteria	All samples	LOR<= site assessment criteria

[1] If the RPD between duplicates is greater than the pre-determined data quality indicator, a judgment was made as to whether the excess is critical in relation to the validation of the data set or unacceptable sampling error is occurring in the field.

[2] A qualitative assessment of compliance with standard procedures and appropriate sample collection methods was completed during the DQI compliance assessment.

6.2 Optimise the Design of Obtaining Data

Various strategies for developing a statistically based sampling plan are identified in EPA (1995[7]), including judgemental, random, systematic and stratified sampling patterns.

6.3 Soil Investigation

For a site of approximately 1.4 ha, Table A of NSW EPA (1995) recommend a minimum of 21 to 25 soil sampling locations. Previous investigations included sampling at 13 locations. As such, JBS&G undertook a comprehensive soil investigation at the site which involved the advancement of 16 boreholes utilising a combination of judgemental and systematic sampling regimes. The sample locations advanced by JBS&G were in addition to the 13 previously advanced during DP (2018).

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[7] *Contaminated Sites: Sampling Design Guidelines*. NSW EPA 1995 (EPA 1995)

Systematic sampling locations were generally advanced across the accessible site area to assess more widespread soil contamination. Soil sampling locations, including those from DP (2018), are shown in **Figure 3**.

6.3.1 Sampling Methodology

6.3.1.1 Soil Sampling Methodology

Soil sampling was completed utilising an excavator equipped with an auger or via manual excavation utilising a hand auger.

Soil samples were generally collected at surface (0-0.15 m) or directly underneath hardstand pavement, 0.5 m and then at 0.5 m intervals to a maximum depth of 2.0 m bgs (BH_P_16), or a minimum of 0.5 m into natural material (or prior refusal), whichever was the shallower Where physical evidence of potential contamination was identified during the works, sampling locations were extended to vertically delineate contamination, where practicable. Following shallow refusal at 0.8 m bgs, BH_P_09 was attempted again within proximity (BH_P_09a). During the collection of soil samples at all locations, features such as seepage, discolouration, staining, odours and other indicators of contamination, if present, were noted on borelogs, provided in **Appendix D**.

Collected samples were immediately transferred to laboratory supplied sample jars and bags. The sample jars were then transferred to a chilled ice box for sample preservation prior to and during shipment to the testing laboratory. A chain-of-custody form was completed and forwarded with the samples to the testing laboratory. Based upon field observations, selected samples were analysed in accordance with the laboratory schedule (**Table 6.2**).

JBS&G note that not all soil samples collected were analysed. All samples will remain at the primary laboratory for a period of two months from the date of sampling. This will allow future analysis to be completed in the event that further information is required to characterise site conditions, provided that proposed analytes remain within technical holding times.

6.3.1.2 Field PID Screening

During site works, sufficient sample material was collected to allow for field testing using a photo-ionisation detector (PID) and laboratory analyses to assess the potential presence of VOCs including petroleum hydrocarbons. Samples obtained for PID screening were placed in a sealed plastic bag for approximately 2 minutes to equilibrate, prior to a PID being attached to the bag. Readings were then monitored for a period of approximately 30 seconds or until values stabilised and the stabilise/highest reading recorded on field logs. The PID was calibrated prior to the commencement of field works and then check readings were completed on a daily basis during the field program using suitable calibration gas (isobutylene – 100 ppm). Field calibration forms are provided in **Appendix E**. PID results are provided in the logs in **Appendix D**.

6.3.1.3 Duplicate and Triplicate Sample Preparation

At selected sample points, sufficient soil was collected to provide primary, blind (duplicate intra-laboratory), and split (triplicate inter-laboratory) replicate samples. In order to minimise the loss of potential volatiles, soil samples were not homogenised. Each sample was labelled with primary, duplicate or triplicate sample identification before being placed in the same chilled esky for transport to the laboratory.

6.3.1.4 Equipment Decontamination

Where sampling equipment was required to be reused, i.e. augers, appropriate decontamination procedures, including brushing and rinsing augers, if required, in accordance with standard JBS&G operating procedures were adhered to. Decontamination forms are provided in **Appendix E**.

New nitrile gloves were utilised for the collection of each soil sample to avoid cross contamination between samples and locations.

6.3.2 Laboratory Analysis

JBS&G contracted Eurofins|MGT Australia (Eurofins) at Lane Cove, NSW, as the primary laboratory for the required analyses. Envirolab Services Pty Ltd (Envirolab) in Chatswood, NSW, were contracted for analysis of triplicate samples. Eurofins and Envirolab are NATA registered for the required analyses. In addition, the laboratory was required to meet JBS&G internal QA/QC requirements. Laboratory analysis of samples was conducted as summarised in **Table 6.2**.

Table 6.1: Sampling and Analytical Program

Sample Type	No. Sample Locations	Analyses (exc. QA/QC)
Soil	16 x boreholes	VOCs – 10 samples Heavy metals (As, Cd, Cr, Cu, Hg, Ni, Pb, Zn) – 15 samples PAH – 15 samples TRH/BTEX – 10 samples OCPs – 5 samples PCBs – 2 samples Asbestos – 15 samples

In addition to the above primary analyses, to address the DQIs, field duplicate and triplicate soil samples were analysed at a rate of at least 1/20 primary samples. A rinsate sample was collected from non-disposable soil sampling equipment, and trip blank and trip spike samples will be submitted with each batch of samples.

7. Assessment Criteria

7.1 Regulatory and Technical Guidelines

The investigation was undertaken with consideration to aspects of the following guidelines, as relevant:

- *National Environment Protection (Assessment of Site Contamination) Measure 2013* (as amended 2013), National Environment Protection Council (NEPC 2013);
- *Guidelines for Consultants Reporting on Contaminated Sites,* NSW OEH (OEH 2011);
- *Guidelines for the NSW Site Auditor Scheme, 3rd Edition*, NSW EPA, 2017 (EPA 2017);
- *Guidelines on Duty to Report Contamination under the Contaminated Land Management Act 1997*, NSW EPA 2015 (EPA 2015);
- *Guidelines for Assessing Former Orchards and Market Gardens*, NSW DEC, June 2005 (NSW DEC 2005);
- *Sampling Design Guidelines,* NSW EPA, September 1995 (NSW EPA 1995); and
- *Acid Sulfate Soil Manual,* NSW Acid Sulfate Soil Management Advisory Committee. August 1998 (ASSMAC 1998).

7.2 Assessment Criteria

7.2.1 Soil Assessment Criteria

The NEPC (2013) NEPM provides risk-based investigation and screening levels for selected organic and inorganic chemicals in soils. Different levels are provided for a variety of exposure settings including residential, open-space / parks / recreational and commercial / industrial land uses.

It is understood that the site is proposed to be redeveloped to incorporate educational facilities for high (secondary) school aged students, i.e. Year 10 to 12. In accordance with the applicable land use scenarios outlined in NEPC (2013) and the respective risk assessment assumptions utilised in their formulation, analytical data from previous (DP 2018) investigations and the current investigation will be compared against the following human health and ecological investigation and screening levels (HILs/HSLs and EILs/ESLs):

- HIL-C: Public Open Spaces (includes Secondary Schools);
- HSL-A: Residential with Accessible Soils for TRH compounds, as per NEPC (2013) guidance which requires secondary school buildings to be assessed using HSL A;
- HSL-C: Public Open Spaces (includes Secondary Schools) for asbestos (ACM and AF/FA)
- EIL & ESL – urban residential and public open space (coarse soil); and
- In addition to the above, aesthetic considerations as per NEPC (2013) will be considered during the current investigation.

8. Quality Assurance and Quality Control

Detailed discussion of the QAQC assessment of the dataset is included in **Appendix F**.

8.1 QA/QC Conclusion

The field sampling and handling procedures across the site produced QA/QC results which indicate that data collected is of an acceptable quality for the DSI objectives.

The NATA certified laboratory reports indicate that the project laboratories were achieving levels of performance within their recommended control limits during the period when the samples from this program were analysed.

On the basis of the results of the field and laboratory QA/QC program, the soil data are of an acceptable quality upon which to draw conclusions regarding the environmental condition of the site.

9. Results

Soil sampling locations are shown on **Figure 3** and a summary of soil analytical data with comparison to the adopted site criteria is presented in **Table A**. Detailed laboratory reports and chain of custody documentation is provided in **Appendix H**. Borehole logs are presented in **Appendix D**.

9.1 Soil Observations

A photographic log documenting key observation made during the current investigation is provided in **Appendix A**

A total of 16 soil sampling locations were advanced across the site. All locations (BH_P_01 to BH_P_14, and BH_P_16) identified fill materials between the ground surface (or below hardstand) to a maximum depth of 1.2 m bgs (BH_P_03, BH_P_06 and BH_P_07). Fill materials generally comprised of brown silty sands and silty clays with trace gravels. These materials were generally consistent with the underlying geology, with the exception of anthropogenic inclusions in some boreholes that included ash, asphalt, brick, and some plastic (**Photos 6** and **7**). JBS&G identified minor hydrocarbon odours from materials at BH_P_07, in proximity to BH18 (DP 2018) whom also reported hydrocarbon odours from materials in this area of the site (see **Figure 3**). PID readings were recorded between 0 and 8.3 ppm (BH_P_07). No staining was noted at any of the borehole locations. No suspected ACM was observed within boreholes advanced as part of this investigation.

Natural material underlying the site generally comprised a brown/grey clay and silty clay overlying shale bedrock. No groundwater seepage was identified at any of the borehole locations.

It is further noted that no indicators of potential acid sulphate soils were observed during intrusive works at the site.

9.2 Analytical Results – Soil

Full copies of the laboratory documentation are provided in **Attachment L**. Summarised laboratory results from JBS&G 2019 are presented in **Table A**. Analytical data from DP (2018) are presented in the **Table** section of this report and have been included in the sections below for completeness.

9.2.1 Heavy Metals

All individual heavy metals concentrations were reported at levels less than the adopted site assessment criteria for human health.

In relation to ecological criteria, the following exceedances are reported:

- EIL Urban Residential: Copper limit of 60 mg/kg
    - BH_P_04_0-0.15 – 75 mg/kg;
    - BH_P_12_0.1-0.2 – 69 mg/kg;
- EIL Urban Residential: Nickel limit of 30 mg/kg
    - BH_P_02_0-0.15 – 32 mg/kg;
    - BH_P_07_0-0.15 – 70 mg/kg;
    - BH21-0.0-0.1 – 38 mg/kg (DP 2018);
- EIL Urban Residential: Zinc limit of 70 mg/kg
    - BH_P_01_0.4-0.5 – 320 mg/kg;
    - BH_P_02_0-0.15 – 110 mg/kg;
    - BH_P_04_0-0.15 – 78 mg/kg;

  - BH_P_06_0.8-0.9 – 310 mg/kg;
  - BH_P_08_0.4-0.5 – 120 mg/kg;
  - BH_P_09_0-0.15 – 190 mg/kg;
  - BH_P_10_0.6-0.7 – 160 mg/kg;
  - BH27-0-0.3 – 1,000 mg/kg (DP 2018).

9.2.2 PAHs

Total PAH and Benzo(a)pyrene (B(a)P) TEQ values for analysed samples were reported at concentrations less than the adopted assessment criteria, with the following exceptions:

- HIL C (Secondary Schools): B(a)P TEQ limit of 3 mg/kg
  - BH_P_02_0-0.15 – 116 mg/kg;
  - BH_P_04_0-0.15 – 3.4 mg/kg;
  - BH13-0-0.1 – 3.2 mg/kg (DP 2018);
  - BH16-0-0.1 – 16 mg/kg (DP 2018);
  - BH18-0.5 – 44 mg/kg (DP 2018);
  - BH18-1.0-1.1 – 56 mg/kg (DP 2018);
  - BH18-1.5 – 17 mg/kg (DP 2018);
  - BH21-0-0.1 – 57 mg/kg (DP 2018);
  - BH23-0-0.1 – 3.4 mg/kg (DP 2018);
  - BH24-0.3-0.4 – 3.5 mg/kg (DP 2018);
- HIL C (Secondary Schools): PAHs (total) limit of 300 mg/kg
  - BH_P_02_0-0.15 – 650.6 mg/kg;
  - BH18-0.5 – 470 mg/kg (DP 2018);
  - BH18-1.0-1.1 – 620 mg/kg (DP 2018);
- ESL Urban Residential and Public Open Space, Coarse Soil: B(a)P limit of 0.7 mg/kg
  - BH_P_02 0-0.15 – 82 mg/kg;
  - BH_P_02 0.4-0.5 – 1.6 mg/kg;
  - BH_P_04 0-0.15 – 2.5 mg/kg;
  - BH_P_05 0.4-0.5 – 0.9 mg/kg;
  - BH_P_06 0.8-0.9 – 1 mg/kg;
  - BH_P_08 0.4-0.5 – 1.7 mg/kg;
  - BH_P_13 0.5-0.6 – 0.7 mg/kg;
  - BH13-0-0.1 – 2.2 mg/kg (DP 2018);
  - BH16-0-0.1 – 16 mg/kg (DP 2018);
  - BH18-0.5 – 30 mg/kg (DP 2018);
  - BH18-1.0-1.1 – 38 mg/kg (DP 2018);
  - BH18-1.5 – 12 mg/kg (DP 2018);

  - BH19-0-0.1 – 1.4 mg/kg (DP 2018);
  - BH21-0-0.1 – 57 mg/kg (DP 2018);
  - BH21-1.0-1.1 – 1.2 mg/kg (DP 2018);
  - BH22-0.3-0.4 – 1.8 mg/kg (DP 2018);
  - BH23-0-0.1 – 2.3 mg/kg (DP 2018);
  - BH24-0.3-0.4 – 2.3 mg/kg (DP 2018);
  - BH28-0.4-0.45 – 1.7 mg/kg (DP 2018);

9.2.3 TRH/BTEXN

Concentrations of TRH and BTEXN were reported below the adopted site assessment criteria for all samples, with the exception of:

- HSL A for Vapour Intrusion for Sand (0 to 1m): F2 limit of 110 mg/kg
  - BH_P_02 0-0.15 – 118.5 mg/kg;
  - BH18-1.0-1.1 – 130 mg/kg (DP 2018);
- HSL A for Direct Contact: F3 limit of 4,500 mg/kg
  - BH21-1.0-1.1 – 3,500 mg/kg (DP 2018);
  - BH27-0-0.3 – 2,800 mg/kg (DP 2018);
- HSL A for Vapour Intrusion for Sand (0 to 1m): Naphthalene limit of 3 mg/kg
  - BH18-0.5 – 8 mg/kg (DP 2018);
  - BH18-1.0-1.1 – 9.2 mg/kg (DP 2018);
- ESL Urban Residential and Public Open Space, Coarse Soil: TRH C10-C16 limit of 120 mg/kg
  - BH18-1.0-1.1 – 140 mg/kg (DP 2018);
- ESL Urban Residential and Public Open Space, Coarse Soil: F3 limit of 300 mg/kg
  - BH16-0-0.1 – 16 mg/kg (DP 2018);
  - BH18-0.5 – 1,300 mg/kg (DP 2018);
  - BH18-1.0-1.1 – 1,600 mg/kg (DP 2018);
  - BH20-0-0.1 – 1,100 mg/kg (DP 2018);
  - BH21-1.0-1.1 – 3,500 mg/kg (DP 2018);
  - BH24-0.3-0.4 – 350 mg/kg (DP 2018);
  - BH26-0.2-0.3 – 300 mg/kg (DP 2018);
  - BH27-0-0.3 – 2,800 mg/kg (DP 2018);
  - BH28-0.4-0.45 – 580 mg/kg (DP 2018).

9.2.4 VOCs

Concentrations of VOCs were reported below the adopted health and ecological assessment criteria for all soil samples selected for analysis.

9.2.5 OCPs and PCBs

Concentrations of OCP and PCB compounds were reported below the adopted health and ecological assessment criteria for all soil samples selected for analysis.

9.2.6 Asbestos

No Asbestos Fines, Fibrous Asbestos (AF/FA) or ACM were reported above the health-based assessment criterial or laboratory limit of detection for all samples submitted for analysis.

10. Site Characterisation

Based on the decision-making process for assessing urban redevelopment sites detailed in EPA (2017) and discussed in **Section 6.1.2**, the decisions required to be made are discussed below.

10.1 Potential Risks to Future Onsite Receptors

The following discussion relates to the site's data set, and includes analytical data collected from DP (2018), in addition to analytical data collected by JBS&G, as documented herein.

The assessment of site suitability is generally undertaken with consideration to the risks various compounds in the environment potentially pose to human and ecological health under one or more land use scenarios. A Tier 1 assessment of potential risk is undertaken by comparison with generic land use criteria such as published by NEPC (2013).

In consideration of the site's data set, potentially unacceptable risks to the health of human receptors at the site under the adopted land use, pursuant to NEPC (2013), were constrained to PAHs, specifically; carcinogenic PAHS as B(a)P TEQ, PAH totals and TRH.

A review of the borelogs for the site, including those completed by DP (2018), indicate that fill materials encountered at a majority of the sampling locations were observed to contain ash, which is a likely source of elevated PAHs in soil. Furthermore, a majority of sampling locations were advanced utilising solid flight augers, through asphalt that was located at the ground surface. The sampling method is likely to have resulted in the entrainment of PAH rich asphalt through the soil profile as the boreholes were advanced. The binding agent utilised in asphalt is bitumen - a hydrocarbon product comprised of long-chain hydrocarbons and rich in PAHs. JBS&G anticipate that the reported concentrations of PAHs are further enriched by the presence of asphalt within surficial soil samples.

Potentially unacceptable health risks from the potential intrusion of vapours to future site structures was noted from TRH concentrations at two locations, BH_P_02 0-0.15 and BH18-1.0-1.1 (DP 2018). The former location was advanced in proximity to the school car park, and the latter was located at the westernmost driveway off Jenkins Street. Fill materials from BH18 (off Jenkins Street) were noted to exhibit hydrocarbon odours and ash within fill materials, which were observed between 0.8 m bgs and 1.8 m bgs. The source of these impacts are unknown. JBS&G consider that there are currently no risks posed by the reported hydrocarbon impacts as there are currently no structures overlying the sampling locations and therefore no risk for the accumulation of vapours. Furthermore, the reported concentrations only marginally exceed the adopted Tier 1 criteria and are likely to attenuate over time due to the volatile nature of the compounds.

Risks to ecological health are often considered in respect to the risks various compounds within the environment pose to ecological health under a given land use scenario and exist for the protection of soil processes, plant species and organisms that inhabit or contact soils.

In relation to the site's data set, concentrations of COPCs were generally reported below the adopted ecological criteria (ESLs/EILs), with the exception of the heavy metals of copper, nickel and zinc, petroleum hydrocarbons, and B(a)P, as presented in **Section 9**.

A review of the borelogs indicate that basalt/dolerite (basic intrusive rock, i.e. blue metal) gravels were present in most locations beneath hardstand and within fill materials. These types of rock are naturally enriched in the heavy metals of nickel and zinc and are the likely source of these compounds in soil.

In relation to the reported concentrations of B(a)P and TRH reported in excess of the adopted ecological screening levels, observations made during the completion of field works indicated that vegetation in proximity to sampling locations that reported elevated levels of these compounds, and across the site in general, appeared to be healthy with no visual indicators of vegetative stress, indicating that soil processes responsible for ecological health did not appear to be inhibited.

Furthermore, NEPC (2013) notes that high molecular weight PAHs such as B(a)P are not readily taken up by plants, and as such are unlikely to pose an unacceptable risk to plant growth. This would particularly be the case of PAH sources such as ash where the PAHs are bound into the matrix.

In relation to the current use of the site as a primary school, noting that the school is currently covered by hardstand and is expected to operate in a condition similar to those observed during the investigation at the site, JBS&G do not consider there to be a complete contamination source-receptor pathway that would present a potentially unacceptable risk to current users of the site.

Considering the proposed future use as a secondary school, it is considered contamination in fill will require to be managed during and following redevelopment activities to ensure there are no complete source-receptor pathways to contaminants.

10.2 Background Soil Concentrations

Soil samples collected from material indicated metal concentrations were below the background metal concentrations provided in Olszowy et. al. (1995) and were below the adopted site criteria (**Section 7**) (for natural materials only).

10.3 Chemical Mixtures

There were no potential chemical mixtures identified during the investigation that may pose an unacceptable contamination risk at the site with respect to future site users.

10.4 Aesthetic Issues

JBS&G noted potential aesthetic issues during the intrusive investigations at the site, relating primarily to anthropogenic inclusions of asphalt, ash, plastics and paper within fill materials. Hydrocarbon odours were noted by DP (2018) at BH18 (Jenkins Street) and at BH_P_07 from 0.2 to 1.2 m bgs (PID reported at 3.9 to 8.2 ppm over this interval). However, as per NEPC (2013) guidance, the presence of small quantities of non-hazardous inert materials and low odour residue (for example, weak petroleum hydrocarbon odours) that are expected to decrease over time should not be a cause of concern or limit the use of a site. Furthermore, sites with well-covered known inert materials that present no health hazard such as brick fragments are of low concern for both non-sensitive and sensitive land uses. As such, JBS&G do not consider there to be any significant aesthetic impacts at the site based on the collected data.

No other odours, staining or ACM was not detected during intrusive investigations at any other location.

10.5 Potential Migration of Contaminants

The potential for migration of contaminants offsite is considered low given the nature, distribution and depth of identified contamination. JBS&G note that concrete/asphalt hardstand exists across the surface of the site and as such, JBS&G do not consider there to be significant pathways for percolating surface waters to interact with the identified impacts in soils. Furthermore, natural clays beneath fill at the site are likely to retard vertical migration of percolating water, mitigating potential risks to groundwater and / or onsite receptors at the site.

10.6 Site Management Strategy

Based on the scope of investigation undertaken, and in accordance with the limitations in **Section 12**, JBS&G consider the site is suitable for the current land use subject to the current configuration of the site being maintained (e.g. hardstand to remain overlying fill materials to remove access to underlying soils from the surface). Should excavation works be required prior to the commencement of redevelopment activities at the site, JBS&G recommend the completion of a Construction Environmental Management Plan (CEMP) or similar to ensure that the current site configuration that enables the site to be considered suitable under the current site uses, are maintained.

JBS&G recommend the development of a Remedial Action Plan (RAP) to manage the potentially unacceptable risks to future site users (and construction workers) based on the identified soil contamination at the site, such that the site can be considered suitable for the proposed education land use.

11. Conclusions and Recommendations

Based on the scope of investigation undertaken, and in accordance with the limitations in **Section 12**, the following conclusions are made:

- Potentially unacceptable concentrations of COPCs were identified within soils at the site, primarily associated with petroleum hydrocarbons and PAHs;
- Based on the current configuration and uses of the site, JBS&G do not consider there to be complete source-receptor pathways that would result in potentially unacceptable risk to current site users (i.e. concrete hardstand separates impacted soils from the ground surface);
- Should excavation works be required prior to the commencement of redevelopment activities at the site, JBS&G recommend the development of a CEMP, or similar, to ensure that the current site configuration that enables the site to be considered suitable under the current site uses, are maintained; and
- JBS&G recommend the development of a RAP to guide the required management of identified soil contamination during and after development such that the site can be considered suitable for the proposed educational land use.

12. Limitations

This report has been prepared for use by the client who has commissioned the works in accordance with the project brief only, and has been based in part on information obtained from the client and other parties.

The advice herein relates only to this project and all results conclusions and recommendations made should be reviewed by a competent person with experience in environmental investigations, before being used for any other purpose.

JBS&G accepts no liability for use or interpretation by any person or body other than the client who commissioned the works. This report should not be reproduced without prior approval by the client, or amended in any way without prior approval by JBS&G, and should not be relied upon by other parties, who should make their own enquiries.

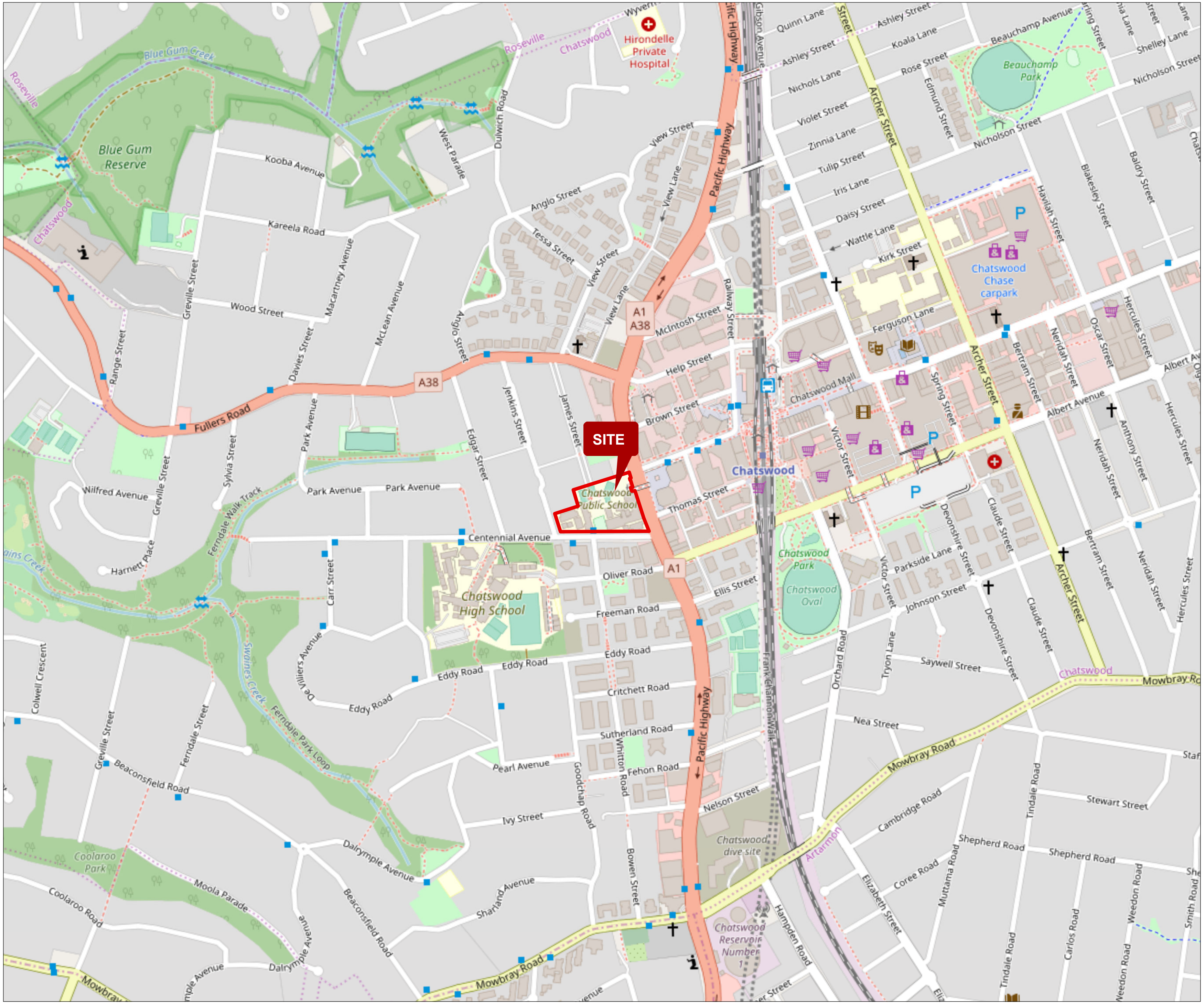
Sampling and chemical analysis of environmental media is based on appropriate guidance documents made and approved by the relevant regulatory authorities. Conclusions arising from the review and assessment of environmental data are based on the sampling and analysis considered appropriate based on the regulatory requirements.

Limited sampling and laboratory analyses were undertaken as part of the investigations undertaken, as described herein. Ground conditions between sampling locations and media may vary, and this should be considered when extrapolating between sampling points. Chemical analytes are based on the information detailed in the site history. Further chemicals or categories of chemicals may exist at the site, which were not identified in the site history and which may not be expected at the site.

Changes to the subsurface conditions may occur subsequent to the investigations described herein, through natural processes or through the intentional or accidental addition of contaminants. The conclusions and recommendations reached in this report are based on the information obtained at the time of the investigations.

This report does not provide a complete assessment of the environmental status of the site, and it is limited to the scope defined herein. Should information become available regarding conditions at the site including previously unknown sources of contamination, JBS&G reserves the right to review the report in the context of the additional information.

Figures



Legend:

🟥 Approximate Site Boundary

JBS&G

Job No: 55579	
Client: Pells Sullivan Meynik	
Version: R02 Rev B	Date 25/10/2019
Drawn By: AV	Checked By: DD
Scale 1:10,000	

0 120 240
metres

Coord. Sys. GDA 1994 MGA Zone 56

5 Centennial Avenue
Chatswood, NSW

Public School

SITE LOCATION

FIGURE 1

File Name: \\JBSG-NSW-FS01\Company Data\Projects\Pells Sullivan Meynink\55579 Chatswood Education Precint\GIS\Maps\R02 Rev B\55579_01_SiteLoc.mxd
Reference: © OpenStreetMap (and) contributors, CC-BY-SA

Legend:
🟥 Approximate Site Boundary
▨ Demountable Buildings

JBS&G

Job No: 55579

Client: Pells Sullivan Meynik

Version: R02 Rev B	Date 25/10/2019
Drawn By: AV	Checked By: DD

Scale 1:850

0 10 20
metres

Coord. Sys. GDA 1994 MGA Zone 56

5 Centennial Avenue
Chatswood, NSW

Primary School

SITE LAYOUT

FIGURE 2

File Name: \\JBSG-NSW-FS01\Company Data\Projects\Pells Sullivan Meynik\55579 Chatswood Education Precint\GIS\Maps\R02 Rev B\55579_02_SiteLay.mxd
Reference: Nearmap - nearmap.com.au - Imagery 27-12-2018

Legend:

🟥 Approximate Site Boundary

● Sample Locations (JBS&G 2019)

● Historical Sample Locations (DP 2018)

JBS&G

Job No: 55579	
Client: Pells Sullivan Meynik	
Version: R02 Rev B	Date 25/10/2019
Drawn By: AV/AS	Checked By: DD
Scale 1:850	

0 10 20

metres

Coord. Sys. GDA 1994 MGA Zone 56

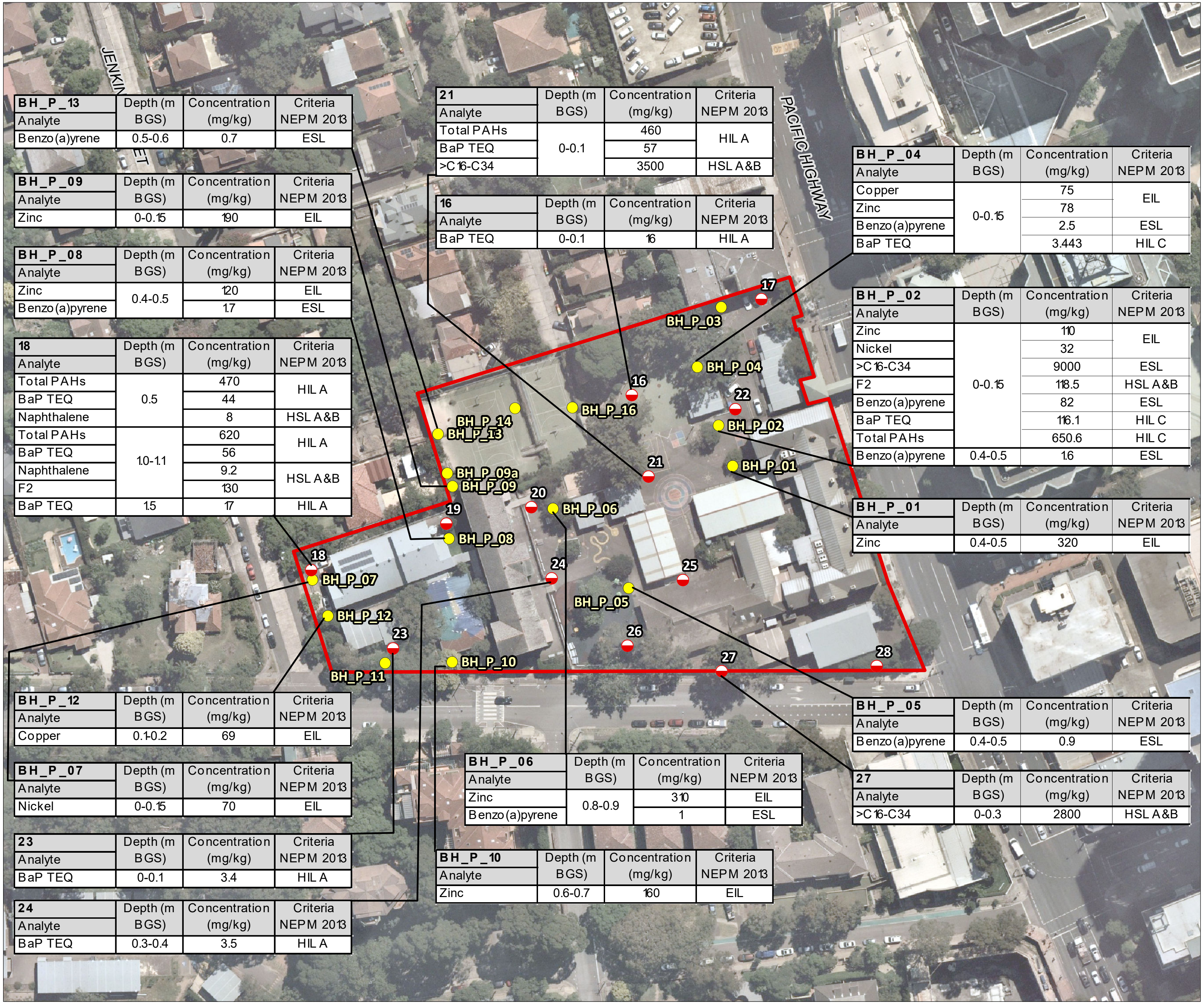
5 Centennial Avenue
Chatswood, NSW

Primary School

HISTORICAL SAMPLE LOCATIONS

FIGURE 3

File Name: \\JBSG-NSW-FS01\Company Data\Projects\Pells Sullivan Meynik\55579 Chatswood Education Precint\GIS\Maps\R02 Rev B\55579_03_SampleLoc.mxd
Reference: Nearmap - nearmap.com.au - Imagery 27-12-2018



BH_P_13	Depth (m	Concentration	Criteria
Analyte	BGS)	(mg/kg)	NEPM 2013
Benzo(a)yrene	0.5-0.6	0.7	ESL

BH_P_09	Depth (m	Concentration	Criteria
Analyte	BGS)	(mg/kg)	NEPM 2013
Zinc	0-0.15	190	EIL

BH_P_08	Depth (m	Concentration	Criteria
Analyte	BGS)	(mg/kg)	NEPM 2013
Zinc	0.4-0.5	120	EIL
Benzo(a)pyrene		1.7	ESL

18	Depth (m	Concentration	Criteria
Analyte	BGS)	(mg/kg)	NEPM 2013
Total PAHs	0.5	470	HIL A
BaP TEQ		44	
Naphthalene		8	HSL A&B
Total PAHs	1.0-1.1	620	HIL A
BaP TEQ		56	
Naphthalene		9.2	HSL A&B
F2		130	
BaP TEQ	1.5	17	HIL A

BH_P_12	Depth (m	Concentration	Criteria
Analyte	BGS)	(mg/kg)	NEPM 2013
Copper	0.1-0.2	69	EIL

BH_P_07	Depth (m	Concentration	Criteria
Analyte	BGS)	(mg/kg)	NEPM 2013
Nickel	0-0.15	70	EIL

23	Depth (m	Concentration	Criteria
Analyte	BGS)	(mg/kg)	NEPM 2013
BaP TEQ	0-0.1	3.4	HIL A

24	Depth (m	Concentration	Criteria
Analyte	BGS)	(mg/kg)	NEPM 2013
BaP TEQ	0.3-0.4	3.5	HIL A

21	Depth (m	Concentration	Criteria
Analyte	BGS)	(mg/kg)	NEPM 2013
Total PAHs	0-0.1	460	HIL A
BaP TEQ		57	
>C16-C34		3500	HSL A&B

16	Depth (m	Concentration	Criteria
Analyte	BGS)	(mg/kg)	NEPM 2013
BaP TEQ	0-0.1	16	HIL A

BH_P_06	Depth (m	Concentration	Criteria
Analyte	BGS)	(mg/kg)	NEPM 2013
Zinc	0.8-0.9	310	EIL
Benzo(a)pyrene		1	ESL

BH_P_10	Depth (m	Concentration	Criteria
Analyte	BGS)	(mg/kg)	NEPM 2013
Zinc	0.6-0.7	160	EIL

BH_P_04	Depth (m	Concentration	Criteria
Analyte	BGS)	(mg/kg)	NEPM 2013
Copper	0-0.15	75	EIL
Zinc		78	
Benzo(a)pyrene		2.5	ESL
BaP TEQ		3.443	HIL C

BH_P_02	Depth (m	Concentration	Criteria
Analyte	BGS)	(mg/kg)	NEPM 2013
Zinc	0-0.15	110	EIL
Nickel		32	
>C16-C34		9000	ESL
F2		118.5	HSL A&B
Benzo(a)pyrene		82	ESL
BaP TEQ		116.1	HIL C
Total PAHs		650.6	HIL C
Benzo(a)pyrene	0.4-0.5	1.6	ESL

BH_P_01	Depth (m	Concentration	Criteria
Analyte	BGS)	(mg/kg)	NEPM 2013
Zinc	0.4-0.5	320	EIL

BH_P_05	Depth (m	Concentration	Criteria
Analyte	BGS)	(mg/kg)	NEPM 2013
Benzo(a)pyrene	0.4-0.5	0.9	ESL

27	Depth (m	Concentration	Criteria
Analyte	BGS)	(mg/kg)	NEPM 2013
>C16-C34	0-0.3	2800	HSL A&B

Legend:

🟥 Approximate Site Boundary

● Sample Locations (JBS&G 2019)

● Historical Sample Locations (DP 2018)

Note - F2= >C10-C16 less naphthalene

JBS&G

Job No: 55579

Client: Pells Sullivan Meynik

Version: R02 Rev B | Date 25/10/2019

Drawn By: AV/AS | Checked By: DD

Scale 1:1,500

0 10 20
metres

Coord. Sys. GDA 1994 MGA Zone 56

5 Centennial Avenue
Chatswood, NSW

Primary School

SOIL EXCEEDANCES

FIGURE 4

File Name: \\JBSG-NSW-FS01\Company Data\Projects\Pells Sullivan Meynink\55579 Chatswood Education Precint\GIS\Maps\R02 Rev B\55579_04_Exceedances.mxd
Reference: Nearmap - nearmap.com.au - Imagery 27-12-2018

Tables

Table A - Summary Analytical Data

Project Number: 55579

Project Name: Chatswood Education Precinct

			Metals & Metalloids								TPHs (NEPC 1999)					TRHs (NEPC 2013)						
			Arsenic (Total)	Cadmium	Chromium (Total)	Copper	Lead	Mercury (Inorganic)	Nickel	Zinc	C6-C9 Fraction	C10-C14 Fraction	C15-C28 Fraction	C29-C36 Fraction	C10-C36 Fraction (Total)	>C10-C16 Fraction	>C16-C34 Fraction	>C34-C40 Fraction	>C10-C40 Fraction (Total)	>C10-C16 less Naphthalene (F2)	C6-C10 Fraction	C6-C10 less BTEX (F1)
			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL			2	0.4	5	5	5	0.1	5	5	20	20	50	50	50	50	100	100	100	50	20	20
NEPM 2013 EIL - Urban Residential (generic)			100		190[#1]	60[#2]	1100		30[#3]	70[#4]												
NEPM 2013 ESL Urban Residential and Public Open Space, Coarse Soil																	300[#5]	2800[#5]		120[#6]		180[#6]
NEPM 2013 HSL Asbestos in Soil - Bonded ACM - Recreational - HSL C																						
NEPM 2013 HSL Asbestos in Soil - FA & AF - HSL																						
NEPM 2013 Soil HIL C			300[#9]	90	300[#10]	17000	600[#11]	80[#12]	1200	30000												
NEPM 2013 Soil HSL A & HSL B for Vapour Intrusion - Sand 0 to <1m																				110[#16]		45[#17]
Sample ID	**Sample Date**	**Report Number**																				
BH_P_01 0.4-0.5	23/01/2019	637818	8.2	<0.4	15	<5	16	<0.1	<5	320	<20	<20	<50	<50	<50	<50	<100	<100	<100	<50	<20	<20
BH_P_02 0-0.15	23/01/2019	637818	2.1	0.7	29	44	100	<0.1	32	110	<40	<20	6400	3900	10,300	120	9000	2200	11,320	118.5	<40	<40
BH_P_02 0.4-0.5	23/01/2019	639419	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH_P_03 1-1.1	23/01/2019	637818	4.1	<0.4	14	<5	23	<0.1	<5	6.3	<20	<20	<50	<50	<50	<50	<100	<100	<100	<50	<20	<20
BH_P_04 0-0.15	23/01/2019	637818	3.8	<0.4	12	75	58	<0.1	8.3	78	-	-	-	-	-	-	-	-	-	-	-	-
BH_P_05 0.4-0.5	23/01/2019	637818	4.4	<0.4	14	8.8	19	<0.1	8.5	14	-	-	-	-	-	-	-	-	-	-	-	-
BH_P_06 0.8-0.9	23/01/2019	637818	4.5	0.4	11	34	98	0.1	6.7	310	<20	<20	<50	<50	<50	<50	<100	<100	<100	<50	<20	<20
BH_P_07 0-0.15	22/01/2019	637818	<2	<0.4	42	55	<5	<0.1	70	55	-	-	-	-	-	-	-	-	-	-	-	-
BH_P_08 0.4-0.5	24/01/2019	637818	4	<0.4	9.1	18	180	<0.1	6	120	-	-	-	-	-	-	-	-	-	-	-	-
BH_P_09 0-0.15	24/01/2019	637818	2.7	<0.4	5.1	15	14	<0.1	<5	190	<20	<20	54	120	174	<50	130	<100	130	<50	<20	<20
BH_P_10 0.6-0.7	24/01/2019	637818	4.9	<0.4	13	20	32	<0.1	<5	160	-	-	-	-	-	-	-	-	-	-	-	-
BH_P_12 0.1-0.2	11/10/2019	682072	5.3	<0.4	15	69	24	<0.1	6	26	<20	<20	<50	<50	<50	<50	<100	<100	<100	<50	<20	<20
BH_P_13 0.1-0.2	10/10/2019	682072	13	<0.4	12	35	53	<0.1	<5	36	<20	<20	<50	<50	<50	<50	<100	<100	<100	<50	<20	<20
QA01 (primary BH_P_13 0.1-0.2)	10/10/2019	228207	19	<0.4	9	31	37	<0.1	5	30	<25	<50	<100	<100	-	<50	<100	<100	<50	<50	<25	<25
QC01 (primary BH_P_13 0.1-0.2)	10/10/2019	682072	12	<0.4	14	39	48	<0.1	<5	40	<20	<20	<50	<50	<50	<50	<100	<100	<100	<50	<20	<20
BH_P_13 0.5-0.6	10/10/2019	682072	16	<0.4	10	50	37	<0.1	8.6	49	<20	<20	<50	<50	<50	<50	<100	<100	<100	<50	<20	<20
BH_P_14 0.4-0.5	10/10/2019	682072	5.9	<0.4	15	18	21	<0.1	7	38	<20	<20	<50	<50	<50	<50	<100	<100	<100	<50	<20	<20
BH_P_16 0.4-0.5	11/10/2019	682072	5	<0.4	21	37	38	<0.1	5.4	24	<20	<20	<50	<50	<50	<50	<100	<100	<100	<50	<20	<20

Env Stds Comments

#1:TV taken for Chromium (III), Clay Content of 1%

#2:TV taken for pH 4.5

#3:TV taken for CEC 5

#4:TV taken for pH 4 and CEC 5

#5:ESLs are of low reliability.

#6:ESLs are of moderate reliability.

#7:Recreational C includes public open space such as parks, playgrounds, playing fields (e.g. ovals), secondary schools and unpaved footpaths.

#8:The screening level of 0.001% w/w asbestos in soil for FA and AF (i.e. non-bonded/friable asbestos) only applies where the FA and AF are able to be quantified by gravimetric procedures (refer Section 4.10). This screening level is not applicable to free fibres.

#9:Key limitations of HSL should be referred to prior to application in Friebel and Nadebaum (2011b and 2011d).

#10:TV adopted from Chromium (VI)

#11:Assumptions of HSL are presented in Friebel and Nadebaum (2011a and 2011b).

#12:Refer to HSL and soil saturation concentration limit.

#13:Refer to Section 8.2 and Appendix J in Friebel and Nadebaum (2011a).

#14:TV maybe be multiplied by a factor to account for biodegradation of vapour

#15:HIL relates to non-dioxin-like PCBs only. If PCB source is suspected a site-specific assessment should be untertaken

#16:To obtain F2 subtract naohthalene from >C10-C16.

#17:To obtain F1 subtract the sum of BTEX from C6-C10.

Table A - Summary Analytical Data
Project Number: 55579
Project Name: Chatswood Education Precinct

			BTEXN							Polycyclic Aromatic Hydrocarbons																
			Benzene	Ethylbenzene	Toluene	Xylene (o)	Xylene (m & p)	Xylene (Total)	Naphthalene	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a)pyrene	Benzo(b,j)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Carcinogenic PAHs as B(a)P TEQ	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Phenanthrene	PAHs (Total)	Pyrene
			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL			0.1	0.1	0.1	0.1	0.2	0.3	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5		0.5	0.5	0.5	0.5	0.5	0.5
NEPM 2013 EIL - Urban Residential (generic)									170																	
NEPM 2013 ESL Urban Residential and Public Open Space, Coarse Soil			50[#5]	70[#5]	85[#5]			105[#5]						0.7[#5]												
NEPM 2013 HSL Asbestos in Soil - Bonded ACM - Recreational - HSL C																										
NEPM 2013 HSL Asbestos in Soil - FA & AF - HSL																										
NEPM 2013 Soil HIL C																				3[#13]					300[#14]	
NEPM 2013 Soil HSL A & HSL B for Vapour Intrusion - Sand 0 to <1m			0.5	55	160			40	3																	
Sample ID	**Sample Date**	**Report Number**																								
BH_P_01 0.4-0.5	23/01/2019	637818	<0.1	<0.1	<0.1	<0.1	<0.2	<0.3	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.21[#5]	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH_P_02 0-0.15	23/01/2019	637818	<0.2	<0.2	<0.2	<0.2	<0.4	<0.6	0.7	1	1.7	7.2	47	82	55	41	59	48	11	116.1[#2]	96	1	61	29	650.6	110
BH_P_02 0.4-0.5	23/01/2019	639419	-	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	1.4	1.6	1.1	1	1.4	1.6	<0.5	2.336[#2]	3.5	<0.5	0.7	1.2	17.1	3.6
BH_P_03 1-1.1	23/01/2019	637818	<0.1	<0.1	<0.1	<0.1	<0.2	<0.3	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.21[#5]	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH_P_04 0-0.15	23/01/2019	637818	-	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	1.5	2.5	1.9	0.8	1.9	1.5	<0.5	3.443[#2]	2.6	<0.5	1.4	1	18	2.9
BH_P_05 0.4-0.5	23/01/2019	637818	-	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	0.6	0.9	0.5	<0.5	0.7	0.5	<0.5	1.408[#2]	1.3	<0.5	0.7	0.9	7.5	1.4
BH_P_06 0.8-0.9	23/01/2019	637818	<0.1	<0.1	<0.1	<0.1	<0.2	<0.3	<0.5	<0.5	<0.5	<0.5	0.6	1	0.9	<0.5	1	0.7	<0.5	1.56[#2]	1.1	<0.5	0.5	<0.5	7	1.2
BH_P_07 0-0.15	22/01/2019	637818	-	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.21[#5]	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH_P_08 0.4-0.5	24/01/2019	637818	-	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	1.3	1.7	1.2	0.6	1.5	1.1	<0.5	2.457[#2]	2.5	<0.5	0.9	1.5	14.8	2.5
BH_P_09 0-0.15	24/01/2019	637818	<0.1	<0.1	<0.1	<0.1	<0.2	<0.3	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.21[#5]	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH_P_10 0.6-0.7	24/01/2019	637818	-	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.21[#5]	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH_P_12 0.1-0.2	11/10/2019	682072	<0.1	<0.1	<0.1	<0.1	<0.2	<0.3	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.21[#6]	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH_P_13 0.1-0.2	10/10/2019	682072	<0.1	<0.1	<0.1	<0.1	<0.2	<0.3	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.21[#6]	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
QA01 (primary BH_P_13 0.1-0.2)	10/10/2019	228207	<0.2	<1	<0.5	<1	<2	<3	<0.1	<0.1	<0.1	<0.1	0.3	0.4	-	0.3	-	0.3	<0.1	0.506[#2]	0.5	<0.1	0.2	0.1	-	0.5
QC01 (primary BH_P_13 0.1-0.2)	10/10/2019	682072	<0.1	<0.1	<0.1	<0.1	<0.2	<0.3	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.21[#6]	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH_P_13 0.5-0.6	10/10/2019	682072	<0.1	<0.1	<0.1	<0.1	<0.2	<0.3	<0.5	<0.5	<0.5	<0.5	0.6	0.7	0.8	<0.5	0.7	0.7	<0.5	1.195[#3]	0.8	<0.5	<0.5	<0.5	5.2	0.9
BH_P_14 0.4-0.5	10/10/2019	682072	<0.1	<0.1	<0.1	<0.1	<0.2	<0.3	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.21[#6]	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BH_P_16 0.4-0.5	11/10/2019	682072	<0.1	<0.1	<0.1	<0.1	<0.2	<0.3	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.21[#6]	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

Env Stds Comments
#1:TV taken for Chromium (III), Clay Content of 1%
#2:TV taken for pH 4.5
#3:TV taken for CEC 5
#4:TV taken for pH 4 and CEC 5
#5:ESLs are of low reliability.
#6:ESLs are of moderate reliability.
#7:Recreational C includes public open space such as parks, playgrounds, playing fiel
#8:The screening level of 0.001% w/w asbestos in soil for FA and AF (i.e. non-bondec
#9:Key limitations of HSL should be referred to prior to application in Friebel and Nac
#10:TV adopted from Chromium (VI)
#11:Assumptions of HSL are presented in Friebel and Nadebaum (2011a and 2011b)
#12:Refer to HSL and soil saturation concentration limit.
#13:Refer to Section 8.2 and Appendix J in Friebel and Nadebaum (2011a).
#14:TV maybe be multiplied by a factor to account for biodegradation of vapour
#15:HIL relates to non-dioxin-like PCBs only. If PCB source is suspected a site-specific
#16:To obtain F2 subtract naohthalene from >C10-C16.
#17:To obtain F1 subtract the sum of BTEX from C6-C10.

Table A - Summary Analytical Data

Project Number: 55579

Project Name: Chatswood Education Precinct

			Organochlorine Pesticides																					
			4,4-DDE	Aldrin	Aldrin + Dieldrin (Sum of Total)	alpha-BHC	beta-BHC	Chlordane	DDD	DDT	Dieldrin	DDT+DDE+DDD (Sum of Total)	delta-BHC	Endosulfan alpha	Endosulfan beta	Endosulfan sulphate	Endrin	Endrin aldehyde	Endrin ketone	Heptachlor	Heptachlor Epoxide	Lindane	Methoxychlor	Toxaphene
			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL			0.05	0.05	0.05	0.05	0.05	0.1	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	1
NEPM 2013 EIL - Urban Residential (generic)										180														
NEPM 2013 ESL Urban Residential and Public Open Space, Coarse Soil																								
NEPM 2013 HSL Asbestos in Soil - Bonded ACM - Recreational - HSL C																								
NEPM 2013 HSL Asbestos in Soil - FA & AF - HSL																								
NEPM 2013 Soil HIL C					10			70				400					20			10			400	30
NEPM 2013 Soil HSL A & HSL B for Vapour Intrusion - Sand 0 to <1m																								
Sample ID	**Sample Date**	**Report Number**																						
BH_P_01 0.4-0.5	23/01/2019	637818	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<1
BH_P_02 0-0.15	23/01/2019	637818	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<1
BH_P_02 0.4-0.5	23/01/2019	639419	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH_P_03 1-1.1	23/01/2019	637818	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<1
BH_P_04 0-0.15	23/01/2019	637818	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH_P_05 0.4-0.5	23/01/2019	637818	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH_P_06 0.8-0.9	23/01/2019	637818	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<1
BH_P_07 0-0.15	22/01/2019	637818	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH_P_08 0.4-0.5	24/01/2019	637818	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH_P_09 0-0.15	24/01/2019	637818	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<1
BH_P_10 0.6-0.7	24/01/2019	637818	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH_P_12 0.1-0.2	11/10/2019	682072	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH_P_13 0.1-0.2	10/10/2019	682072	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
QA01 (primary BH_P_13 0.1-0.2)	10/10/2019	228207	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
QC01 (primary BH_P_13 0.1-0.2)	10/10/2019	682072	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH_P_13 0.5-0.6	10/10/2019	682072	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH_P_14 0.4-0.5	10/10/2019	682072	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH_P_16 0.4-0.5	11/10/2019	682072	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Env Stds Comments

#1:TV taken for Chromium (III), Clay Content of 1%

#2:TV taken for pH 4.5

#3:TV taken for CEC 5

#4:TV taken for pH 4 and CEC 5

#5:ESLs are of low reliability.

#6:ESLs are of moderate reliability.

#7:Recreational C includes public open space such as parks, playgrounds, playing fiel

#8:The screening level of 0.001% w/w asbestos in soil for FA and AF (i.e. non-bondec

#9:Key limitations of HSL should be referred to prior to application in Friebel and Nac

#10:TV adopted from Chromium (VI)

#11:Assumptions of HSL are presented in Friebel and Nadebaum (2011a and 2011b)

#12:Refer to HSL and soil saturation concentration limit.

#13:Refer to Section 8.2 and Appendix J in Friebel and Nadebaum (2011a).

#14:TV maybe be multiplied by a factor to account for biodegradation of vapour

#15:HIL relates to non-dioxin-like PCBs only. If PCB source is suspected a site-specific

#16:To obtain F2 subtract naohthalene from >C10-C16.

#17:To obtain F1 subtract the sum of BTEX from C6-C10.

Table A - Summary Analytical Data

Project Number: 55579

Project Name: Chatswood Education Precinct

			Polychlorinated Biphenyls								Chlorinated Benzenes	Asbestos										Other
			Aroclor 1016	Aroclor 1221	Aroclor 1232	Aroclor 1242	Aroclor 1248	Aroclor 1254	Aroclor 1260	PCBs (Total)	Hexachlorobenzene	Approx. Sample Mass	Asbestos from ACM in Soil	Asbestos from FA & AF in Soil	Mass ACM	Mass Asbestos in ACM	Mass FA	Mass Asbestos in FA	Mass AF	Mass Asbestos in AF	Mass Asbestos in FA & AF	% Moisture 103oC
			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	g	%w/w	%w/w	g	g	g	g	g	g	g	%
EQL			0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.05											1
NEPM 2013 EIL - Urban Residential (generic)																						
NEPM 2013 ESL Urban Residential and Public Open Space, Coarse Soil																						
NEPM 2013 HSL Asbestos in Soil - Bonded ACM - Recreational - HSL C													0.02[#7]									
NEPM 2013 HSL Asbestos in Soil - FA & AF - HSL														0.001[#8]								
NEPM 2013 Soil HIL C										1[#15]	10											
NEPM 2013 Soil HSL A & HSL B for Vapour Intrusion - Sand 0 to <1m																						
Sample ID	**Sample Date**	**Report Number**																				
BH_P_01 0.4-0.5	23/01/2019	637818	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	488	0	0	0	0	0	0	0	0	0	20
BH_P_02 0-0.15	23/01/2019	637818	-	-	-	-	-	-	-	-	<0.05	697	0	0	0	0	0	0	0	0	0	2.9
BH_P_02 0.4-0.5	23/01/2019	639419	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8.6
BH_P_03 1-1.1	23/01/2019	637818	-	-	-	-	-	-	-	-	<0.05	685	0	0	0	0	0	0	0	0	0	14
BH_P_04 0-0.15	23/01/2019	637818	-	-	-	-	-	-	-	-	-	818	0	0	0	0	0	0	0	0	0	8.4
BH_P_05 0.4-0.5	23/01/2019	637818	-	-	-	-	-	-	-	-	-	643	0	0	0	0	0	0	0	0	0	8.8
BH_P_06 0.8-0.9	23/01/2019	637818	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	544	0	0	0	0	0	0	0	0	0	16
BH_P_07 0-0.15	22/01/2019	637818	-	-	-	-	-	-	-	-	-	789	0	0	0	0	0	0	0	0	0	6.4
BH_P_08 0.4-0.5	24/01/2019	637818	-	-	-	-	-	-	-	-	-	618	0	0	0	0	0	0	0	0	0	17
BH_P_09 0-0.15	24/01/2019	637818	-	-	-	-	-	-	-	-	<0.05	608	0	0	0	0	0	0	0	0	0	5.7
BH_P_10 0.6-0.7	24/01/2019	637818	-	-	-	-	-	-	-	-	-	706	0	0	0	0	0	0	0	0	0	15
BH_P_12 0.1-0.2	11/10/2019	682072	-	-	-	-	-	-	-	-	-	422	0	0	0	0	0	0	0	0	0	19
BH_P_13 0.1-0.2	10/10/2019	682072	-	-	-	-	-	-	-	-	-	660	0	0	0	0	0	0	0	0	0	20
QA01 (primary BH_P_13 0.1-0.2)	10/10/2019	228207	-	-	-	-	-	-	-	-	-	657	0	0	0	0	0	0	0	0	0	21
QC01 (primary BH_P_13 0.1-0.2)	10/10/2019	682072	-	-	-	-	-	-	-	-	-	430	0	0	0	0	0	0	0	0	0	22
BH_P_13 0.5-0.6	10/10/2019	682072	-	-	-	-	-	-	-	-	-	474	0	0	0	0	0	0	0	0	0	23
BH_P_14 0.4-0.5	10/10/2019	682072	-	-	-	-	-	-	-	-	-	629	0	0	0	0	0	0	0	0	0	14
BH_P_16 0.4-0.5	11/10/2019	682072	-	-	-	-	-	-	-	-	-	375	0	0	0	0	0	0	0	0	0	21

Env Stds Comments

#1:TV taken for Chromium (III), Clay Content of 1%

#2:TV taken for pH 4.5

#3:TV taken for CEC 5

#4:TV taken for pH 4 and CEC 5

#5:ESLs are of low reliability.

#6:ESLs are of moderate reliability.

#7:Recreational C includes public open space such as parks, playgrounds, playing fiel

#8:The screening level of 0.001% w/w asbestos in soil for FA and AF (i.e. non-bondec

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#11:Assumptions of HSL are presented in Friebel and Nadebaum (2011a and 2011b)

#12:Refer to HSL and soil saturation concentration limit.

#13:Refer to Section 8.2 and Appendix J in Friebel and Nadebaum (2011a).

#14:TV maybe be multiplied by a factor to account for biodegradation of vapour

#15:HIL relates to non-dioxin-like PCBs only. If PCB source is suspected a site-specific

#16:To obtain F2 subtract naohthalene from >C10-C16.

#17:To obtain F1 subtract the sum of BTEX from C6-C10.

Table K1: Summary of Laboratory Results for Soil Analysis

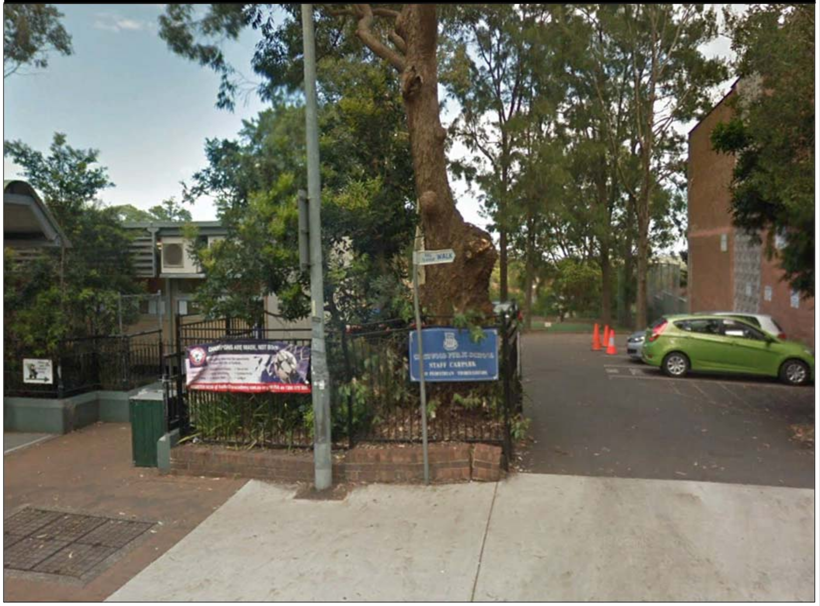
Sample	Soil Type (C=coarse F=fine)	Date Sampled	Heavy Metals									PAH						TRH/TPH[i]	
			As	Cd	Cr[c]	Cu	Pb	TCLP Pb	Hg	Ni	Zn	total[d]	TCLP total	BaP TEQ	BaP	TCLP BaP	Naphthalene	C_6 - C_9	C_{10} - C_{36}[e]
			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/L	mg/kg	mg/kg	mg/kg	mg/kg	mg/L	mg/kg	mg/kg	mg/L	mg/kg	mg/kg	mg/kg
Soil Assessment Criteria (SAC) - NEPM (as amended 2013) (refer to report body for details)																			
Residential with Accessible Soil																			
HIL A			100	20	100[c]	6,000	300		40	400	7,400	300		3					
EIL/ ESL	coarse		100		250	110	1,100			35	250				0.7		170		
EIL/ ESL	fine		100		640	110	1,100			270	290				0.7		170		
Management Limit	coarse																		
Management Limit	fine																		
HSL A&B, vapour intrusion, 0-<1m, sand																	3		
HSL A&B, vapour intrusion, 0-<1m, clay																	5		
HSL A, direct contact																	1,400		
Waste Classification Thresholds																			
General Solid	CT1		100	20	100		100		4	40		200			0.8			650	10,000
	SCC1/TCLP1		500	100	1,900		1,500	5	50	1,050		200			10	0.04		650	10,000
Restricted Solid	CT2		400	80	400		400		16	160		800			3.2			2,600	40,000
	SCC2/TCLP2		2,000	400	7,600		6,000	20	200	4,200		800			23	0.16		2,600	40,000
Published Background Ranges for Assessment of Natural Soils																			
NEPC (1999)			1-50	1	5-1000	2-100	2-200		0.03	5-500	10-300								
ANZECC (1992)			0.2-30	0.04-2	0.5-110	1-190	<2-200		0.001-0.1	2-400	2-180	0.95-5							
ANZECC (2000)			1-53	0.016-0.78	2.5-673	0.4-412	2-81			1-517	1-263								
Laboratory Results																			
High School																			
1 / 0.5-0.6	filling-F	22/01/18	6	<0.4	12	20	52		<0.1	8	280	<0.05		<0.5	<0.05		<0.1	<25	<250
REPLICATE1-220118	filling-F	22/01/18	13	<0.4	16	27	58		<0.1	13	490	<0.5		<0.5	<0.5		<0.5		
2 / 0.1	silty clay?	23/01/18	4	<0.4	14	13	70		<0.1	3	86	0.2		<0.5	<0.05		<0.1	<25	195
3 / 0-0.1	silty clay?	23/01/18	5	<0.4	12	14	18		<0.1	3	15	0.51		<0.5	0.09		<0.1	<25	<250
Replicate 6	silty clay?	23/01/18	5	<0.4	12	15	33		<0.1	4	28	2.6		<0.5	0.2		<0.1		
4 / 0-0.1	filling-C	22/01/18	9	<0.4	11	25	62		0.1	7	120	8		1	0.73		<0.1	<25	<250
5 / 1-1.1	filling-F	22/01/18	7	<0.4	14	18	26		<0.1	7	34	<0.05		<0.5	<0.05		<0.1	<25	<250
6 / 0.2-0.3	silty clay	22/01/18	<4	<0.4	5	8	16		<0.1	1	3	<0.05		<0.5	<0.05		<0.1	<25	<250
7 / 0-0.1	filling-C	23/01/18	7	<0.4	28	36	38		<0.1	25	83	0.1		<0.5	<0.05		<0.1	<25	<250
7 / 0.5-0.6	filling-F	23/01/18	7	<0.4	12	30	**130**	0.07	<0.1	8	82	<0.05		<0.5	<0.05		<0.1	<25	<250
8 / 0-0.1	filling-C	23/01/18	<4	<0.4	41	51	15		<0.1	**46**	59	0.2		<0.5	<0.05		<0.1	<25	770
8 / 0.7-0.8	filling-F	23/01/18	8	<0.4	10	19	16		<0.1	7	31	<0.05		<0.5	<0.05		<0.1	<25	<250
9 / 0.2-0.3	filling-F	22/01/18	12	<0.4	8	56	8		<0.1	33	35	<0.05		<0.5	<0.05		<0.1	<25	775
10 / 2-2.1	filling-F	22/01/18	8	<0.4	13	21	24		<0.1	9	53	0.3		<0.5	0.06		<0.1	<25	<250
11 / 0-0.1	filling-C	23/01/18	6	<0.4	11	21	27		<0.1	5	40	46	0.004	**5.6**	**3.9**	<0.001	<1 - 0.6	<25	225
12 / 0-0.1	filling-C	23/01/18	<4	<0.4	21	35	11		<0.1	25	34	4.1		<0.5	0.3		<0.1	<25	835
Public School and Bush Campus																			
13 / 0.0-0.1	filling-C	23/01/18	4	<0.4	9	45	95		0.4	7	97	23	NIL (+)VE	**3.2**	**2.2**	<0.001	<0.1	<25	120
Replicate 4	filling-C	23/01/18	4	<0.4	16	34	88		0.4	11	83	27		**3.4**	**2.3**		0.2		
13 / 0.4-0.5	filling-C	23/01/18	5	<0.4	18	35	52		0.2	9	82	6.1		1	0.64		<0.1	<25	<250
14 / 0.0-0.1	filling-F	23/01/18	5	<0.4	10	23	29		<0.1	4	64	<0.05		<0.5	<0.05		<0.1	<25	<250
15 / 0-0.1	filling-F	19/01/18	5	<0.4	9	31	18		<0.1	10	62	<0.05		<0.5	<0.05		<0.1	<25	120
16 / 0.0-0.1	filling-C	24/01/18	6	<0.4	8	89	**130**	0.08	<0.1	8	58	86	NIL (+)VE	**16**	**11**	<0.001	0.3	<25	570
17 / 0.3-0.4	silty clay?	24/01/18	<4	<0.4	20	2	22		<0.1	3	5	3.4		0.5	0.4		<0.1	<25	<250
18 / 0.5	filling-F	23/01/18	<4	<0.4	30	39	31		<0.1	34	44	**470**		**44**	**30**		**8**	<25	1,440
18 / 1.0-1.1	filling-F	23/01/18	<4	<0.4	13	16	25		<0.1	5	14	**620**	0.08	**56**	**38**	<0.001	**9.2**	<25	1,800
18 / 1.5	filling-F	23/01/18										190		**17**	**12**		3	<25	620
19 / 0-0.1	filling-C	19/01/18	<4	<0.4	9	20	62		<0.1	5	80	22		2.1	**1.4**		<0.1	<25	<250
20 / 0.0-0.1	filling-C	24/01/18	<4	<0.4	16	28	24		0.1	19	48	0.94		<0.5	0.08		<0.1	<25	1,470
21 / 0.0-0.1	filling-C	24/01/18	<4	<0.4	35	22	61		<0.1	38	48	**460**	0.004	**57**	**39**	<0.001	0.7	<25	4,100
21 / 1-1.1	silty clay?	24/01/18										14		1.7	**1.2**		<0.1	<25	<250
22 / 0.3-0.4	filling-F	24/01/18	<4	<0.4	19	12	66		<0.1	6	30	15		2.8	**1.8**		<0.1	<25	<250
23 / 0-0.1	filling-F	19/01/18	5	<0.4	10	19	81		<0.1	5	69	31		**3.4**	**2.3**		0.1	<25	110
24 / 0.3-0.4	filling-F	24/01/18	4	<0.4	13	21	**150**	0.06	0.2	7	100	23	NIL (+)VE	**3.5**	**2.3**	<0.001	<0.1	<25	440
25 / 0.2-0.3	filling-C	24/01/18	<4	<0.4	4	2	3		<0.1	1	3	<0.05		<0.5	<0.05		<0.1	<25	<250
26 / 0.2-0.3	filling-C	24/01/18	7	<0.4	12	16	26		<0.1	6	48	4.6		0.6	0.4		<0.1	<25	280
27 / 0-0.3	filling-C	19/01/18	5	0.5	16	170	**120**		0.1	7	1,000	0.3		<0.5	0.06		<0.1	<25	4,395
28 / 0.4-0.45	filling-C	19/01/18	<4	<0.4	29	26	91		<0.1	19	150	21	NIL (+)VE	2.9	**1.9**	<0.001	0.1	<25	760
REPLICATE1-190118	filling-C	19/01/18	3.6	< 0.4	13	23	85		< 0.1	9.8	170	15.7		2.2	**1.7**		< 0.5		

Table K1: Summary of Laboratory Results for Soil A

Sample	Soil Type (C=coarse F=fine)	Date Sampled	TRH (NEPM 2013) [i]						TPH (NEPM 2013) (silica gel clean up)			BTEX				phenol	PCB [d]	OCP [d]	OPP	asbestos
			C6-C10	>C10-C16	C6 – C10 less BTEX (F1)	>C10-C16 less naphthalene (F2)	>C16-C34 (F3)	>C34-C40 (F4)	>C10-C16 [j] (F2)	>C16-C34 (F3	>C34-C40 (F4	Benzene	Toluene	Ethylbenzene	xylene [e]					
			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	0.1g/kg
Soil Assessment Criteria (SAC) - NEPM (as amendec																				
Residential with Accessible Soil																				
HIL A																3,000	1	6	340	
EIL/ ESL	coarse			120	180		300	2,800	120	300	2,800	50	85	70	105			180 (DDT)		
EIL/ ESL	fine			120	180		1,300	5,600	120	1,300	5,600	65	105	125	45			180 (DDT)		
Management Limit	coarse		700	1,000			2,500	10,000	1,000	2,500	10,000									
Management Limit	fine		800	1,000			3,500	10,000	1,000	3,500	10,000									
HSL A&B, vapour intrusion, 0-<1m, sand					45	110			110			0.5	160	55	40					
HSL A&B, vapour intrusion, 0-<1m, clay					50	280			280			0.7	480	NL	110					
HSL A, direct contact					4,400	3,300	4,500	6,300	3,300	4,500	6,300	100	14,000	4,500	12,000					
Waste Classification Thresholds																				
General Solid	CT1											10	288	600	1,000	288	<50	<50 [f]	4 [g]	nil
	SCC1/TCLP1											18	518	1,080	1,800	518	<50	<50 [f]	7.5 [g]	nil
Restricted Solid	CT2											40	1,152	2,400	4,000	1,152	<50	<50 [f]	16 [g]	nil
	SCC2/TCLP2											72	2,073	4,320	7,200	2,070	<50	<50 [f]	30 [g]	nil
Published Background Ranges for Assessment of N																				
NEPC (1999)																				
ANZECC (1992)												0.05 - 1	0.1 - 1			0.03 – 0.5	0.02 – 0.1	<0.001 - <0.97		
ANZECC (2000)																				
Laboratory Results																				
High School																				
1 / 0.5-0.6	filling-F	22/01/18	<25	<50	<25	<50	<100	<100				<0.2	<0.5	<1	<1	<5	<0.1	<0.1	<0.1	NAD
REPLICATE1-220118	filling-F	22/01/18																		
2 / 0.1	silty clay?	23/01/18	<25	<50	<25	<50	<100	120				<0.2	<0.5	<1	<1	<5	<0.1	<0.1	<0.1	NAD
3 / 0-0.1	silty clay?	23/01/18	<25	<50	<25	<50	<100	<100				<0.2	<0.5	<1	<1	<5	<0.1	<0.1	<0.1	NAD
Replicate 6	silty clay?	23/01/18																		
4 / 0-0.1	filling-C	22/01/18	<25	<50	<25	<50	<100	<100				<0.2	<0.5	<1	<1	<5	<0.1	<0.1	<0.1	NAD
5 / 1-1.1	filling-F	22/01/18	<25	<50	<25	<50	<100	<100				<0.2	<0.5	<1	<1	<5	<0.1	<0.1	<0.1	NAD
6 / 0.2-0.3	silty clay	22/01/18	<25	<50	<25	<50	<100	<100				<0.2	<0.5	<1	<1	<5	<0.1	<0.1	<0.1	
7 / 0-0.1	filling-C	23/01/18	<25	<50	<25	<50	<100	<100				<0.2	<0.5	<1	<1	<5	<0.1	<0.1	<0.1	NAD
7 / 0.5-0.6	filling-F	23/01/18	<25	<50	<25	<50	<100	<100				<0.2	<0.5	<1	<1	<5	<0.1	<0.1	<0.1	
8 / 0-0.1	filling-C	23/01/18	<25	<50	<25	<50	600	570				<0.2	<0.5	<1	<1	<5	<0.1	<0.1	<0.1	NAD
8 / 0.7-0.8	filling-F	23/01/18	<25	<50	<25	<50	<100	<100				<0.2	<0.5	<1	<1	<5	<0.1	<0.1	<0.1	NAD
9 / 0.2-0.3	filling-F	22/01/18	<25	<50	<25	<50	550	700				<0.2	<0.5	<1	<1	<5	<0.1	<0.1	<0.1	NAD
10 / 2-2.1	filling-F	22/01/18	<25	<50	<25	<50	<100	<100				<0.2	<0.5	<1	<1	<5	<0.1	<0.1	<0.1	NAD
11 / 0-0.1	filling-C	23/01/18	<25	<50	<25	<50	210	<100				<0.2	<0.5	<1	<1	<5	<0.2	<0.1	<0.1	NAD
12 / 0-0.1	filling-C	23/01/18	<25	<50	<25	<50	530	800				<0.2	<0.5	<1	<1	<5	<0.1	<0.1	<0.1	NAD
Public School and Bush Campus																				
13 / 0.0-0.1	filling-C	23/01/18	<25	<50	<25	<50	160	<100				<0.2	<0.5	<1	<1	<5	<0.1	<0.1	<0.1	NAD
Replicate 4	filling-C	23/01/18																		
13 / 0.4-0.5	filling-C	23/01/18	<25	<50	<25	<50	<100	<100				<0.2	<0.5	<1	<1					NAD
14 / 0.0-0.1	filling-F	23/01/18	<25	<50	<25	<50	<100	<100				<0.2	<0.5	<1	<1	<5	<0.1	<0.1	<0.1	NAD
15 / 0-0.1	filling-F	19/01/18	<25	<50	<25	<50	100	<100				<0.2	<0.5	<1	<1	<5	<0.1	<0.1	<0.1	NAD
16 / 0.0-0.1	filling-C	24/01/18	<25	<50	<25	<50	500	140				<0.2	<0.5	<1	<1	<5	<0.5	<0.1	<0.1	NAD
17 / 0.3-0.4	silty clay?	24/01/18	<25	<50	<25	<50	<100	<100				<0.2	<0.5	<1	<1	<5	<0.1	<0.1	<0.1	
18 / 0.5	filling-F	23/01/18	<25	87	<25	79	1,300	210				<0.2	<0.5	<1	<1					NAD
18 / 1.0-1.1	filling-F	23/01/18	<25	140	<25	**130**	1,600	220	89	940	<100	<0.2	<0.5	<1	<1	<5	<1	<0.1	<0.1	NAD
18 / 1.5	filling-F	23/01/18	<25	<50	<25	<50	570	<100				<0.2	<0.5	<1	<1					
19 / 0-0.1	filling-C	19/01/18	<25	<50	<25	<50	<100	<100				<0.2	<0.5	<1	<1	<5	<0.1	<0.1	<0.1	NAD
20 / 0.0-0.1	filling-C	24/01/18	<25	<50	<25	<50	1,100	1,100				<0.2	<0.5	<1	<1	<5	<0.1	<0.1	<0.1	NAD
21 / 0.0-0.1	filling-C	24/01/18	<25	80	<25	80	**3,500**	1,900	<50	1,400	790	<0.2	<0.5	<1	<1	<5	<1	<1	<1	NAD
21 / 1-1.1	silty clay?	24/01/18	<25	<50	<25	<50	<100	<100				<0.2	<0.5	<1	<1					
22 / 0.3-0.4	filling-F	24/01/18	<25	<50	<25	<50	<100	<100				<0.2	<0.5	<1	<1	<5	<0.1	<0.1	<0.1	
23 / 0-0.1	filling-F	19/01/18	<25	<50	<25	<50	160	<100				<0.2	<0.5	<1	<1	<5	<0.1	<0.1	<0.1	NAD
24 / 0.3-0.4	filling-F	24/01/18	<25	<50	<25	<50	350	280				<0.2	<0.5	<1	<1	<5	<0.1	<0.1	<0.1	NAD
25 / 0.2-0.3	filling-C	24/01/18	<25	<50	<25	<50	<100	<100				<0.2	<0.5	<1	<1	<5	<0.1	<0.1	<0.1	NAD
26 / 0.2-0.3	filling-C	24/01/18	<25	<50	<25	<50	300	240				<0.2	<0.5	<1	<1	<5	<0.1	<0.1	<0.1	NAD
27 / 0-0.3	filling-C	19/01/18	<25	100	<25	100	**2,800**	2,000	<50	230	<100	<0.2	<0.5	<1	<1	98	<0.1	<0.1	<0.1	NAD
28 / 0.4-0.45	filling-C	19/01/18	<25	<50	<25	<50	580	570				<0.2	<0.5	<1	<1	<5	<0.1	<0.1	<0.1	NAD
REPLICATE1-190118	filling-C	19/01/18																		

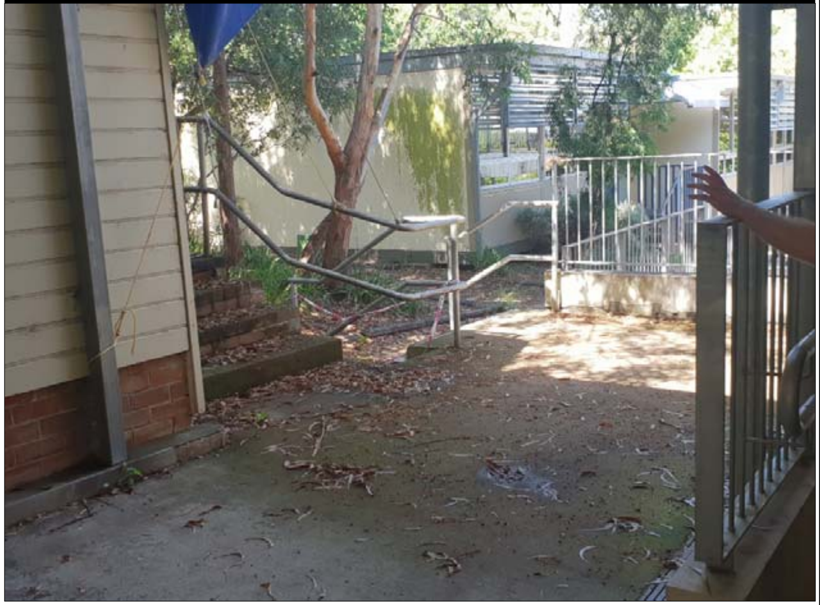
Appendix A Photographic Log

1. NORTHERN-EASTERN ENTRANCE VIA PACIFIC HIGHWAY – 09/01/2019

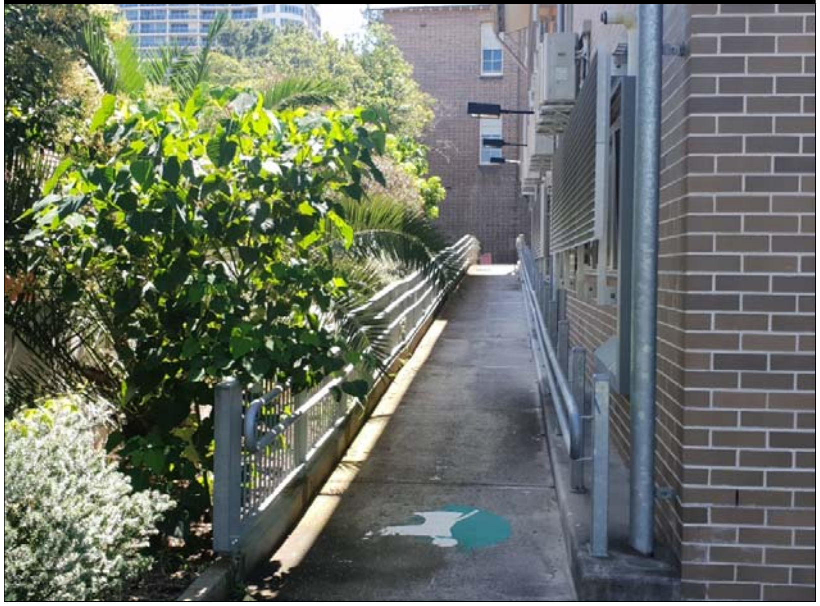


2. WESTERN ENTRANCE VIA JENKINS STREET– 09/01/2019

3. INSIDE PRIMARY SCHOOL PREMISES – 09/01/2019



4. INSIDE PRIMARY SCHOOL PREMISES – 09/01/2019



JBS&G

Job No: 55579	
Client: Pells Sullivan Meynink	
Version: Rev 0	Date: 05.02.2019
Drawn By: MN	Checked By: DD
Not to Scale	
Coord. Sys n/a	

Chatswood PublicSchool

Centennial Avenue,
Chatswood, NSW

APPENDIX A: PHOTOGRAPHIC LOG

5. BH_P_04 BOREHOLE – NORTHERN SYNTHETIC FIELD-23/01/2019

6. BH_P_06 – FILL MATERIALS – 23/01/2019

7. BH_P_06 – FILL MATERIALS – 23/01/2019

Job No: 55579

Client: Pells Sullivan Meynink

Version: Rev 0	Date: 05.02.2019
Drawn By: MN	Checked By: DD

Not to Scale

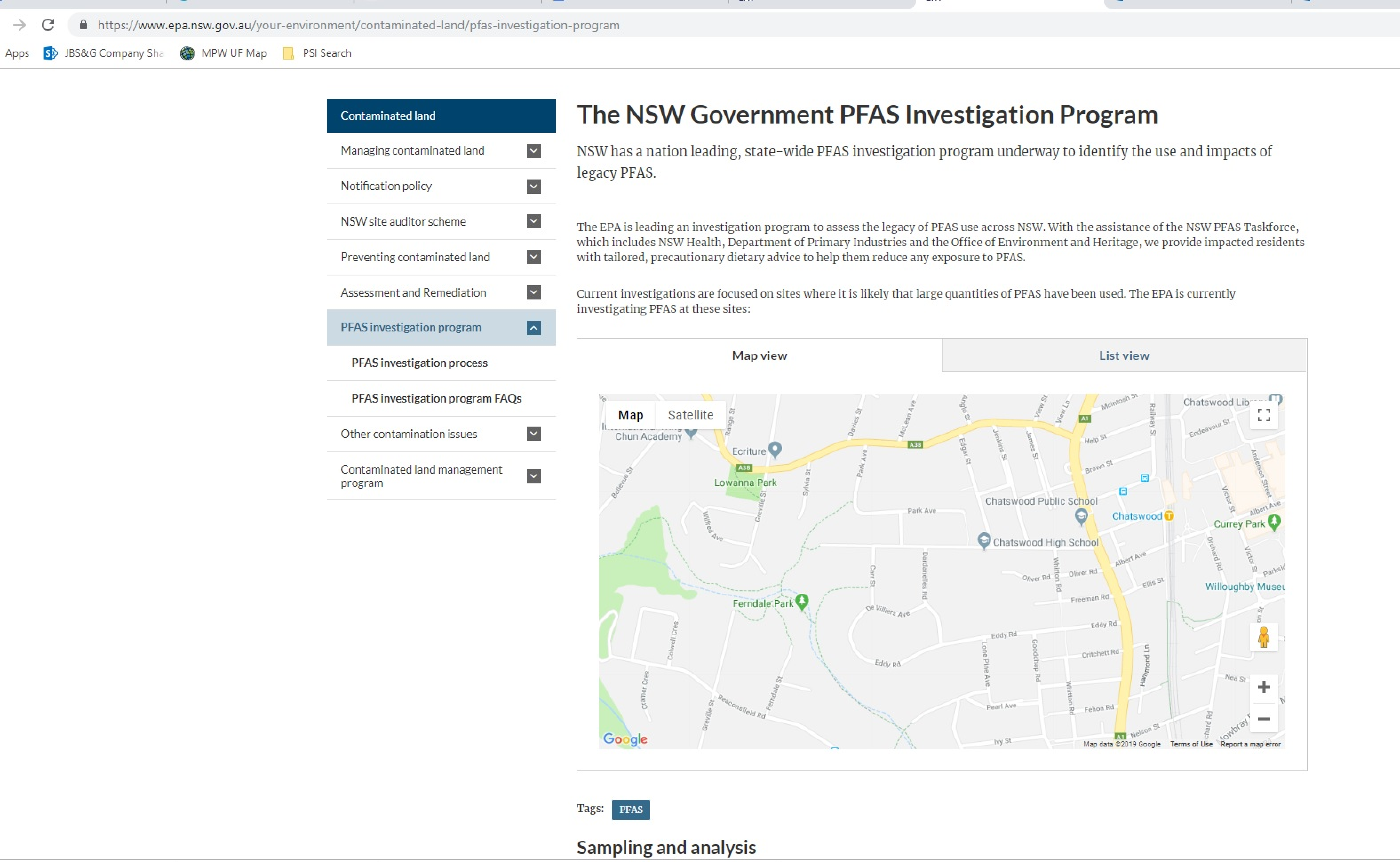
Coord. Sys n/a

Chatswood PublicSchool

Centennial Avenue,
Chatswood, NSW

APPENDIX A: PHOTOGRAPHIC LOG

Appendix B PFAS Register



The NSW Government PFAS Investigation Program

NSW has a nation leading, state-wide PFAS investigation program underway to identify the use and impacts of legacy PFAS.

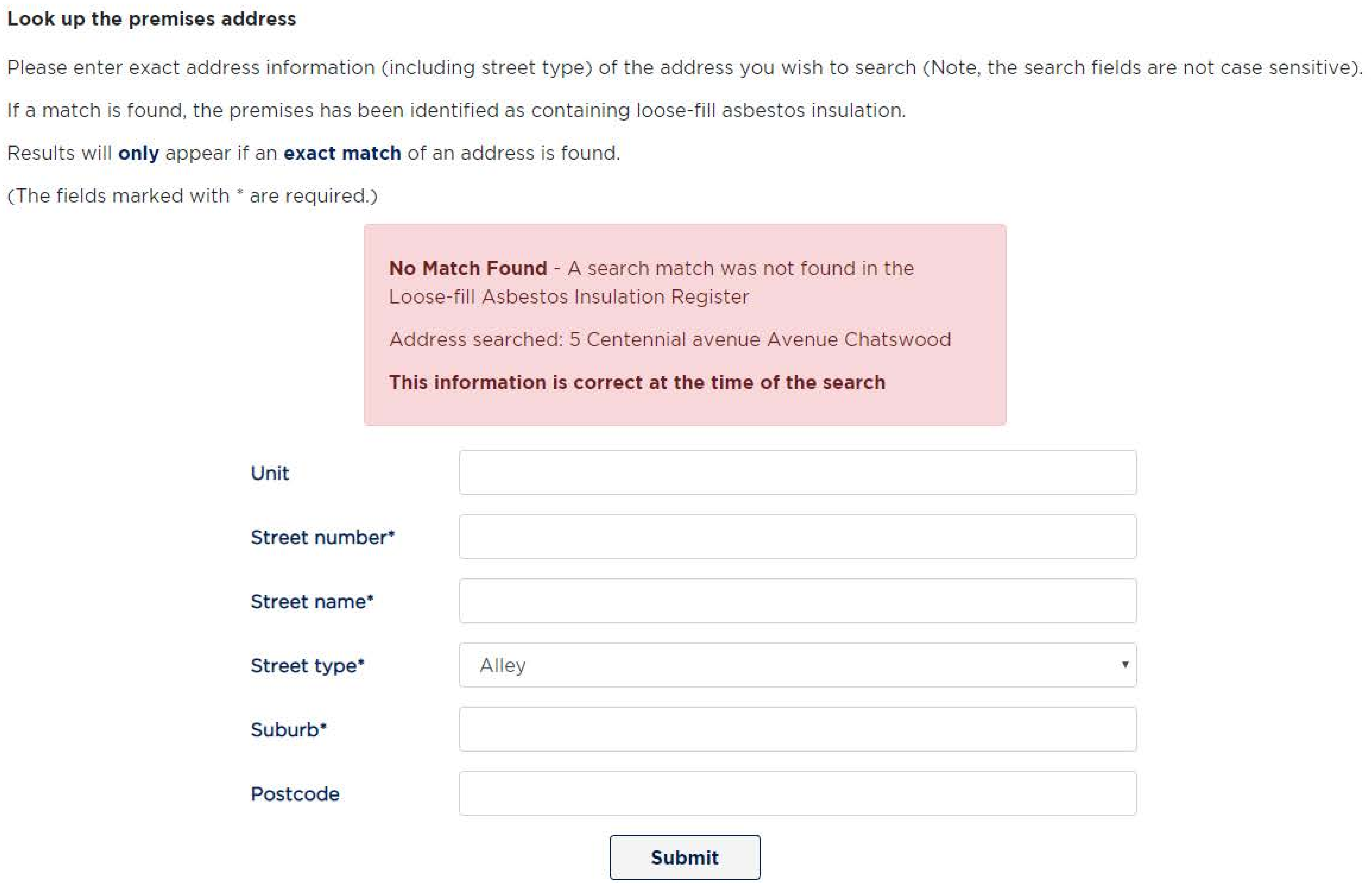
The EPA is leading an investigation program to assess the legacy of PFAS use across NSW. With the assistance of the NSW PFAS Taskforce, which includes NSW Health, Department of Primary Industries and the Office of Environment and Heritage, we provide impacted residents with tailored, precautionary dietary advice to help them reduce any exposure to PFAS.

Current investigations are focused on sites where it is likely that large quantities of PFAS have been used. The EPA is currently investigating PFAS at these sites:

Tags: PFAS

Sampling and analysis

Appendix C Loose-Fill Asbestos Insulation Register



Look up the premises address

Please enter exact address information (including street type) of the address you wish to search (Note, the search fields are not case sensitive).

If a match is found, the premises has been identified as containing loose-fill asbestos insulation.

Results will **only** appear if an **exact match** of an address is found.

(The fields marked with * are required.)

No Match Found - A search match was not found in the Loose-fill Asbestos Insulation Register

Address searched: 5 Centennial avenue Avenue Chatswood

This information is correct at the time of the search

Unit

Street number*

Street name*

Street type* Alley

Suburb*

Postcode

Appendix D Borelogs

BH_P_01

Project Number: 55579
Client: Pells Sullivan Meynink
Project Name: Chatswood Education Precinct
Site Address: Centennial Avenue, Chatswood

Date: 23-Jan-19
Logged By: M.N/R.C
Contractor:
Total Hole Depth (mbgs): 1.4
Bore Diameter (mm): 200

Eastings (GDA 94):
Northings (GDA 94):
Zone/Area/Permit#:
Reference Level: Ground Surface
Elevation (m):

Method	Depth (mbgs)	Contact (mbgs)	Graphic Log	Lithological Class	Lithological Description	Samples Tests Remarks	Additional Observations
SFA			▨	Fill	Gravelly silty sand. Grey / brown, moist, heterogeneous, dense. Inclusions of asphalt.	BH_P_01 0.0-0.15 PID = 2 ppm	No asbestos, odours or staining observed.
		0.20	▨	Fill	Silty clay. Brown / light grey, damp, homogeneous.		
	0.5					BH_P_01 0.4-0.5 PID = 2.6 ppm	No asbestos, odours or staining observed.
	1.0						
		1.00	▥	CL-ML	Silty clay. Light grey/red, homogeneous, hard, high plasticity, damp. Inclusions of shale.	BH_P_01 1.0-1.1 PID = 0.2 ppm	No asbestos, odours or staining observed.
		1.40			Borehole BH_P_01 terminated at 1.4m		
	1.5						
	2.0						

BH_P_02

Project Number: 55579
Client: Pells Sullivan Meynink
Project Name: Chatswood Education Precinct
Site Address: Centennial Avenue, Chatswood

Date: 23-Jan-19
Logged By: M.N/R.C
Contractor:
Total Hole Depth (mbgs): 1.3
Bore Diameter (mm): 200

Eastings (GDA 94):
Northings (GDA 94):
Zone/Area/Permit#:
Reference Level: Ground Surface
Elevation (m):

Method	Depth (mbgs)	Contact (mbgs)	Graphic Log	Lithological Class	Lithological Description	Samples Tests Remarks	Additional Observations
SFA			▨	Fill	Gravelly silty sand. Dark brown, dry, heterogeneous and medium dense. Inclusions of asphalt.	BH_P_02 0.0-0.15 PID = 0.4 ppm	No asbestos, odours or staining observed.
	0.5	0.20	▨	Fill	Silty clayey sand. Brown, damp, heterogeneous and loose. Inclusions of trace gravel, shale and brick	BH_P_02 0.4-0.5 PID = 1.4 ppm	No asbestos, odours or staining observed.
	1.0	0.90	☰	SHALE	Shale. Very hard.	BH_P_02 1.0-1.1 PID = 0.3 ppm	No asbestos, odours or staining observed.
	1.5 2.0	1.30			Borehole BH_P_02 terminated at 1.3m		Refusal on hard shale

BH_P_03

Project Number: 55579
Client: Pells Sullivan Meynink
Project Name: Chatswood Education Precinct
Site Address: Centennial Avenue, Chatswood

Date: 23-Jan-19
Logged By: M.N/R.C
Contractor:
Total Hole Depth (mbgs): 1.6
Bore Diameter (mm): 200

Eastings (GDA 94):
Northings (GDA 94):
Zone/Area/Permit#:
Reference Level: Ground Surface
Elevation (m):

Method	Depth (mbgs)	Contact (mbgs)	Graphic Log	Lithological Class	Lithological Description	Samples Tests Remarks	Additional Observations
SFA				Fill	Silty gravelly sand. Light grey, heterogeneous, dry and dense. Inclusions of asphalt.	BH_P_03 0.0-0.15 PID = 2.1 ppm	No asbestos, odours or staining observed.
	0.5	0.20		Fill	Silty clayey sand. Light brown, heterogenous and loose. Inclusions of trace gravels.	BH_P_03 0.4-0.5 PID = 1.4 ppm	No asbestos, odours or staining observed.
	1.0	0.60		Fill	Silty clay. Brown / light grey, dry, homogeneous, hard and medium plasticity.	BH_P_03 1.0-1.1 PID = 2.5 ppm	No asbestos, odours or staining observed.
	1.5	1.20		CL	Clay. Light grey, dy, homogeneous, hard and high plasticity. Inlusions of shale.	BH_P_03 1.4-1.5 PID = 1.5 ppm	No asbestos, odours or staining observed.
	2.0	1.60			Borehole BH_P_03 terminated at 1.6m		

BH_P_04

Project Number: 55579
Client: Pells Sullivan Meynink
Project Name: Chatswood Education Precinct
Site Address: Centennial Avenue, Chatswood

Date: 23-Jan-19
Logged By: M.N/R.C
Contractor:
Total Hole Depth (mbgs): 1.5
Bore Diameter (mm): 200

Eastings (GDA 94):
Northings (GDA 94):
Zone/Area/Permit#:
Reference Level: Ground Surface
Elevation (m):

Method	Depth (mbgs)	Contact (mbgs)	Graphic Log	Lithological Class	Lithological Description	Samples Tests Remarks	Additional Observations
SFA				Fill	Gravelly silty clay. Brown, heterogeneous, clay and medium dense. Inclusions of rootlets.	BH_P_04 0.0-0.15 PID = 3.7 ppm	No asbestos, odours or staining observed.
		0.20		Fill	Silty clay. Brown, damp, heterogeneous, stiff and medium plasticity. Inclusions of rootlets and shale.		
						BH_P_04 0.4-0.5 PID = 4.6 ppm	No asbestos, odours or staining observed.
	0.5						
		0.80		CL-ML	Silty clay. Brown/grey, damp, heterogeneous, medium plasticity and hard. Inclusions of shale.		
	1.0					BH_P_04 1.0-1.1 PID = 1.7 ppm	No asbestos, odours or staining observed.
	1.5	1.50			Borehole BH_P_04 terminated at 1.5m		
	2.0						

BH_P_05

Project Number: 55579
Client: Pells Sullivan Meynink
Project Name: Chatswood Education Precinct
Site Address: Centennial Avenue, Chatswood

Date: 23-Jan-19
Logged By: M.N/R.C
Contractor:
Total Hole Depth (mbgs): 1.2
Bore Diameter (mm): 200

Eastings (GDA 94):
Northings (GDA 94):
Zone/Area/Permit#:
Reference Level: Ground Surface
Elevation (m):

Method	Depth (mbgs)	Contact (mbgs)	Graphic Log	Lithological Class	Lithological Description	Samples Tests Remarks	Additional Observations
SFA			▩	Fill	Gravelly silty sand. Heterogeneous, dark brown, medium dense, medium gravels and damp.	BH_P_05 0.0-0.15 PID = 1.3 ppm	No asbestos, odours or staining observed.
	0.5	0.20	▩	Fill	Sandy clay. Brown / yellow, heterogeneous, damp, firm and medium plasticity. Inclusions of shale	BH_P_05 0.4-0.5 PID = 2.7 ppm	No asbestos, odours or staining observed. QA20190123RC_01 / QC20190123RC_01
	1.0	0.80	▤	SHALE	Crushed shale, red / brown / light grey, dry, homogeneous and firm.	BH_P_05 1.0-1.1 PID = 5.5 ppm	No asbestos, odours or staining observed.
	1.5 2.0	1.20			Borehole BH_P_05 terminated at 1.2m		Refusal on hard shale

BH_P_06

Project Number: 55579
Client: Pells Sullivan Meynink
Project Name: Chatswood Education Precinct
Site Address: Centennial Avenue, Chatswood

Date: 23-Jan-19
Logged By: M.N/R.C
Contractor:
Total Hole Depth (mbgs): 1.8
Bore Diameter (mm): 200

Eastings (GDA 94):
Northings (GDA 94):
Zone/Area/Permit#:
Reference Level: Ground Surface
Elevation (m):

Method	Depth (mbgs)	Contact (mbgs)	Graphic Log	Lithological Class	Lithological Description	Samples Tests Remarks	Additional Observations
SFA			▩	Fill	Silty gravel. Black, homogeneous, damp, dense and coarse grained.	BH_P_06 0.0-0.15 PID = 3.5 ppm	No asbestos, odours or staining observed.
	0.5	0.20	▩	Fill	Silty clay. Grey/brown, damp, heterogeneous, firm and medium plasticity. Inclusions of gravel, shale and anthropogenic material.	BH_P_06 0.4-0.5 PID = 4.8 ppm	No asbestos, odours or staining observed.
	1.0	0.70	▩	Fill	Silty sand. Dark brown, heterogeneous and damp. Inclusions of gravels.	BH_P_06 0.8-0.9 PID = 3.8 ppm	No asbestos, odours or staining observed.
	1.5	1.20	▧	CL	Clay. Light brown/yellow with light grey and mottling. Homogeneous, damp, hard and high plasticity.	BH_P_06 1.5-1.6 PID = 3.7 ppm	No asbestos, odours or staining observed.
	2.0	1.80			Borehole BH_P_06 terminated at 1.8m		

BH_P_07

Project Number: 55579
Client: Pells Sullivan Meynink
Project Name: Chatswood Education Precinct
Site Address: Centennial Avenue, Chatswood

Date: 22-Jan-19
Logged By: M.N/R.C
Contractor:
Total Hole Depth (mbgs): 1.8
Bore Diameter (mm): 100

Eastings (GDA 94):
Northings (GDA 94):
Zone/Area/Permit#:
Reference Level: Ground Surface
Elevation (m):

Method	Depth (mbgs)	Contact (mbgs)	Graphic Log	Lithological Class	Lithological Description	Samples Tests Remarks	Additional Observations
SFA			▩	Fill	Silty sand. Dark brown, heterogeneous, damp and medium dense. Inclusions of trace plastics, zip ties, gravel and asphalt.	BH_P_07 0.0-0.15 PID = 4.2 ppm	No asbestos, odours or staining observed.
	0.5	0.20	▩	Fill	Silty clay. Brown, heterogeneous, damp and stiff. Inclusions of shale and sandstone gravels.	BH_P_07 0.4-0.5 PID = 5.3 ppm	No asbestos or staining observed. Slight HC odours.
	1.0	0.80	▩	Fill	Silty clay. Brown, heterogeneous, damp and stiff. Inclusions of shale and sandstone gravels.	BH_P_07 1.0-1.1 PID = 3.9 ppm	No asbestos or staining observed. Slight HC odours.
	1.5	1.20	▨	CL-ML	Silty clay. Grey with light grey/light brown mottling. Homogeneous, damp, hard and high plasticity.	BH_P_07 1.7-1.8 PID = 8.2 ppm	No asbestos, odours or staining observed.
	2.0	1.80			Borehole BH_P_07 terminated at 1.8m		

BH_P_08

Project Number: 55579
Client: Pells Sullivan Meynink
Project Name: Chatswood Education Precinct
Site Address: Centennial Avenue, Chatswood

Date: 24-Jan-19
Logged By: M.N/R.C
Contractor:
Total Hole Depth (mbgs): 0.5
Bore Diameter (mm): 100

Eastings (GDA 94):
Northings (GDA 94):
Zone/Area/Permit#:
Reference Level: Ground Surface
Elevation (m):

Method	Depth (mbgs)	Contact (mbgs)	Graphic Log	Lithological Class	Lithological Description	Samples Tests Remarks	Additional Observations
HA			▨	Fill	Silty clay. Dark brown, heterogeneous, loose and damp. Inclusions of rootlets.	BH_P_08 0.0-0.15 PID = 2.2 ppm	No asbestos, odours or staining observed.
		0.20	▨	Fill	Silty clay. Brown/grey, heterogeneous, damp, hard and medium plasticity. Inclusions of brick.	BH_P_08 0.4-0.5 PID = 3.5 ppm	No asbestos, odours or staining observed.
	0.5	0.50			Borehole BH_P_08 terminated at 0.5m		
	1.0						
	1.5						
	2.0						

BH_P_09

Project Number: 55579
Client: Pells Sullivan Meynink
Project Name: Chatswood Education Precinct
Site Address: Centennial Avenue, Chatswood

Date: 24-Jan-19
Logged By: M.N/R.C
Contractor:
Total Hole Depth (mbgs): 0.6
Bore Diameter (mm): 100

Eastings (GDA 94):
Northings (GDA 94):
Zone/Area/Permit#:
Reference Level: Ground Surface
Elevation (m):

Method	Depth (mbgs)	Contact (mbgs)	Graphic Log	Lithological Class	Lithological Description	Samples Tests Remarks	Additional Observations
HA			▩	Fill	Sand. Light grey/brown, heterogeneous, damp and medium grained. Inclusions of shale, twigs, plastic and paper.	BH_P_09 0.0-0.15 PID = 2.6 ppm	
		0.20	▩	Fill	Silty sand, light brown / yellow, heterogeneous, damp, medium sand, loose, sub-rounded, poorly graded, with inclusions of cobbles of rock	BH_P_09 0.4-0.5 PID = 1.6 ppm	No asbestos, odours or staining observed.
	0.5						
		0.60			Borehole BH_P_09 terminated at 0.6m		Refusal on rock
	1.0						
	1.5						
	2.0						

BH_P_09a

Project Number: 55579
Client: Pells Sullivan Meynink
Project Name: Chatswood Education Precinct
Site Address: Centennial Avenue, Chatswood

Date: 24-Jan-19
Logged By: M.N/R.C
Contractor:
Total Hole Depth (mbgs): 0.6
Bore Diameter (mm): 100

Eastings (GDA 94):
Northings (GDA 94):
Zone/Area/Permit#:
Reference Level: Ground Surface
Elevation (m):

Method	Depth (mbgs)	Contact (mbgs)	Graphic Log	Lithological Class	Lithological Description	Samples Tests Remarks	Additional Observations
HA			▨	Fill	Sand. Light grey/brown, heterogeneous, damp and medium grained. Inclusions of shale, twigs, plastic and paper.	BH_P_09a 0.0-0.15 PID = 1.6 ppm	No asbestos, odours or staining observed.
		0.20	▨	Fill	Silty sand. Light brown/yellow, heterogeneous, damp, medium grained. Inclusions of sub-rounded, poorly graded rock cobbles.	BH_P_09a 0.4-0.5 PID = 0.9 ppm	No asbestos, odours or staining observed.
	0.5						
		0.60			Borehole BH_P_09a terminated at 0.6m		Refusal on rock
	1.0						
	1.5						
	2.0						

BH_P_10

Project Number: 55579
Client: Pells Sullivan Meynink
Project Name: Chatswood Education Precinct
Site Address: Centennial Avenue, Chatswood

Date: 24-Jan-19
Logged By: M.N/R.C
Contractor:
Total Hole Depth (mbgs): 1.2
Bore Diameter (mm): 100

Eastings (GDA 94):
Northings (GDA 94):
Zone/Area/Permit#:
Reference Level: Ground Surface
Elevation (m):

Method	Depth (mbgs)	Contact (mbgs)	Graphic Log	Lithological Class	Lithological Description	Samples Tests Remarks	Additional Observations
HA	0.5		▨	Fill	Silty sand. Brown, heterogeneous, damp and loose. Inclusions of mulch, trace of gravel and bark.	BH_P_10 0.0-0.15 PID = 3.7 ppm	No asbestos, odours or staining observed.
		0.60	▨	Fill	Silty clayey sand. Brown, damp, heterogeneous and low plasticity. Inclusions of bark and shale.	BH_P_10 0.6-0.7 PID = 1.7 ppm	No asbestos, odours or staining observed.
	1.0	0.80	☰	SHALE	Crushed shale. Light grey, damp, homogeneous, dense and hard.	BH_P_10 1.0-1.1 PID = 2.3 ppm	No asbestos, odours or staining observed.
	1.5 2.0	1.20			Borehole BH_P_10 terminated at 1.2m		

BH_P_11

Project Number: 55579
Client: Pells Sullivan Meynink
Project Name: Chatswood Education Precinct
Site Address: Centennial Avenue, Chatswood

Date: 24-Jan-19
Logged By: M.N/R.C
Contractor:
Total Hole Depth (mbgs): 1.2
Bore Diameter (mm): 100

Eastings (GDA 94):
Northings (GDA 94):
Zone/Area/Permit#:
Reference Level: Ground Surface
Elevation (m):

Method	Depth (mbgs)	Contact (mbgs)	Graphic Log	Lithological Class	Lithological Description	Samples Tests Remarks	Additional Observations
HA			▨	Fill	Silty sand. Brown, damp and heterogeneous. Trace inculsions of shale gravels.	BH_P_11 0.0-0.15 PID = 0.3 ppm	No asbestos, odours or staining observed.
	0.5	0.30	▨	Fill	Silty clayey sand. Brown, damp, heterogeneous and loose. Inclusions of trace shales and rootlets.	BH_P_11 0.4-0.5 PID = 2.7 ppm	No asbestos or staining observed. Slight HC odours.
	1.0	0.60	▨	Fill	Silty clay. Brown/light grey, damp, homogeneous, stiff and medium plasticity.	BH_P_11 0.8-0.9 PID = 2.1 ppm	No asbestos or staining observed. Slight HC odours.
		1.00	▤	SHALE	Crushed shale. Light grey, damp, homogeneous and medium dense.	BH_P_11 1.1-1.2 PID = 3.8 ppm	No asbestos or staining observed. Slight HC odours.
	1.5 2.0	1.20			Borehole BH_P_11 terminated at 1.2m		

BH_P_12

Project Number: 55579
Client: Pells Sullivan Meynink
Project Name: Chatswood Education Precinct
Site Address: Centennial Avenue, Chatswood

Date: 11/10/2019
Logged By: MN
Contractor: BG Drilling
Total Hole Depth (mbgs): 8
Bore Diameter (mm): 150

Eastings (GDA 94):
Northings (GDA 94):
Zone/Area/Permit#:
Reference Level:
Elevation (m):

Method	Depth (mbgs)	Contact (mbgs)	Graphic Log	Lithological Class	Lithological Description	Samples Tests Remarks	Additional Observations
Solid Flight Auger		0.02	▨	Fill	Asphalt		No ACM, odours or staining observed.
			▨	Fill	Gravelly clay, brown, homogeneous, damp, firm, medium/high plasticity	BH_P_12 0.1-0.20 PID = 2 ppm BH_P_12 0.4-0.50 PID = 1.8 ppm	No ACM, odours or staining observed.
		0.60	▧	CH	Clay, grey/light brown, heterogeneous, medium plasticity, stiff, with inclusion of weathered shale	BH_P_12 0.9-1.00 PID = 1.9 ppm	No ACM, odours or staining observed.
	1	1.00	☰	SHALE	Weathered shale (pulverized), brown, homogeneous, dry		
	2		☰				
	3		☰				
	4		☰				No ACM, odours or staining observed.
	5		☰				
	6		☰				
	7		☰				
	8	8.00			Borehole BH_P_12 terminated at 8m		

BH_P_13

Project Number: 55579
Client: Pells Sullivan Meynink
Project Name: Chatswood Education Precinct
Site Address: Centennial Avenue, Chatswood

Date: 10/10/2019
Logged By: MN
Contractor: BG Drilling
Total Hole Depth (mbgs): 4
Bore Diameter (mm): 150

Eastings (GDA 94):
Northings (GDA 94):
Zone/Area/Permit#:
Reference Level:
Elevation (m):

Method	Depth (mbgs)	Contact (mbgs)	Graphic Log	Lithological Class	Lithological Description	Samples Tests Remarks	Additional Observations
Solid Flight Auger			▩	Fill	Asphalt		No ACM, odours or staining observed.
		0.05	▩	Fill	Clay, brown, heterogeneous, damp, firm, medium/high plasticity, with inclusion of gravel	BH_P_13 0.1-0.20 PID = 0.4 ppm BH_P_13 0.5-0.60 PID = 0.3 ppm	No ACM, odours or staining observed.
	1 2	0.80	▧	CH	Clay, light brown/grey, heterogeneous, damp, stiff, high plasticity, with inclusion of rootlets and weathered shale	BH_P_13 1.0-1.10 PID = 0.5 ppm	No ACM, odours or staining observed.
	3	3.00	▤	SHALE	Weathered shale, grey, homogeneous, dry, loose		No ACM, odours or staining observed.
	4 5 6 7 8	4.00			Borehole BH_P_13 terminated at 4m		

BH_P_14

Project Number: 55579
Client: Pells Sullivan Meynink
Project Name: Chatswood Education Precinct
Site Address: Centennial Avenue, Chatswood

Date: 10/10/2019
Logged By: MN
Contractor: BG Drilling
Total Hole Depth (mbgs): 4
Bore Diameter (mm): 150

Eastings (GDA 94):
Northings (GDA 94):
Zone/Area/Permit#:
Reference Level:
Elevation (m):

Method	Depth (mbgs)	Contact (mbgs)	Graphic Log	Lithological Class	Lithological Description	Samples Tests Remarks	Additional Observations
Solid Flight Auger				Fill	Sandy clay, brown/grey, heterogeneous, damp, firm, medium plasticity, with inclusion of gravel and sandstone	BH_P_14 0.0-0.10 PID = 0.3 ppm BH_P_14 0.4-0.50 PID = 0.2 ppm	No ACM, odours or staining observed.
	1	0.70		CH	Clay, grey, heterogeneous, damp, stiff, high plasticity, with inclusion of brown weathered shale	BH_P_14 0.9-1.00 PID = 0.2 ppm	No ACM, odours or staining observed.
	2 3 4	1.60		SHALE	Weathered shale, grey/brown, homogeneous, damp, hard		No ACM, odours or staining observed.
	5 6 7 8	4.00			Borehole BH_P_14 terminated at 4m		

BH_P_16

Project Number: 55579
Client: Pells Sullivan Meynink
Project Name: Chatswood Education Precinct
Site Address: Centennial Avenue, Chatswood

Date: 11/10/2019
Logged By: MN
Contractor: BG Drilling
Total Hole Depth (mbgs): 4
Bore Diameter (mm): 150

Eastings (GDA 94):
Northings (GDA 94):
Zone/Area/Permit#:
Reference Level:
Elevation (m):

Method	Depth (mbgs)	Contact (mbgs)	Graphic Log	Lithological Class	Lithological Description	Samples Tests Remarks	Additional Observations
Solid Flight Auger			▩	Fill	Sandy clay, brown, heterogeneous, damp, firm, high plasticity, with inclusion of gravel	BH_P_16 0.0-0.10 PID = 0.9 ppm BH_P_16 0.4-0.50 PID = 1.3 ppm	No ACM, odours or staining observed.
	1	0.50	▧	CH	Clay, light brown with grey mottling, damp, hard, high plasticity, with inclusion of shale	BH_P_16 0.9-1.00 PID = 1.1 ppm BH_P_16 1.4-1.50 PID = 1.3 ppm	No ACM, odours or staining observed.
	2 3 4	1.70	▤	SHALE	Weathered shale, grey/light brown, homogeneous, hard	BH_P_16 1.9-2.00 PID = 1.4 ppm	No ACM, odours or staining observed.
	5 6 7 8	4.00			Borehole BH_P_16 terminated at 4m		

Appendix E PID Calibration and Decontamination Field Forms

1/2

Field Equipment Calibration and Decontamination

JBS&G

PROJECT NAME: Chatswood Education Precinct **PROJECT NO:** 55579
FIELD DATES: 21/1/19 - 25/1/19 **FIELD STAFF:** MN, RC

CALIBRATION SUMMARY
EQUIPMENT: PID
CALIBRATION STANDARD: 100ppm isobutylene.

DATE	TIME	READING (ppm$_v$)	COMMENTS
21/1/19	7:00am	0	Ambient
21/1/19	7:03am	100	isobutylene
21/1/19	7:05am	100.2	Bump.
22/1/19	7:00am	0	Ambient
22/1/19	7:02am	100	isobutylene
22/1/19	7:04am	100.5	bump.
23/1/19	7:00am	0	Ambient
23/1/19	7:03am	100	isobutylene
23/1/19	7:06am	99.8	bump
24/1/19	7:01am	0	Ambient.
24/1/19	7:02am	100	isobutylene
24/1/19	7:05am	100.1	Bump

DECONTAMINATION SUMMARY
EQUIPMENT: Auger.
Washed with decontamination water before collection of new sample. Nitrile gloves were changed for each sample collection.

1. Was the equipment decontaminated appropriately prior to sampling at each location? [✓ Y] N NA
2. Was excess soil removed by scraping, brushing or wiping with disposable towels? [✓ Y] N NA
3. Was the equipment contaminated with grease, tar or similar material? Y [✓ N] [✓ NA]
If so, was the equipment steam cleaned or rinsed with pesticide-grade acetone:hexane? Y N
4. Was phosphate-free detergent used to wash the equipment? [✓ Y] N NA
5. Was the equipment rinsed with clean water? [✓ Y] N NA
6. Was the equipment then rinsed with deionised water? [✓ Y] N NA
7. Were all sample containers cleaned and acid or solvent washed prior to sample collection? Y N [✓ NA]

WERE ANY ADDITIONAL DECONTAMINATION MEASURES REQUIRED? PROVIDE DETAILS.

Field Equipment Calibration and Decontamination

JBS&G

PROJECT NAME:	Chatswood Ed	PROJECT NO:	55579
FIELD DATES:	21/1/19 - 25/1/19	FIELD STAFF:	MN, RC

CALIBRATION SUMMARY

EQUIPMENT: PID.

CALIBRATION STANDARD: 100ppm isobutylene

DATE	TIME	READING (ppm$_v$)	COMMENTS
25/1/19	7:00am	0	Ambient
25/1/19	7:05am	100	isobutylene
25/1/19	7:07am	100.2	bump.

DECONTAMINATION SUMMARY

EQUIPMENT: Auger

washed with decontamination water before collection of new samples. Nitrile gloves were changed for each sample collection.

1. Was the equipment decontaminated appropriately prior to sampling at each location? [✓ Y] N NA
2. Was excess soil removed by scraping, brushing or wiping with disposable towels? [✓ Y] N NA
3. Was the equipment contaminated with grease, tar or similar material? Y [✓ N] [✓ NA]
   If so, was the equipment steam cleaned or rinsed with pesticide-grade acetone:hexane? Y N
4. Was phosphate-free detergent used to wash the equipment? [✓ Y] N NA
5. Was the equipment rinsed with clean water? [✓ Y] N NA
6. Was the equipment then rinsed with deionised water? [✓ Y] N NA
7. Were all sample containers cleaned and acid or solvent washed prior to sample collection? Y N [✓ NA]

WERE ANY ADDITIONAL DECONTAMINATION MEASURES REQUIRED? PROVIDE DETAILS.

Appendix F QAQC Assessment

Table 1 - QA/QC Results Summary

Data Quality Indicator	Results	DQI met?
Precision		
Soil Blind duplicates (intra laboratory)	0-175% RPD Intra laboratory samples were analysed at a rate greater than 1 in 20 samples.	Partial[1]
Soil Blind triplicates (inter laboratory)	0-160% RPD Inter laboratory samples were analysed at a rate greater than 1 in 20 samples.	Partial[1]
Laboratory duplicates	0-6% RPD Intra laboratory samples were analysed at a rate of 1 in 20 samples.	Yes
Accuracy		
Surrogate spikes	54-124% Recovery Surrogate spikes were completed for all organic samples	Partial[1]
Laboratory Control Samples	71-126% Recovery Laboratory control samples were completed for all organic and metals samples	Yes
Matrix spikes	70- 123% Recovery Matrix spikes were completed for all organic and metals samples	Yes
Representativeness		
Sampling appropriate for media and analytes	All sampling conducted in accordance with JBS&G procedures	Yes
Laboratory blanks	<LOR	Yes
Samples extracted and analysed within holding times.	All samples were extracted and analysed within holding times less than 14 days.	Yes
Trip spikes	NA	Yes
Trip blanks	NA	No
Rinsate blank	<LOR	Partial
Comparability		
Standard operating procedures used for sample collection & handling	Field staff used same standard operating procedures throughout works	Yes
Standard analytical methods used	Standard analytical methods used as listed in **Table 5.2**.	Yes
Consistent field conditions, sampling staff and laboratory analysis	Sampling was conducted by a field scientist using standard operating procedures in the same conditions throughout the works. The laboratories remained consistent throughout the investigation.	Yes
Limits of reporting appropriate and consistent	Limits of reporting were consistent and appropriate.	Yes
Completeness		
Soil description & COCs completed	All bore logs and COCs were completed appropriately.	Yes
Appropriate documentation	All appropriate field documentation is included in the Appendices.	Yes
Satisfactory frequency/result for QC samples	The QC results are considered adequate for the purposes of the investigation.	Yes
Data from critical samples is considered valid	Data from critical samples is considered valid.	Yes

1. See discussion of DQI exceedances below.

QA/QC Discussion

Precision

Blind / Split Duplicates

The rate of duplicate sampling and analysis for soils was 2 duplicates per 5 primary samples for heavy metals, and PAHs, and 2 duplicates per 10 primary samples for asbestos. As such, the frequency of duplicate sample analysis for all key contaminants of concern met/exceeded the nominated 1/20 frequency.

High RPDs in the duplicate samples can be expected when materials are heterogeneous and/or when analyte concentrations are close to LOR. The elevated RPDs presented for both intra-laboratory and inter-laboratory duplicates are considered to be acceptable on the basis that the reported concentrations are typically within 10 times the LOR. As a conservative measure the highest values have been considered in the interpretation of data.

The elevated RPDs presented for laboratory duplicates are considered acceptable as reported concentrations are <10 times the LOR and therefore the RPD limit is generally not applicable (as stated by the laboratory QC acceptance criteria).

Laboratory Duplicates

The laboratory completed a total of 3 laboratory duplicate soil samples within the JBS&G acceptance criteria of 1 in 20 samples. Laboratory duplicates analysed had RPDs within the JBS&G DQI of 0%-50%.

Accuracy

Laboratory Control Samples

A total of 18 soil and 6 water laboratory control samples (LCS) we tested, meeting the DQIs. All LCS were reported as having recoveries within the JBS&G acceptable range of 70-130%.

Surrogate Spikes

Surrogate spike exceedances are considered acceptable as they are within the laboratory acceptance criteria of 50-150% recovery for surrogate spikes.

Matrix Spikes

Matrix spike recoveries were within the acceptable range of 70-130% with the exception of sample NCP_Ja24618_637848-SPK (copper recovery 170%), NCP_Ja24618_637848-SPK (lead recovery 219%) and sample NCP_Ja24618_637848-SPK (zinc recovery 150%). These recoveries are not considered to be reflective of an unacceptable level of accuracy in the dataset as an acceptable recovery was obtained for the laboratory control sample indicating a sample matrix interference.

Representativeness

The extraction and analysis of selected samples was completed within the recommended holding times for all analytes.

JBS&G note that no trip spikes or trip blanks (TS/TB) were analysed as part of the assessment herein. It is noted that all sample handling procedures, including the transfer and storage of samples into chilled eskis were adhered to prior to, and during shipment to the laboratory. As such, JBS&G do not consider the omission of TB/TS samples adversely affect the representativeness of the data set.

All laboratory blanks analysed reported no concentrations above the laboratory LOR.

All field equipment was decontaminated and calibrated appropriately.

A rinsate sample was collected following decontamination of all non-disposable sampling equipment for the intrusive investigation. All analyte concentrations in rinsate samples were below the laboratory limit of reporting (LOR) with the exception of DDT (0.0001 for DDT+DDE+DDD (Total) and 4.4’-DDT), detected within the rinsate sample S19-Ja24422 collected on the 23rd January 2019. JBS&G note that no pesticides were reported within soils at any of the sample locations and therefore the Type 2 error is not considered to significantly impact upon the data set.

Comparability

Eurofins|mgt, the primary laboratory, and Envirolab Services, the secondary laboratory, are NATA accredited for all analytical methods used. The laboratories used similar analytical methods and the analytical data were comparable between laboratories as indicated by the results of duplicate analysis. Where different LORs were adopted by the laboratories, consideration of the data set was not impacted.

The samples collected for assessment purposes are considered comparable as all samples were collected by experienced JBS&G personnel in accordance with standard JBS&G sampling methods.

Completeness

All laboratory and field documentation is complete and correct. Chain of custody documentation is provided with laboratory reports in **Appendix M**.

The frequency of analysis of all QC samples was considered appropriate and valid.

Sensitivity

The adopted analytical methods provided suitable LORs with respect to the adopted site assessment criteria for all mediums.

QA/QC Conclusions

The field sampling and handling procedures across the site produced QA/QC results which indicate that soil and groundwater data collected is of an acceptable quality.

The NATA certified laboratory reports indicate that the project laboratories were achieving levels of performance within their recommended control limits during the period when the samples from this program were analysed.

On the basis of the results of the field and laboratory QA/QC program, the soil, soil vapour and groundwater data is of an acceptable quality upon which to draw conclusions regarding the environmental condition of the site.

Appendix G Laboratory Documentation

07561

Eurofins 1of2

CHAIN OF CUSTODY

JBS&G

PROJECT NO.: 55579

PROJECT NAME: Chatswood Education Precint Primary School

DATE NEEDED BY: STD

LABORATORY BATCH NO.:

SAMPLERS: RC / MN

QC LEVEL: NEPM (2013)

PHONE: Sydney: 02 8245 0300 | Perth: 08 9488 0100 | Brisbane: 07 3112 2688

SEND REPORT & INVOICE TO: (1) adminnsw@jbsg.com.au; (2) ...DDenaro...............@jbsg.com.au; (3) ...mnovjaim...............@jbsg.com.au RChapman@jbsg.com.au

COMMENTS / SPECIAL HANDLING / STORAGE OR DISPOSAL:

SAMPLE ID	MATRIX	DATE	TIME	TYPE & PRESERVATIVE	pH	Metals	PAHs	TRH/BTEX		OCP	PCB	TCLP Metals/PAH	TYPE OF ASBESTOS ANALYSIS: IDENTIFICATION	TYPE OF ASBESTOS ANALYSIS: NEPM/WA	The unspecifie Put onhold NOTES:
BH-P-01 0.4-0.5	Soil	23/1/19		Sampling bag, Jar+ice		X	X	X		X	X			X	
BH-P-02 0-0.15								X		X				X	
BH-P-03 1-1.1								X		X				X	
BH-P-04 0-0.15														X	
BH-P-05 0.4-0.5														X	
BH-P-06 0.8-0.9		✓												X	
BH-P-07 0-0.15	↓	22/1/19						X		X	X			X	
BH-P-08 0.4-0.5		24/1/19												X	
BH-P-09 0-0.15		24/1/19												X	
BH-P-10 0.6-0.7		24/1/19				↓	↓	X		X				X	
BHP-01 0-0.15		23/1/19		↓											
BH-P-01 1-1.1				Jar+ice											
BH-P-02 0.4-0.5				bag, jar+ice											
BH-P-02 1-1.1				Jar+ice											
BH-P-03 0-0.15				bag, jar+ice											
BH-P-03 0.4-0.5				bag, jar+ice											
BH-P-03 1.4-1.5				jar+ice											
BH-P-04 0.4-0.5				bag, jar+ice											
BH-P-04 1-1.1	↓	↓		bag, jar+ice											

RELINQUISHED BY:

NAME: DATE: 25/1/19

OF: JBS&G

NAME: DATE:

OF:

METHOD OF SHIPMENT:

CONSIGNMENT NOTE NO.

TRANSPORT CO.

CONSIGNMENT NOTE NO.

TRANSPORT CO

RECEIVED BY:

NAME: ElvisD

DATE: 25/1/19

OF: Eurofins

NAME: DATE:

OF:

FOR RECEIVING LAB USE ONLY:

COOLER SEAL – Yes....... No .... Intact .... Broken ....

COOLER TEMP 3.5 .... deg C

COOLER SEAL – Yes....... No .... Intact .... Broken ....

COOLER TEMP .... deg C

Container & Preservative Codes: P = Plastic; J = Soil Jar; B = Glass Bottle; N = Nitric Acid Prsvd.; C = Sodium Hydroxide Prsvd; VC = Hydrochloric Acid Prsvd Vial; VS = Sulfuric Acid Prsvd Vial; S = Sulfuric Acid Prsvd; Z = Zinc Prsvd; E = EDTA Prsvd; ST = Sterile Bottle; O = Other

IMSO FormsO13 – Chain of Custody - Generic

Eurofins 2 of 2

07562

CHAIN OF CUSTODY

JBS&G

PROJECT NO.: 55579
PROJECT NAME: Chatswood Education Precinct Primary School
DATE NEEDED BY: STD
PHONE: Sydney: 02 8245 0300 | Perth: 08 9488 0100 | Brisbane: 07 3112 2688
SEND REPORT & INVOICE TO: (1) adminnsw@jbsg.com.au; (2) ...D.Denaro...............@jbsg.com.au; (3) ....mnougaim...........@jbsg.com.au Rchapman@jbsg, com.au

LABORATORY BATCH NO.:
SAMPLERS: RC/MN
QC LEVEL: NEPM (2013)

COMMENTS / SPECIAL HANDLING / STORAGE OR DISPOSAL:

SAMPLE ID	MATRIX	DATE	TIME	TYPE & PRESERVATIVE	pH	Metals	PAHs	TRH/BTEX	OCPs	PCB	TCLP metals/PAH	TYPE OF ASBESTOS ANALYSIS IDENTIFICATION	NEPM/WA
BH-P-05 0-0.15	Soil	23/1/19		bag, jar+ice									
BH-P-05 1-1.1				Jar+ice									
BH-P-06 0-0.15				bag, jar+ice									
BH-P-06 0.4-0.5				bag, jar+ice									
BH-P-06 1.5-1.6				Jar+ice									
BH-P-07 0.4-0.5		22/1/19		bag, jar+ice									
BH-P-07 1-1.1				bag, jar+ice									
BH-P-07 1.7-1.8				Jar+ice									
BH-P-08 0-0.15		24/1/19		bag, jar+ice									
BH-P-09 0.4-0.5				bag, jar+ice									
BH-P-09a 0-0.15													
BH-P-09a 0.4-0.5													
BH-P-10 0-0.15													
BH-P-10 1-1.1				Jar+ice									
BH-P-11 0-0.15				bag, jar+ice									
BH-P-11 0.4-0.5													
BH-P-11 0.8-0.9													
BH-P-11 1.1-1.2				Jar+ice									

NOTES: The unspecified Putonhole

RELINQUISHED BY:
NAME: DATE: 25/1/19
OF: JBS&G
NAME: DATE:
OF:

METHOD OF SHIPMENT:
CONSIGNMENT NOTE NO.
TRANSPORT CO.
CONSIGNMENT NOTE NO.
TRANSPORT CO

RECEIVED BY:
NAME:
DATE:
OF:
NAME: DATE:
OF:

FOR RECEIVING LAB USE ONLY:
COOLER SEAL – Yes....... No .... Intact .... Broken ....
COOLER TEMP .... deg C
COOLER SEAL – Yes....... No .... Intact .... Broken ....
COOLER TEMP .... deg C

Container & Preservative Codes: P = Plastic; J = Soil Jar; B = Glass Bottle; N = Nitric Acid Prsvd.; C = Sodium Hydroxide Prsvd; VC = Hydrochloric Acid Prsvd Vial; VS = Sulfuric Acid Prsvd Vial; S = Sulfuric Acid Prsvd; Z = Zinc Prsvd; E = EDTA Prsvd; ST = Sterile Bottle; O = Other

Certificate of Analysis

NATA Accredited
Accreditation Number 1261
Site Number 18217

Accredited for compliance with ISO/IEC 17025–Testing
The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

JBS & G Australia (NSW) P/L
Level 1, 50 Margaret St
Sydney
NSW 2000

Attention:	Daniel Denaro
Report	637818-AID
Project Name	CHATSWOOD EDUCATION PRECINCT PRIMARY SCHOOL
Project ID	55579
Received Date	Jan 25, 2019
Date Reported	Feb 04, 2019

Methodology:

Asbestos Fibre Identification	Conducted in accordance with the Australian Standard AS 4964 – 2004: Method for the Qualitative Identification of Asbestos in Bulk Samples and in-house Method LTM-ASB-8020 by polarised light microscopy (PLM) and dispersion staining (DS) techniques. *NOTE: Positive Trace Analysis results indicate the sample contains detectable respirable fibres.*
Unknown Mineral Fibres	Mineral fibres of unknown type, as determined by PLM with DS, may require another analytical technique, such as Electron Microscopy, to confirm unequivocal identity. *NOTE: While Actinolite, Anthophyllite and Tremolite asbestos may be detected by PLM with DS, due to variability in the optical properties of these materials, AS4964 requires that these are reported as UMF unless confirmed by an independent technique.*
Subsampling Soil Samples	The whole sample submitted is first dried and then passed through a 10mm sieve followed by a 2mm sieve. All fibrous matter greater than 10mm, greater than 2mm as well as the material passing through the 2mm sieve are retained and analysed for the presence of asbestos. If the sub 2mm fraction is greater than approximately 30 to 60g then a sub-sampling routine based on ISO 3082:2009(E) is employed. *NOTE: Depending on the nature and size of the soil sample, the sub-2 mm residue material may need to be sub-sampled for trace analysis, in accordance with AS 4964-2004.*
Bonded asbestos-containing material (ACM)	The material is first examined and any fibres isolated for identification by PLM and DS. Where required, interfering matrices may be removed by disintegration using a range of heat, chemical or physical treatments, possibly in combination.The resultant material is then further examined in accordance with AS 4964 - 2004. *NOTE: Even after disintegration it may be difficult to detect the presence of asbestos in some asbestos-containing bulk materials using PLM and DS. This is due to the low grade or small length or diameter of the asbestos fibres present in the material, or to the fact that very fine fibres have been distributed intimately throughout the materials. Vinyl/asbestos floor tiles, some asbestos-containing sealants and mastics, asbestos-containing epoxy resins and some ore samples are examples of these types of material, which are difficult to analyse.*
Limit of Reporting	The performance limitation of the AS 4964 (2004) method for non-homogeneous samples is around 0.1 g/kg (equivalent to 0.01% (w/w)). Where no asbestos is found by PLM and DS, including Trace Analysis, this is considered to be at the nominal reporting limit of 0.01% (w/w). The NEPM screening level of 0.001% (w/w) is intended as an on-site determination, not a laboratory Limit of Reporting (LOR), per se. Examination of a large sample size (e.g. 500 mL) may improve the likelihood of detecting asbestos, particularly AF, to aid assessment against the NEPM criteria. Gravimetric determinations to this level of accuracy are outside of AS 4964 and hence NATA Accreditation does not cover the performance of this service (non-NATA results shown with an asterisk). *NOTE: NATA News March 2014, p.7, states in relation to AS 4964: "This is a qualitative method with a nominal reporting limit of 0.01 % " and that currently in Australia "there is no validated method available for the quantification of asbestos".This report is consistent with the analytical procedures and reporting recommendations in the NEPM and the WA DoH.*

Project Name	CHATSWOOD EDUCATION PRECINCT PRIMARY SCHOOL
Project ID	55579
Date Sampled	Jan 22, 2019 to Jan 24, 2019
Report	637818-AID

Client Sample ID	Eurofins | mgt Sample No.	Date Sampled	Sample Description	Result
BH_P_01 0.4-0.5	19-Ja24219	Jan 23, 2019	Approximate Sample 488g Sample consisted of: Brown coarse-grained soil and rocks	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No respirable fibres detected.
BH_P_02 0-0.15	19-Ja24220	Jan 23, 2019	Approximate Sample 697g Sample consisted of: Dark brown coarse-grained soil, rocks and fragments of bitumen	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No respirable fibres detected.
BH_P_03 1-1.1	19-Ja24221	Jan 23, 2019	Approximate Sample 685g Sample consisted of: Brown coarse-grained soil and rocks	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No respirable fibres detected.
BH_P_04 0-0.15	19-Ja24222	Jan 23, 2019	Approximate Sample 818g Sample consisted of: Brown coarse-grained soil and rocks	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No respirable fibres detected.
BH_P_05 0.4-0.5	19-Ja24223	Jan 23, 2019	Approximate Sample 643g Sample consisted of: Brown coarse-grained soil and rocks	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No respirable fibres detected.
BH_P_06 0.8-0.9	19-Ja24224	Jan 23, 2019	Approximate Sample 544g Sample consisted of: Brown coarse-grained soil and rocks	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No respirable fibres detected.
BH_P_07 0-0.15	19-Ja24225	Jan 22, 2019	Approximate Sample 789g Sample consisted of: Brown coarse-grained soil and rocks	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No respirable fibres detected.
BH_P_08 0.4-0.5	19-Ja24226	Jan 24, 2019	Approximate Sample 618g Sample consisted of: Brown coarse-grained soil and rocks	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No respirable fibres detected.

Client Sample ID	Eurofins | mgt Sample No.	Date Sampled	Sample Description	Result
BH_P_09 0-0.15	19-Ja24227	Jan 24, 2019	Approximate Sample 608g Sample consisted of: Brown coarse-grained soil and rocks	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No respirable fibres detected.
BH_P_10 0.6-0.7	19-Ja24228	Jan 24, 2019	Approximate Sample 706g Sample consisted of: Brown coarse-grained soil and rocks	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No respirable fibres detected.

Sample History

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

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

Description	Testing Site	Extracted	Holding Time
Asbestos - LTM-ASB-8020	Sydney	Jan 29, 2019	Indefinite

Company Name: JBS & G Australia (NSW) P/L
Address: Level 1, 50 Margaret St
Sydney
NSW 2000

Order No.:
Report #: 637818
Phone: 02 8245 0300
Fax:

Received: Jan 25, 2019 5:50 PM
Due: Feb 4, 2019
Priority: 5 Day
Contact Name: Daniel Denaro

Project Name: CHATSWOOD EDUCATION PRECINCT PRIMARY SCHOOL
Project ID: 55579

Eurofins | mgt Analytical Services Manager : Nibha Vaidya

Sample Detail						Asbestos - WA guidelines	HOLD	Polycyclic Aromatic Hydrocarbons	Organochlorine Pesticides	Metals M8	Moisture Set	Eurofins | mgt Suite B7	JBS&G Suite 2
Melbourne Laboratory - NATA Site # 1254 & 14271							X	X	X	X	X	X	X
Sydney Laboratory - NATA Site # 18217						X							
Brisbane Laboratory - NATA Site # 20794													
Perth Laboratory - NATA Site # 23736													
External Laboratory													
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**								
1	BH_P_01 0.4-0.5	Jan 23, 2019		Soil	S19-Ja24219	X					X		X
2	BH_P_02 0-0.15	Jan 23, 2019		Soil	S19-Ja24220	X			X		X	X	
3	BH_P_03 1-1.1	Jan 23, 2019		Soil	S19-Ja24221	X			X		X	X	
4	BH_P_04 0-0.15	Jan 23, 2019		Soil	S19-Ja24222	X		X		X	X		
5	BH_P_05 0.4-0.5	Jan 23, 2019		Soil	S19-Ja24223	X		X		X	X		
6	BH_P_06 0.8-	Jan 23, 2019		Soil	S19-Ja24224	X					X		X

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Sample Detail						Asbestos - WA guidelines	HOLD	Polycyclic Aromatic Hydrocarbons	Organochlorine Pesticides	Metals M8	Moisture Set	Eurofins | mgt Suite B7	JBS&G Suite 2
Melbourne Laboratory - NATA Site # 1254 & 14271							X	X	X	X	X	X	X
Sydney Laboratory - NATA Site # 18217						X							
Brisbane Laboratory - NATA Site # 20794													
Perth Laboratory - NATA Site # 23736													
	0.9												
7	BH_P_07 0-0.15	Jan 22, 2019		Soil	S19-Ja24225	X		X		X	X		
8	BH_P_08 0.4-0.5	Jan 24, 2019		Soil	S19-Ja24226	X		X		X	X		
9	BH_P_09 0-0.15	Jan 24, 2019		Soil	S19-Ja24227	X			X		X	X	
10	BH_P_10 0.6-0.7	Jan 24, 2019		Soil	S19-Ja24228	X		X		X	X		
11	BH_P_01 0-0.15	Jan 23, 2019		Soil	S19-Ja24229		X						
12	BH_P_01 1-1.1	Jan 23, 2019		Soil	S19-Ja24230		X						
13	BH_P_02 0.4-	Jan 23, 2019		Soil	S19-Ja24231		X						

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Sample Detail						Asbestos - WA guidelines	HOLD	Polycyclic Aromatic Hydrocarbons	Organochlorine Pesticides	Metals M8	Moisture Set	Eurofins | mgt Suite B7	JBS&G Suite 2
Melbourne Laboratory - NATA Site # 1254 & 14271							X	X	X	X	X	X	X
Sydney Laboratory - NATA Site # 18217						X							
Brisbane Laboratory - NATA Site # 20794													
Perth Laboratory - NATA Site # 23736													
	0.5												
14	BH_P_02 1-1.1	Jan 23, 2019		Soil	S19-Ja24232		X						
15	BH_P_03 0-0.15	Jan 23, 2019		Soil	S19-Ja24233		X						
16	BH_P_03 0.4-0.5	Jan 23, 2019		Soil	S19-Ja24234		X						
17	BH_P_03 1.4-1.5	Jan 23, 2019		Soil	S19-Ja24235		X						
18	BH_P_04 0.4-0.5	Jan 23, 2019		Soil	S19-Ja24236		X						
19	BH_P_04 1-1.1	Jan 23, 2019		Soil	S19-Ja24237		X						
20	BH_P_05 0-	Jan 23, 2019		Soil	S19-Ja24238		X						

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Eurofins | mgt Analytical Services Manager : Nibha Vaidya

Sample Detail						Asbestos - WA guidelines	HOLD	Polycyclic Aromatic Hydrocarbons	Organochlorine Pesticides	Metals M8	Moisture Set	Eurofins | mgt Suite B7	JBS&G Suite 2
Melbourne Laboratory - NATA Site # 1254 & 14271							X	X	X	X	X	X	X
Sydney Laboratory - NATA Site # 18217						X							
Brisbane Laboratory - NATA Site # 20794													
Perth Laboratory - NATA Site # 23736													
	0.15												
21	BH_P_05 1-1.1	Jan 23, 2019		Soil	S19-Ja24239		X						
22	BH_P_06 0-0.15	Jan 23, 2019		Soil	S19-Ja24240		X						
23	BH_P_06 0.4-0.5	Jan 23, 2019		Soil	S19-Ja24241		X						
24	BH_P_06 1.5-1.6	Jan 23, 2019		Soil	S19-Ja24242		X						
25	BH_P_07 0.4-0.5	Jan 22, 2019		Soil	S19-Ja24243		X						
26	BH_P_07 1-1.1	Jan 22, 2019		Soil	S19-Ja24244		X						
27	BH_P_07 1.7-	Jan 22, 2019		Soil	S19-Ja24245		X						

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Sample Detail						Asbestos - WA guidelines	HOLD	Polycyclic Aromatic Hydrocarbons	Organochlorine Pesticides	Metals M8	Moisture Set	Eurofins | mgt Suite B7	JBS&G Suite 2
Melbourne Laboratory - NATA Site # 1254 & 14271							X	X	X	X	X	X	X
Sydney Laboratory - NATA Site # 18217						X							
Brisbane Laboratory - NATA Site # 20794													
Perth Laboratory - NATA Site # 23736													
	1.8												
28	BH_P_08 0-0.15	Jan 24, 2019		Soil	S19-Ja24246		X						
29	BH_P_09 0.4-0.5	Jan 24, 2019		Soil	S19-Ja24247		X						
30	BH_P_09A 0-0.15	Jan 24, 2019		Soil	S19-Ja24248		X						
31	BH_P_09A 0.4-0.5	Jan 24, 2019		Soil	S19-Ja24249		X						
32	BH_P_10 0-0.15	Jan 24, 2019		Soil	S19-Ja24250		X						
33	BH_P_10 1-1.1	Jan 24, 2019		Soil	S19-Ja24251		X						
34	BH_P_11 0-	Jan 24, 2019		Soil	S19-Ja24252		X						

Company Name:	JBS & G Australia (NSW) P/L	**Order No.:**	
Address:	Level 1, 50 Margaret St Sydney NSW 2000	**Report #:**	637818
		Phone:	02 8245 0300
		Fax:	
Project Name:	CHATSWOOD EDUCATION PRECINCT PRIMARY SCHOOL		
Project ID:	55579		

Received: Jan 25, 2019 5:50 PM
Due: Feb 4, 2019
Priority: 5 Day
Contact Name: Daniel Denaro

Eurofins | mgt Analytical Services Manager : Nibha Vaidya

Sample Detail						Asbestos - WA guidelines	HOLD	Polycyclic Aromatic Hydrocarbons	Organochlorine Pesticides	Metals M8	Moisture Set	Eurofins | mgt Suite B7	JBS&G Suite 2
Melbourne Laboratory - NATA Site # 1254 & 14271							X	X	X	X	X	X	X
Sydney Laboratory - NATA Site # 18217						X							
Brisbane Laboratory - NATA Site # 20794													
Perth Laboratory - NATA Site # 23736													
	0.15												
35	BH_P_11 0.4-0.5	Jan 24, 2019		Soil	S19-Ja24253		X						
36	BH_P_11 0.8-0.9	Jan 24, 2019		Soil	S19-Ja24254		X						
37	BH_P_11 1.1-1.2	Jan 24, 2019		Soil	S19-Ja24255		X						
Test Counts						10	27	5	3	5	10	3	2

Internal Quality Control Review and Glossary

General

1. QC data may be available on request.
2. All soil results are reported on a dry basis, unless otherwise stated.
3. Samples were analysed on an 'as received' basis.
4. This report replaces any interim results previously issued.

Holding Times

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

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

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

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

Units

% w/w: weight for weight basis	grams per kilogram
Filter loading:	fibres/100 graticule areas
Reported Concentration:	fibres/mL
Flowrate:	L/min

Terms

Dry	Sample is dried by heating prior to analysis
LOR	Limit of Reporting
COC	Chain of Custody
SRA	Sample Receipt Advice
ISO	International Standards Organisation
AS	Australian Standards
WA DOH	Reference document for the NEPM. Government of Western Australia, Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia (2009), including supporting document Recommended Procedures for Laboratory Analysis of Asbestos in Soil (2011)
NEPM	National Environment Protection (Assessment of Site Contamination) Measure, 2013 (as amended)
ACM	Asbestos Containing Materials. Asbestos contained within a non-asbestos matrix, typically presented in bonded and/or sound condition. For the purposes of the NEPM, ACM is generally restricted to those materials that do not pass a 7mm x 7mm sieve.
AF	Asbestos Fines. Asbestos containing materials, including friable, weathered and bonded materials, able to pass a 7mm x 7mm sieve. Considered under the NEPM as equivalent to “non-bonded / friable”.
FA	Fibrous Asbestos. Asbestos containing materials in a friable and/or severely weathered condition. For the purposes of the NEPM, FA is generally restricted to those materials that do not pass a 7mm x 7mm sieve.
Friable	Asbestos-containing materials of any size that may be broken or crumbled by hand pressure. For the purposes of the NEPM, this includes both AF and FA. It is outside of the laboratory’s remit to assess degree of friability.
Trace Analysis	Analytical procedure used to detect the presence of respirable fibres in the matrix.

Comments

Ja24219: Sample received was less than the nominal 500mL as recommended in Section 4.10 of the NEPM Schedule B1 - Guideline on Investigation Levels for Soil and Groundwater.

Sample Integrity

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

Qualifier Codes/Comments

Code	Description
N/A	Not applicable

Asbestos Counter/Identifier:

Laxman Dias	Senior Analyst-Asbestos (NSW)

Authorised by:

Sayeed Abu	Senior Analyst-Asbestos (NSW)

Glenn Jackson
General Manager

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

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

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

Certificate of Analysis

NATA Accredited
Accreditation Number 1261
Site Number 18217

Accredited for compliance with ISO/IEC 17025 – Testing
The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

WORLD RECOGNISED ACCREDITATION

JBS & G Australia (NSW) P/L
Level 1, 50 Margaret St
Sydney
NSW 2000

Attention: **Daniel Denaro**

Report **637818-S**
Project name CHATSWOOD EDUCATION PRECINCT PRIMARY SCHOOL
Project ID 55579
Received Date Jan 25, 2019

Client Sample ID			**BH_P_01 0.4-0.5**	[R16]**BH_P_02 0-0.15**	**BH_P_03 1-1.1**	**BH_P_04 0-0.15**
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins | mgt Sample No.			**S19-Ja24219**	**S19-Ja24220**	**S19-Ja24221**	**S19-Ja24222**
Date Sampled			**Jan 23, 2019**	**Jan 23, 2019**	**Jan 23, 2019**	**Jan 23, 2019**
Test/Reference	LOR	Unit				
Total Recoverable Hydrocarbons - 1999 NEPM Fractions						
TRH C6-C9	20	mg/kg	< 20	< 40	< 20	-
TRH C10-C14	20	mg/kg	< 20	< 20	< 20	-
TRH C15-C28	50	mg/kg	< 50	6400	< 50	-
TRH C29-C36	50	mg/kg	< 50	3900	< 50	-
TRH C10-36 (Total)	50	mg/kg	< 50	10300	< 50	-
BTEX						
Benzene	0.1	mg/kg	< 0.1	< 0.2	< 0.1	-
Toluene	0.1	mg/kg	< 0.1	< 0.2	< 0.1	-
Ethylbenzene	0.1	mg/kg	< 0.1	< 0.2	< 0.1	-
m&p-Xylenes	0.2	mg/kg	< 0.2	< 0.4	< 0.2	-
o-Xylene	0.1	mg/kg	< 0.1	< 0.2	< 0.1	-
Xylenes - Total	0.3	mg/kg	< 0.3	< 0.6	< 0.3	-
4-Bromofluorobenzene (surr.)	1	%	75	88	68	-
Total Recoverable Hydrocarbons - 2013 NEPM Fractions						
Naphthalene[N02]	0.5	mg/kg	< 0.5	1.5	< 0.5	-
TRH C6-C10	20	mg/kg	< 20	< 40	< 20	-
TRH C6-C10 less BTEX (F1)[N04]	20	mg/kg	< 20	< 40	< 20	-
TRH >C10-C16	50	mg/kg	< 50	120	< 50	-
TRH >C10-C16 less Naphthalene (F2)[N01]	50	mg/kg	< 50	118.5	< 50	-
TRH >C16-C34	100	mg/kg	< 100	9000	< 100	-
TRH >C34-C40	100	mg/kg	< 100	2200	< 100	-
TRH >C10-C40 (total)*	100	mg/kg	< 100	11320	< 100	-
Polycyclic Aromatic Hydrocarbons						
Benzo(a)pyrene TEQ (lower bound) *	0.5	mg/kg	< 0.5	120	< 0.5	3.2
Benzo(a)pyrene TEQ (medium bound) *	0.5	mg/kg	0.6	120	0.6	3.4
Benzo(a)pyrene TEQ (upper bound) *	0.5	mg/kg	1.2	120	1.2	3.7
Acenaphthene	0.5	mg/kg	< 0.5	1.0	< 0.5	< 0.5
Acenaphthylene	0.5	mg/kg	< 0.5	1.7	< 0.5	< 0.5
Anthracene	0.5	mg/kg	< 0.5	7.2	< 0.5	< 0.5
Benz(a)anthracene	0.5	mg/kg	< 0.5	47	< 0.5	1.5
Benzo(a)pyrene	0.5	mg/kg	< 0.5	82	< 0.5	2.5
Benzo(b&j)fluoranthene[N07]	0.5	mg/kg	< 0.5	55	< 0.5	1.9
Benzo(g.h.i)perylene	0.5	mg/kg	< 0.5	41	< 0.5	0.8
Benzo(k)fluoranthene	0.5	mg/kg	< 0.5	59	< 0.5	1.9
Chrysene	0.5	mg/kg	< 0.5	48	< 0.5	1.5

Client Sample ID			**BH_P_01 0.4-0.5**	**R16BH_P_02 0-0.15**	**BH_P_03 1-1.1**	**BH_P_04 0-0.15**
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins | mgt Sample No.			**S19-Ja24219**	**S19-Ja24220**	**S19-Ja24221**	**S19-Ja24222**
Date Sampled			**Jan 23, 2019**	**Jan 23, 2019**	**Jan 23, 2019**	**Jan 23, 2019**
Test/Reference	LOR	Unit				
Polycyclic Aromatic Hydrocarbons						
Dibenz(a.h)anthracene	0.5	mg/kg	< 0.5	11	< 0.5	< 0.5
Fluoranthene	0.5	mg/kg	< 0.5	96	< 0.5	2.6
Fluorene	0.5	mg/kg	< 0.5	1.0	< 0.5	< 0.5
Indeno(1.2.3-cd)pyrene	0.5	mg/kg	< 0.5	61	< 0.5	1.4
Naphthalene	0.5	mg/kg	< 0.5	0.7	< 0.5	< 0.5
Phenanthrene	0.5	mg/kg	< 0.5	29	< 0.5	1.0
Pyrene	0.5	mg/kg	< 0.5	110	< 0.5	2.9
Total PAH*	0.5	mg/kg	< 0.5	650.6	< 0.5	18
2-Fluorobiphenyl (surr.)	1	%	82	73	75	81
p-Terphenyl-d14 (surr.)	1	%	97	73	88	84
Organochlorine Pesticides						
Chlordanes - Total	0.1	mg/kg	< 0.1	< 0.1	< 0.1	-
4.4'-DDD	0.05	mg/kg	< 0.05	< 0.05	< 0.05	-
4.4'-DDE	0.05	mg/kg	< 0.05	< 0.05	< 0.05	-
4.4'-DDT	0.05	mg/kg	< 0.05	< 0.05	< 0.05	-
a-BHC	0.05	mg/kg	< 0.05	< 0.05	< 0.05	-
Aldrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	-
b-BHC	0.05	mg/kg	< 0.05	< 0.05	< 0.05	-
d-BHC	0.05	mg/kg	< 0.05	< 0.05	< 0.05	-
Dieldrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	-
Endosulfan I	0.05	mg/kg	< 0.05	< 0.05	< 0.05	-
Endosulfan II	0.05	mg/kg	< 0.05	< 0.05	< 0.05	-
Endosulfan sulphate	0.05	mg/kg	< 0.05	< 0.05	< 0.05	-
Endrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	-
Endrin aldehyde	0.05	mg/kg	< 0.05	< 0.05	< 0.05	-
Endrin ketone	0.05	mg/kg	< 0.05	< 0.05	< 0.05	-
g-BHC (Lindane)	0.05	mg/kg	< 0.05	< 0.05	< 0.05	-
Heptachlor	0.05	mg/kg	< 0.05	< 0.05	< 0.05	-
Heptachlor epoxide	0.05	mg/kg	< 0.05	< 0.05	< 0.05	-
Hexachlorobenzene	0.05	mg/kg	< 0.05	< 0.05	< 0.05	-
Methoxychlor	0.05	mg/kg	< 0.05	< 0.05	< 0.05	-
Toxaphene	1	mg/kg	< 1	< 1	< 1	-
Aldrin and Dieldrin (Total)*	0.05	mg/kg	< 0.05	< 0.05	< 0.05	-
DDT + DDE + DDD (Total)*	0.05	mg/kg	< 0.05	< 0.05	< 0.05	-
Vic EPA IWRG 621 OCP (Total)*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	-
Vic EPA IWRG 621 Other OCP (Total)*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	-
Dibutylchlorendate (surr.)	1	%	121	97	94	-
Tetrachloro-m-xylene (surr.)	1	%	55	100	100	-
Polychlorinated Biphenyls						
Aroclor-1016	0.1	mg/kg	< 0.1	-	-	-
Aroclor-1221	0.1	mg/kg	< 0.1	-	-	-
Aroclor-1232	0.1	mg/kg	< 0.1	-	-	-
Aroclor-1242	0.1	mg/kg	< 0.1	-	-	-
Aroclor-1248	0.1	mg/kg	< 0.1	-	-	-
Aroclor-1254	0.1	mg/kg	< 0.1	-	-	-
Aroclor-1260	0.1	mg/kg	< 0.1	-	-	-
Total PCB*	0.1	mg/kg	< 0.1	-	-	-
Dibutylchlorendate (surr.)	1	%	121	-	-	-
Tetrachloro-m-xylene (surr.)	1	%	55	-	-	-

Client Sample ID			BH_P_01 0.4-0.5	[R16]BH_P_02 0-0.15	BH_P_03 1-1.1	BH_P_04 0-0.15
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins | mgt Sample No.			**S19-Ja24219**	**S19-Ja24220**	**S19-Ja24221**	**S19-Ja24222**
Date Sampled			**Jan 23, 2019**	**Jan 23, 2019**	**Jan 23, 2019**	**Jan 23, 2019**
Test/Reference	LOR	Unit				
Heavy Metals						
Arsenic	2	mg/kg	8.2	2.1	4.1	3.8
Cadmium	0.4	mg/kg	< 0.4	0.7	< 0.4	< 0.4
Chromium	5	mg/kg	15	29	14	12
Copper	5	mg/kg	< 5	44	< 5	75
Lead	5	mg/kg	16	100	23	58
Mercury	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Nickel	5	mg/kg	< 5	32	< 5	8.3
Zinc	5	mg/kg	320	110	6.3	78
% Moisture	1	%	20	2.9	14	8.4

Client Sample ID			BH_P_05 0.4-0.5	BH_P_06 0.8-0.9	BH_P_07 0-0.15	BH_P_08 0.4-0.5
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins | mgt Sample No.			**S19-Ja24223**	**S19-Ja24224**	**S19-Ja24225**	**S19-Ja24226**
Date Sampled			**Jan 23, 2019**	**Jan 23, 2019**	**Jan 22, 2019**	**Jan 24, 2019**
Test/Reference	LOR	Unit				
Total Recoverable Hydrocarbons - 1999 NEPM Fractions						
TRH C6-C9	20	mg/kg	-	< 20	-	-
TRH C10-C14	20	mg/kg	-	< 20	-	-
TRH C15-C28	50	mg/kg	-	< 50	-	-
TRH C29-C36	50	mg/kg	-	< 50	-	-
TRH C10-36 (Total)	50	mg/kg	-	< 50	-	-
BTEX						
Benzene	0.1	mg/kg	-	< 0.1	-	-
Toluene	0.1	mg/kg	-	< 0.1	-	-
Ethylbenzene	0.1	mg/kg	-	< 0.1	-	-
m&p-Xylenes	0.2	mg/kg	-	< 0.2	-	-
o-Xylene	0.1	mg/kg	-	< 0.1	-	-
Xylenes - Total	0.3	mg/kg	-	< 0.3	-	-
4-Bromofluorobenzene (surr.)	1	%	-	70	-	-
Total Recoverable Hydrocarbons - 2013 NEPM Fractions						
Naphthalene[N02]	0.5	mg/kg	-	< 0.5	-	-
TRH C6-C10	20	mg/kg	-	< 20	-	-
TRH C6-C10 less BTEX (F1)[N04]	20	mg/kg	-	< 20	-	-
TRH >C10-C16	50	mg/kg	-	< 50	-	-
TRH >C10-C16 less Naphthalene (F2)[N01]	50	mg/kg	-	< 50	-	-
TRH >C16-C34	100	mg/kg	-	< 100	-	-
TRH >C34-C40	100	mg/kg	-	< 100	-	-
TRH >C10-C40 (total)*	100	mg/kg	-	< 100	-	-
Polycyclic Aromatic Hydrocarbons						
Benzo(a)pyrene TEQ (lower bound) *	0.5	mg/kg	1.2	1.3	< 0.5	2.2
Benzo(a)pyrene TEQ (medium bound) *	0.5	mg/kg	1.4	1.6	0.6	2.5
Benzo(a)pyrene TEQ (upper bound) *	0.5	mg/kg	1.7	1.8	1.2	2.7
Acenaphthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Acenaphthylene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benz(a)anthracene	0.5	mg/kg	0.6	0.6	< 0.5	1.3

Client Sample ID			**BH_P_05 0.4-0.5**	**BH_P_06 0.8-0.9**	**BH_P_07 0-0.15**	**BH_P_08 0.4-0.5**
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins | mgt Sample No.			**S19-Ja24223**	**S19-Ja24224**	**S19-Ja24225**	**S19-Ja24226**
Date Sampled			**Jan 23, 2019**	**Jan 23, 2019**	**Jan 22, 2019**	**Jan 24, 2019**
Test/Reference	LOR	Unit				
Polycyclic Aromatic Hydrocarbons						
Benzo(a)pyrene	0.5	mg/kg	0.9	1.0	< 0.5	1.7
Benzo(b&j)fluoranthene^{N07}	0.5	mg/kg	0.5	0.9	< 0.5	1.2
Benzo(g.h.i)perylene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	0.6
Benzo(k)fluoranthene	0.5	mg/kg	0.7	1.0	< 0.5	1.5
Chrysene	0.5	mg/kg	0.5	0.7	< 0.5	1.1
Dibenz(a.h)anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Fluoranthene	0.5	mg/kg	1.3	1.1	< 0.5	2.5
Fluorene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Indeno(1.2.3-cd)pyrene	0.5	mg/kg	0.7	0.5	< 0.5	0.9
Naphthalene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Phenanthrene	0.5	mg/kg	0.9	< 0.5	< 0.5	1.5
Pyrene	0.5	mg/kg	1.4	1.2	< 0.5	2.5
Total PAH*	0.5	mg/kg	7.5	7	< 0.5	14.8
2-Fluorobiphenyl (surr.)	1	%	72	75	74	89
p-Terphenyl-d14 (surr.)	1	%	72	71	75	90
Organochlorine Pesticides						
Chlordanes - Total	0.1	mg/kg	-	< 0.1	-	-
4.4'-DDD	0.05	mg/kg	-	< 0.05	-	-
4.4'-DDE	0.05	mg/kg	-	< 0.05	-	-
4.4'-DDT	0.05	mg/kg	-	< 0.05	-	-
a-BHC	0.05	mg/kg	-	< 0.05	-	-
Aldrin	0.05	mg/kg	-	< 0.05	-	-
b-BHC	0.05	mg/kg	-	< 0.05	-	-
d-BHC	0.05	mg/kg	-	< 0.05	-	-
Dieldrin	0.05	mg/kg	-	< 0.05	-	-
Endosulfan I	0.05	mg/kg	-	< 0.05	-	-
Endosulfan II	0.05	mg/kg	-	< 0.05	-	-
Endosulfan sulphate	0.05	mg/kg	-	< 0.05	-	-
Endrin	0.05	mg/kg	-	< 0.05	-	-
Endrin aldehyde	0.05	mg/kg	-	< 0.05	-	-
Endrin ketone	0.05	mg/kg	-	< 0.05	-	-
g-BHC (Lindane)	0.05	mg/kg	-	< 0.05	-	-
Heptachlor	0.05	mg/kg	-	< 0.05	-	-
Heptachlor epoxide	0.05	mg/kg	-	< 0.05	-	-
Hexachlorobenzene	0.05	mg/kg	-	< 0.05	-	-
Methoxychlor	0.05	mg/kg	-	< 0.05	-	-
Toxaphene	1	mg/kg	-	< 1	-	-
Aldrin and Dieldrin (Total)*	0.05	mg/kg	-	< 0.05	-	-
DDT + DDE + DDD (Total)*	0.05	mg/kg	-	< 0.05	-	-
Vic EPA IWRG 621 OCP (Total)*	0.1	mg/kg	-	< 0.1	-	-
Vic EPA IWRG 621 Other OCP (Total)*	0.1	mg/kg	-	< 0.1	-	-
Dibutylchlorendate (surr.)	1	%	-	91	-	-
Tetrachloro-m-xylene (surr.)	1	%	-	97	-	-
Polychlorinated Biphenyls						
Aroclor-1016	0.1	mg/kg	-	< 0.1	-	-
Aroclor-1221	0.1	mg/kg	-	< 0.1	-	-
Aroclor-1232	0.1	mg/kg	-	< 0.1	-	-
Aroclor-1242	0.1	mg/kg	-	< 0.1	-	-
Aroclor-1248	0.1	mg/kg	-	< 0.1	-	-

Client Sample ID			**BH_P_05 0.4-0.5**	**BH_P_06 0.8-0.9**	**BH_P_07 0-0.15**	**BH_P_08 0.4-0.5**
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins | mgt Sample No.			**S19-Ja24223**	**S19-Ja24224**	**S19-Ja24225**	**S19-Ja24226**
Date Sampled			**Jan 23, 2019**	**Jan 23, 2019**	**Jan 22, 2019**	**Jan 24, 2019**
Test/Reference	LOR	Unit				
Polychlorinated Biphenyls						
Aroclor-1254	0.1	mg/kg	-	< 0.1	-	-
Aroclor-1260	0.1	mg/kg	-	< 0.1	-	-
Total PCB*	0.1	mg/kg	-	< 0.1	-	-
Dibutylchlorendate (surr.)	1	%	-	91	-	-
Tetrachloro-m-xylene (surr.)	1	%	-	97	-	-
Heavy Metals						
Arsenic	2	mg/kg	4.4	4.5	< 2	4.0
Cadmium	0.4	mg/kg	< 0.4	0.4	< 0.4	< 0.4
Chromium	5	mg/kg	14	11	42	9.1
Copper	5	mg/kg	8.8	34	55	18
Lead	5	mg/kg	19	98	< 5	180
Mercury	0.1	mg/kg	< 0.1	0.1	< 0.1	< 0.1
Nickel	5	mg/kg	8.5	6.7	70	6.0
Zinc	5	mg/kg	14	310	55	120
% Moisture	1	%	8.8	16	6.4	17

Client Sample ID			**BH_P_09 0-0.15**	**BH_P_10 0.6-0.7**
Sample Matrix			**Soil**	**Soil**
Eurofins | mgt Sample No.			**S19-Ja24227**	**S19-Ja24228**
Date Sampled			**Jan 24, 2019**	**Jan 24, 2019**
Test/Reference	LOR	Unit		
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				
TRH C6-C9	20	mg/kg	< 20	-
TRH C10-C14	20	mg/kg	< 20	-
TRH C15-C28	50	mg/kg	54	-
TRH C29-C36	50	mg/kg	120	-
TRH C10-36 (Total)	50	mg/kg	174	-
BTEX				
Benzene	0.1	mg/kg	< 0.1	-
Toluene	0.1	mg/kg	< 0.1	-
Ethylbenzene	0.1	mg/kg	< 0.1	-
m&p-Xylenes	0.2	mg/kg	< 0.2	-
o-Xylene	0.1	mg/kg	< 0.1	-
Xylenes - Total	0.3	mg/kg	< 0.3	-
4-Bromofluorobenzene (surr.)	1	%	79	-
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				
Naphthalene^{N02}	0.5	mg/kg	< 0.5	-
TRH C6-C10	20	mg/kg	< 20	-
TRH C6-C10 less BTEX (F1)^{N04}	20	mg/kg	< 20	-
TRH >C10-C16	50	mg/kg	< 50	-
TRH >C10-C16 less Naphthalene (F2)^{N01}	50	mg/kg	< 50	-
TRH >C16-C34	100	mg/kg	130	-
TRH >C34-C40	100	mg/kg	< 100	-
TRH >C10-C40 (total)*	100	mg/kg	130	-

Client Sample ID			**BH_P_09 0-0.15**	**BH_P_10 0.6-0.7**
Sample Matrix			**Soil**	**Soil**
Eurofins | mgt Sample No.			**S19-Ja24227**	**S19-Ja24228**
Date Sampled			**Jan 24, 2019**	**Jan 24, 2019**
Test/Reference	LOR	Unit		
Polycyclic Aromatic Hydrocarbons				
Benzo(a)pyrene TEQ (lower bound) *	0.5	mg/kg	< 0.5	< 0.5
Benzo(a)pyrene TEQ (medium bound) *	0.5	mg/kg	0.6	0.6
Benzo(a)pyrene TEQ (upper bound) *	0.5	mg/kg	1.2	1.2
Acenaphthene	0.5	mg/kg	< 0.5	< 0.5
Acenaphthylene	0.5	mg/kg	< 0.5	< 0.5
Anthracene	0.5	mg/kg	< 0.5	< 0.5
Benz(a)anthracene	0.5	mg/kg	< 0.5	< 0.5
Benzo(a)pyrene	0.5	mg/kg	< 0.5	< 0.5
Benzo(b&j)fluoranthene^{N07}	0.5	mg/kg	< 0.5	< 0.5
Benzo(g.h.i)perylene	0.5	mg/kg	< 0.5	< 0.5
Benzo(k)fluoranthene	0.5	mg/kg	< 0.5	< 0.5
Chrysene	0.5	mg/kg	< 0.5	< 0.5
Dibenz(a.h)anthracene	0.5	mg/kg	< 0.5	< 0.5
Fluoranthene	0.5	mg/kg	< 0.5	< 0.5
Fluorene	0.5	mg/kg	< 0.5	< 0.5
Indeno(1.2.3-cd)pyrene	0.5	mg/kg	< 0.5	< 0.5
Naphthalene	0.5	mg/kg	< 0.5	< 0.5
Phenanthrene	0.5	mg/kg	< 0.5	< 0.5
Pyrene	0.5	mg/kg	< 0.5	< 0.5
Total PAH*	0.5	mg/kg	< 0.5	< 0.5
2-Fluorobiphenyl (surr.)	1	%	82	89
p-Terphenyl-d14 (surr.)	1	%	82	95
Organochlorine Pesticides				
Chlordanes - Total	0.1	mg/kg	< 0.1	-
4.4'-DDD	0.05	mg/kg	< 0.05	-
4.4'-DDE	0.05	mg/kg	< 0.05	-
4.4'-DDT	0.05	mg/kg	< 0.05	-
a-BHC	0.05	mg/kg	< 0.05	-
Aldrin	0.05	mg/kg	< 0.05	-
b-BHC	0.05	mg/kg	< 0.05	-
d-BHC	0.05	mg/kg	< 0.05	-
Dieldrin	0.05	mg/kg	< 0.05	-
Endosulfan I	0.05	mg/kg	< 0.05	-
Endosulfan II	0.05	mg/kg	< 0.05	-
Endosulfan sulphate	0.05	mg/kg	< 0.05	-
Endrin	0.05	mg/kg	< 0.05	-
Endrin aldehyde	0.05	mg/kg	< 0.05	-
Endrin ketone	0.05	mg/kg	< 0.05	-
g-BHC (Lindane)	0.05	mg/kg	< 0.05	-
Heptachlor	0.05	mg/kg	< 0.05	-
Heptachlor epoxide	0.05	mg/kg	< 0.05	-
Hexachlorobenzene	0.05	mg/kg	< 0.05	-
Methoxychlor	0.05	mg/kg	< 0.05	-
Toxaphene	1	mg/kg	< 1	-
Aldrin and Dieldrin (Total)*	0.05	mg/kg	< 0.05	-
DDT + DDE + DDD (Total)*	0.05	mg/kg	< 0.05	-
Vic EPA IWRG 621 OCP (Total)*	0.1	mg/kg	< 0.1	-
Vic EPA IWRG 621 Other OCP (Total)*	0.1	mg/kg	< 0.1	-
Dibutylchlorendate (surr.)	1	%	117	-
Tetrachloro-m-xylene (surr.)	1	%	101	-

Client Sample ID			**BH_P_09 0-0.15**	**BH_P_10 0.6-0.7**
Sample Matrix			**Soil**	**Soil**
Eurofins | mgt Sample No.			**S19-Ja24227**	**S19-Ja24228**
Date Sampled			**Jan 24, 2019**	**Jan 24, 2019**
Test/Reference	LOR	Unit		
Heavy Metals				
Arsenic	2	mg/kg	2.7	4.9
Cadmium	0.4	mg/kg	< 0.4	< 0.4
Chromium	5	mg/kg	5.1	13
Copper	5	mg/kg	15	20
Lead	5	mg/kg	14	32
Mercury	0.1	mg/kg	< 0.1	< 0.1
Nickel	5	mg/kg	< 5	< 5
Zinc	5	mg/kg	190	160
% Moisture	1	%	5.7	15

Sample History

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

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

Description	Testing Site	Extracted	Holding Time
JBS&G Suite 2			
Total Recoverable Hydrocarbons - 1999 NEPM Fractions	Melbourne	Feb 01, 2019	14 Day
- Method: LTM-ORG-2010 TRH C6-C40			
BTEX	Melbourne	Feb 01, 2019	14 Day
- Method: LTM-ORG-2150 VOCs in Soils Liquid and other Aqueous Matrices			
Total Recoverable Hydrocarbons - 2013 NEPM Fractions	Melbourne	Feb 01, 2019	14 Day
- Method: LTM-ORG-2010 TRH C6-C40			
Total Recoverable Hydrocarbons - 2013 NEPM Fractions	Melbourne	Feb 01, 2019	14 Day
- Method: LTM-ORG-2010 TRH C6-C40			
Polycyclic Aromatic Hydrocarbons	Melbourne	Feb 01, 2019	14 Day
- Method: LTM-ORG-2130 PAH and Phenols in Soil and Water			
Organochlorine Pesticides	Melbourne	Feb 01, 2019	14 Day
- Method: LTM-ORG-2220 OCP & PCB in Soil and Water			
Polychlorinated Biphenyls	Melbourne	Feb 01, 2019	28 Days
- Method: LTM-ORG-2220 OCP & PCB in Soil and Water			
Metals M8	Melbourne	Feb 01, 2019	28 Days
- Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS			
% Moisture	Melbourne	Jan 29, 2019	14 Day
- Method: LTM-GEN-7080 Moisture			

Company Name:	JBS & G Australia (NSW) P/L	**Order No.:**		**Received:**	Jan 25, 2019 5:50 PM
Address:	Level 1, 50 Margaret St Sydney NSW 2000	**Report #:**	637818	**Due:**	Feb 4, 2019
		Phone:	02 8245 0300	**Priority:**	5 Day
		Fax:		**Contact Name:**	Daniel Denaro
Project Name:	CHATSWOOD EDUCATION PRECINCT PRIMARY SCHOOL				
Project ID:	55579				

Eurofins | mgt Analytical Services Manager : Nibha Vaidya

Sample Detail						Asbestos - WA guidelines	HOLD	Polycyclic Aromatic Hydrocarbons	Organochlorine Pesticides	Metals M8	Moisture Set	Eurofins | mgt Suite B7	JBS&G Suite 2
Melbourne Laboratory - NATA Site # 1254 & 14271							X	X	X	X	X	X	X
Sydney Laboratory - NATA Site # 18217						X							
Brisbane Laboratory - NATA Site # 20794													
Perth Laboratory - NATA Site # 23736													
External Laboratory													
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**								
1	BH_P_01 0.4-0.5	Jan 23, 2019		Soil	S19-Ja24219	X					X		X
2	BH_P_02 0-0.15	Jan 23, 2019		Soil	S19-Ja24220	X			X		X	X	
3	BH_P_03 1-1.1	Jan 23, 2019		Soil	S19-Ja24221	X			X		X	X	
4	BH_P_04 0-0.15	Jan 23, 2019		Soil	S19-Ja24222	X		X		X	X		
5	BH_P_05 0.4-0.5	Jan 23, 2019		Soil	S19-Ja24223	X		X		X	X		
6	BH_P_06 0.8-	Jan 23, 2019		Soil	S19-Ja24224	X					X		X

Company Name: JBS & G Australia (NSW) P/L
Address: Level 1, 50 Margaret St
Sydney
NSW 2000

Project Name: CHATSWOOD EDUCATION PRECINCT PRIMARY SCHOOL
Project ID: 55579

Order No.:
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Phone: 02 8245 0300
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Priority: 5 Day
Contact Name: Daniel Denaro

Eurofins | mgt Analytical Services Manager : Nibha Vaidya

Sample Detail						Asbestos - WA guidelines	HOLD	Polycyclic Aromatic Hydrocarbons	Organochlorine Pesticides	Metals M8	Moisture Set	Eurofins | mgt Suite B7	JBS&G Suite 2
Melbourne Laboratory - NATA Site # 1254 & 14271							X	X	X	X	X	X	X
Sydney Laboratory - NATA Site # 18217						X							
Brisbane Laboratory - NATA Site # 20794													
Perth Laboratory - NATA Site # 23736													
	0.9												
7	BH_P_07 0-0.15	Jan 22, 2019		Soil	S19-Ja24225	X		X		X	X		
8	BH_P_08 0.4-0.5	Jan 24, 2019		Soil	S19-Ja24226	X		X		X	X		
9	BH_P_09 0-0.15	Jan 24, 2019		Soil	S19-Ja24227	X			X		X	X	
10	BH_P_10 0.6-0.7	Jan 24, 2019		Soil	S19-Ja24228	X		X		X	X		
11	BH_P_01 0-0.15	Jan 23, 2019		Soil	S19-Ja24229		X						
12	BH_P_01 1-1.1	Jan 23, 2019		Soil	S19-Ja24230		X						
13	BH_P_02 0.4-	Jan 23, 2019		Soil	S19-Ja24231		X						

Company Name: JBS & G Australia (NSW) P/L
Address: Level 1, 50 Margaret St
Sydney
NSW 2000

Project Name: CHATSWOOD EDUCATION PRECINCT PRIMARY SCHOOL
Project ID: 55579

Order No.:
Report #: 637818
Phone: 02 8245 0300
Fax:

Received: Jan 25, 2019 5:50 PM
Due: Feb 4, 2019
Priority: 5 Day
Contact Name: Daniel Denaro

Eurofins | mgt Analytical Services Manager : Nibha Vaidya

Sample Detail						Asbestos - WA guidelines	HOLD	Polycyclic Aromatic Hydrocarbons	Organochlorine Pesticides	Metals M8	Moisture Set	Eurofins | mgt Suite B7	JBS&G Suite 2
Melbourne Laboratory - NATA Site # 1254 & 14271							X	X	X	X	X	X	X
Sydney Laboratory - NATA Site # 18217						X							
Brisbane Laboratory - NATA Site # 20794													
Perth Laboratory - NATA Site # 23736													
	0.5												
14	BH_P_02 1-1.1	Jan 23, 2019		Soil	S19-Ja24232		X						
15	BH_P_03 0-0.15	Jan 23, 2019		Soil	S19-Ja24233		X						
16	BH_P_03 0.4-0.5	Jan 23, 2019		Soil	S19-Ja24234		X						
17	BH_P_03 1.4-1.5	Jan 23, 2019		Soil	S19-Ja24235		X						
18	BH_P_04 0.4-0.5	Jan 23, 2019		Soil	S19-Ja24236		X						
19	BH_P_04 1-1.1	Jan 23, 2019		Soil	S19-Ja24237		X						
20	BH_P_05 0-	Jan 23, 2019		Soil	S19-Ja24238		X						

Company Name:	JBS & G Australia (NSW) P/L	**Order No.:**	
Address:	Level 1, 50 Margaret St Sydney NSW 2000	**Report #:**	637818
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Project Name:	CHATSWOOD EDUCATION PRECINCT PRIMARY SCHOOL		
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Received: Jan 25, 2019 5:50 PM
Due: Feb 4, 2019
Priority: 5 Day
Contact Name: Daniel Denaro

Eurofins | mgt Analytical Services Manager : Nibha Vaidya

Sample Detail						Asbestos - WA guidelines	HOLD	Polycyclic Aromatic Hydrocarbons	Organochlorine Pesticides	Metals M8	Moisture Set	Eurofins | mgt Suite B7	JBS&G Suite 2
Melbourne Laboratory - NATA Site # 1254 & 14271							X	X	X	X	X	X	X
Sydney Laboratory - NATA Site # 18217						X							
Brisbane Laboratory - NATA Site # 20794													
Perth Laboratory - NATA Site # 23736													
	0.15												
21	BH_P_05 1-1.1	Jan 23, 2019		Soil	S19-Ja24239		X						
22	BH_P_06 0-0.15	Jan 23, 2019		Soil	S19-Ja24240		X						
23	BH_P_06 0.4-0.5	Jan 23, 2019		Soil	S19-Ja24241		X						
24	BH_P_06 1.5-1.6	Jan 23, 2019		Soil	S19-Ja24242		X						
25	BH_P_07 0.4-0.5	Jan 22, 2019		Soil	S19-Ja24243		X						
26	BH_P_07 1-1.1	Jan 22, 2019		Soil	S19-Ja24244		X						
27	BH_P_07 1.7-	Jan 22, 2019		Soil	S19-Ja24245		X						

Company Name:	JBS & G Australia (NSW) P/L	**Order No.:**		**Received:**	Jan 25, 2019 5:50 PM
Address:	Level 1, 50 Margaret St Sydney NSW 2000	**Report #:**	637818	**Due:**	Feb 4, 2019
		Phone:	02 8245 0300	**Priority:**	5 Day
		Fax:		**Contact Name:**	Daniel Denaro
Project Name:	CHATSWOOD EDUCATION PRECINCT PRIMARY SCHOOL				
Project ID:	55579				

Eurofins | mgt Analytical Services Manager : Nibha Vaidya

Sample Detail						Asbestos - WA guidelines	HOLD	Polycyclic Aromatic Hydrocarbons	Organochlorine Pesticides	Metals M8	Moisture Set	Eurofins | mgt Suite B7	JBS&G Suite 2
Melbourne Laboratory - NATA Site # 1254 & 14271							X	X	X	X	X	X	X
Sydney Laboratory - NATA Site # 18217						X							
Brisbane Laboratory - NATA Site # 20794													
Perth Laboratory - NATA Site # 23736													
	1.8												
28	BH_P_08 0-0.15	Jan 24, 2019		Soil	S19-Ja24246		X						
29	BH_P_09 0.4-0.5	Jan 24, 2019		Soil	S19-Ja24247		X						
30	BH_P_09A 0-0.15	Jan 24, 2019		Soil	S19-Ja24248		X						
31	BH_P_09A 0.4-0.5	Jan 24, 2019		Soil	S19-Ja24249		X						
32	BH_P_10 0-0.15	Jan 24, 2019		Soil	S19-Ja24250		X						
33	BH_P_10 1-1.1	Jan 24, 2019		Soil	S19-Ja24251		X						
34	BH_P_11 0-	Jan 24, 2019		Soil	S19-Ja24252		X						

Company Name: JBS & G Australia (NSW) P/L
Address: Level 1, 50 Margaret St
Sydney
NSW 2000

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Sample Detail						Asbestos - WA guidelines	HOLD	Polycyclic Aromatic Hydrocarbons	Organochlorine Pesticides	Metals M8	Moisture Set	Eurofins | mgt Suite B7	JBS&G Suite 2
Melbourne Laboratory - NATA Site # 1254 & 14271							X	X	X	X	X	X	X
Sydney Laboratory - NATA Site # 18217						X							
Brisbane Laboratory - NATA Site # 20794													
Perth Laboratory - NATA Site # 23736													
	0.15												
35	BH_P_11 0.4-0.5	Jan 24, 2019		Soil	S19-Ja24253		X						
36	BH_P_11 0.8-0.9	Jan 24, 2019		Soil	S19-Ja24254		X						
37	BH_P_11 1.1-1.2	Jan 24, 2019		Soil	S19-Ja24255		X						
Test Counts						10	27	5	3	5	10	3	2

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure, April 2011 and are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. This report replaces any interim results previously issued.

Holding Times

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

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

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

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

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

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

Units

mg/kg: milligrams per kilogram	**mg/L:** milligrams per litre	**ug/L:** micrograms per litre
ppm: Parts per million	**ppb:** Parts per billion	**%:** Percentage
org/100mL: Organisms per 100 millilitres	**NTU:** Nephelometric Turbidity Units	**MPN/100mL:** Most Probable Number of organisms per 100 millilitres

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery.
CRM	Certified Reference Material - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
QSM	US Department of Defense Quality Systems Manual Version 5.2 2018
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

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

Results <10 times the LOR : No Limit

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

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

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

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.2 where no positive PFAS results have been reported have been reviewed and no data was affected.

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

QC Data General Comments

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

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions							
TRH C6-C9	mg/kg	< 20			20	Pass	
TRH C10-C14	mg/kg	< 20			20	Pass	
TRH C15-C28	mg/kg	< 50			50	Pass	
TRH C29-C36	mg/kg	< 50			50	Pass	
Method Blank							
BTEX							
Benzene	mg/kg	< 0.1			0.1	Pass	
Toluene	mg/kg	< 0.1			0.1	Pass	
Ethylbenzene	mg/kg	< 0.1			0.1	Pass	
m&p-Xylenes	mg/kg	< 0.2			0.2	Pass	
o-Xylene	mg/kg	< 0.1			0.1	Pass	
Xylenes - Total	mg/kg	< 0.3			0.3	Pass	
Method Blank							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	mg/kg	< 0.5			0.5	Pass	
TRH C6-C10	mg/kg	< 20			20	Pass	
TRH >C10-C16	mg/kg	< 50			50	Pass	
TRH >C16-C34	mg/kg	< 100			100	Pass	
TRH >C34-C40	mg/kg	< 100			100	Pass	
Method Blank							
Polycyclic Aromatic Hydrocarbons							
Acenaphthene	mg/kg	< 0.5			0.5	Pass	
Acenaphthylene	mg/kg	< 0.5			0.5	Pass	
Anthracene	mg/kg	< 0.5			0.5	Pass	
Benz(a)anthracene	mg/kg	< 0.5			0.5	Pass	
Benzo(a)pyrene	mg/kg	< 0.5			0.5	Pass	
Benzo(b&j)fluoranthene	mg/kg	< 0.5			0.5	Pass	
Benzo(g.h.i)perylene	mg/kg	< 0.5			0.5	Pass	
Benzo(k)fluoranthene	mg/kg	< 0.5			0.5	Pass	
Chrysene	mg/kg	< 0.5			0.5	Pass	
Dibenz(a.h)anthracene	mg/kg	< 0.5			0.5	Pass	
Fluoranthene	mg/kg	< 0.5			0.5	Pass	
Fluorene	mg/kg	< 0.5			0.5	Pass	
Indeno(1.2.3-cd)pyrene	mg/kg	< 0.5			0.5	Pass	
Naphthalene	mg/kg	< 0.5			0.5	Pass	
Phenanthrene	mg/kg	< 0.5			0.5	Pass	
Pyrene	mg/kg	< 0.5			0.5	Pass	
Method Blank							
Organochlorine Pesticides							
Chlordanes - Total	mg/kg	< 0.1			0.1	Pass	
4.4'-DDD	mg/kg	< 0.05			0.05	Pass	
4.4'-DDE	mg/kg	< 0.05			0.05	Pass	
4.4'-DDT	mg/kg	< 0.05			0.05	Pass	
a-BHC	mg/kg	< 0.05			0.05	Pass	
Aldrin	mg/kg	< 0.05			0.05	Pass	
b-BHC	mg/kg	< 0.05			0.05	Pass	
d-BHC	mg/kg	< 0.05			0.05	Pass	
Dieldrin	mg/kg	< 0.05			0.05	Pass	
Endosulfan I	mg/kg	< 0.05			0.05	Pass	
Endosulfan II	mg/kg	< 0.05			0.05	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Endosulfan sulphate	mg/kg	< 0.05			0.05	Pass	
Endrin	mg/kg	< 0.05			0.05	Pass	
Endrin aldehyde	mg/kg	< 0.05			0.05	Pass	
Endrin ketone	mg/kg	< 0.05			0.05	Pass	
g-BHC (Lindane)	mg/kg	< 0.05			0.05	Pass	
Heptachlor	mg/kg	< 0.05			0.05	Pass	
Heptachlor epoxide	mg/kg	< 0.05			0.05	Pass	
Hexachlorobenzene	mg/kg	< 0.05			0.05	Pass	
Methoxychlor	mg/kg	< 0.05			0.05	Pass	
Toxaphene	mg/kg	< 1			1	Pass	
Method Blank							
Polychlorinated Biphenyls							
Aroclor-1016	mg/kg	< 0.1			0.1	Pass	
Aroclor-1221	mg/kg	< 0.1			0.1	Pass	
Aroclor-1232	mg/kg	< 0.1			0.1	Pass	
Aroclor-1242	mg/kg	< 0.1			0.1	Pass	
Aroclor-1248	mg/kg	< 0.1			0.1	Pass	
Aroclor-1254	mg/kg	< 0.1			0.1	Pass	
Aroclor-1260	mg/kg	< 0.1			0.1	Pass	
Total PCB*	mg/kg	< 0.1			0.1	Pass	
Method Blank							
Heavy Metals							
Arsenic	mg/kg	< 2			2	Pass	
Cadmium	mg/kg	< 0.4			0.4	Pass	
Chromium	mg/kg	< 5			5	Pass	
Copper	mg/kg	< 5			5	Pass	
Lead	mg/kg	< 5			5	Pass	
Mercury	mg/kg	< 0.1			0.1	Pass	
Nickel	mg/kg	< 5			5	Pass	
Zinc	mg/kg	< 5			5	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions							
TRH C6-C9	%	82			70-130	Pass	
TRH C10-C14	%	79			70-130	Pass	
LCS - % Recovery							
BTEX							
Benzene	%	91			70-130	Pass	
Toluene	%	97			70-130	Pass	
Ethylbenzene	%	99			70-130	Pass	
m&p-Xylenes	%	100			70-130	Pass	
Xylenes - Total	%	101			70-130	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	%	87			70-130	Pass	
TRH C6-C10	%	79			70-130	Pass	
TRH >C10-C16	%	74			70-130	Pass	
LCS - % Recovery							
Polycyclic Aromatic Hydrocarbons							
Acenaphthene	%	80			70-130	Pass	
Acenaphthylene	%	76			70-130	Pass	
Anthracene	%	75			70-130	Pass	
Benz(a)anthracene	%	80			70-130	Pass	
Benzo(a)pyrene	%	99			70-130	Pass	
Benzo(b&j)fluoranthene	%	91			70-130	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Benzo(g.h.i)perylene	%	128			70-130	Pass	
Benzo(k)fluoranthene	%	87			70-130	Pass	
Chrysene	%	81			70-130	Pass	
Dibenz(a.h)anthracene	%	110			70-130	Pass	
Fluoranthene	%	76			70-130	Pass	
Fluorene	%	78			70-130	Pass	
Indeno(1.2.3-cd)pyrene	%	126			70-130	Pass	
Naphthalene	%	78			70-130	Pass	
Phenanthrene	%	74			70-130	Pass	
Pyrene	%	78			70-130	Pass	
LCS - % Recovery							
Organochlorine Pesticides							
Chlordanes - Total	%	117			70-130	Pass	
4.4'-DDD	%	95			70-130	Pass	
4.4'-DDE	%	125			70-130	Pass	
4.4'-DDT	%	90			70-130	Pass	
a-BHC	%	107			70-130	Pass	
Aldrin	%	106			70-130	Pass	
b-BHC	%	77			70-130	Pass	
d-BHC	%	92			70-130	Pass	
Dieldrin	%	122			70-130	Pass	
Endosulfan I	%	126			70-130	Pass	
Endosulfan II	%	94			70-130	Pass	
Endosulfan sulphate	%	98			70-130	Pass	
Endrin	%	78			70-130	Pass	
Endrin aldehyde	%	114			70-130	Pass	
Endrin ketone	%	106			70-130	Pass	
g-BHC (Lindane)	%	122			70-130	Pass	
Heptachlor	%	78			70-130	Pass	
Heptachlor epoxide	%	91			70-130	Pass	
Hexachlorobenzene	%	109			70-130	Pass	
Methoxychlor	%	88			70-130	Pass	
LCS - % Recovery							
Polychlorinated Biphenyls							
Aroclor-1260	%	124			70-130	Pass	
LCS - % Recovery							
Heavy Metals							
Arsenic	%	109			80-120	Pass	
Cadmium	%	102			80-120	Pass	
Chromium	%	120			80-120	Pass	
Copper	%	110			80-120	Pass	
Lead	%	112			80-120	Pass	
Mercury	%	88			75-125	Pass	
Nickel	%	109			80-120	Pass	
Zinc	%	105			80-120	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1					
TRH C6-C9	S19-Ja24219	CP	%	85			70-130	Pass	
TRH C10-C14	S19-Ja24219	CP	%	77			70-130	Pass	
Spike - % Recovery									
BTEX				Result 1					
Benzene	S19-Ja24219	CP	%	85			70-130	Pass	
Toluene	S19-Ja24219	CP	%	96			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Ethylbenzene	S19-Ja24219	CP	%	103			70-130	Pass	
m&p-Xylenes	S19-Ja24219	CP	%	102			70-130	Pass	
o-Xylene	S19-Ja24219	CP	%	103			70-130	Pass	
Xylenes - Total	S19-Ja24219	CP	%	103			70-130	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1					
Naphthalene	S19-Ja24219	CP	%	85			70-130	Pass	
TRH C6-C10	S19-Ja24219	CP	%	83			70-130	Pass	
TRH >C10-C16	S19-Ja24219	CP	%	71			70-130	Pass	
Spike - % Recovery									
Organochlorine Pesticides				Result 1					
Chlordanes - Total	M19-Ja23929	NCP	%	115			70-130	Pass	
4.4'-DDD	M19-Ja23929	NCP	%	102			70-130	Pass	
4.4'-DDE	M19-Ja23929	NCP	%	123			70-130	Pass	
4.4'-DDT	M19-Ja23929	NCP	%	80			70-130	Pass	
a-BHC	M19-Ja23929	NCP	%	100			70-130	Pass	
Aldrin	M19-Ja23929	NCP	%	127			70-130	Pass	
b-BHC	M19-Ja23929	NCP	%	103			70-130	Pass	
d-BHC	M19-Ja23929	NCP	%	113			70-130	Pass	
Dieldrin	M19-Ja23929	NCP	%	103			70-130	Pass	
Endosulfan I	M19-Ja23929	NCP	%	87			70-130	Pass	
Endosulfan II	M19-Ja23929	NCP	%	97			70-130	Pass	
Endosulfan sulphate	M19-Ja23929	NCP	%	89			70-130	Pass	
Endrin	M19-Ja24635	NCP	%	103			70-130	Pass	
Endrin aldehyde	M19-Ja23929	NCP	%	82			70-130	Pass	
Endrin ketone	M19-Ja23929	NCP	%	101			70-130	Pass	
g-BHC (Lindane)	M19-Ja23929	NCP	%	130			70-130	Pass	
Heptachlor	M19-Ja23929	NCP	%	86			70-130	Pass	
Heptachlor epoxide	M19-Ja23929	NCP	%	94			70-130	Pass	
Hexachlorobenzene	M19-Ja23929	NCP	%	118			70-130	Pass	
Methoxychlor	M19-Ja24635	NCP	%	75			70-130	Pass	
Spike - % Recovery									
Polychlorinated Biphenyls				Result 1					
Aroclor-1016	M19-Ja25847	NCP	%	126			70-130	Pass	
Aroclor-1260	M19-Ja25847	NCP	%	122			70-130	Pass	
Spike - % Recovery									
Heavy Metals				Result 1					
Arsenic	M19-Fe01747	NCP	%	102			75-125	Pass	
Cadmium	M19-Fe01747	NCP	%	107			75-125	Pass	
Chromium	M19-Fe01747	NCP	%	107			75-125	Pass	
Copper	M19-Fe01747	NCP	%	98			75-125	Pass	
Lead	M19-Fe01747	NCP	%	99			75-125	Pass	
Mercury	M19-Fe01747	NCP	%	89			70-130	Pass	
Nickel	M19-Fe01747	NCP	%	95			75-125	Pass	
Zinc	M19-Fe01747	NCP	%	78			75-125	Pass	
Spike - % Recovery									
Polycyclic Aromatic Hydrocarbons				Result 1					
Acenaphthene	S19-Ja24223	CP	%	91			70-130	Pass	
Acenaphthylene	S19-Ja24223	CP	%	87			70-130	Pass	
Anthracene	S19-Ja24223	CP	%	87			70-130	Pass	
Benz(a)anthracene	S19-Ja24223	CP	%	92			70-130	Pass	
Benzo(a)pyrene	S19-Ja24223	CP	%	128			70-130	Pass	
Benzo(b&j)fluoranthene	S19-Ja24223	CP	%	117			70-130	Pass	
Benzo(g.h.i)perylene	S19-Ja24223	CP	%	83			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Benzo(k)fluoranthene	S19-Ja24223	CP	%	113			70-130	Pass	
Chrysene	S19-Ja24223	CP	%	91			70-130	Pass	
Dibenz(a.h)anthracene	S19-Ja24223	CP	%	76			70-130	Pass	
Fluoranthene	S19-Ja24223	CP	%	85			70-130	Pass	
Fluorene	S19-Ja24223	CP	%	91			70-130	Pass	
Indeno(1.2.3-cd)pyrene	S19-Ja24223	CP	%	98			70-130	Pass	
Naphthalene	S19-Ja24223	CP	%	88			70-130	Pass	
Phenanthrene	S19-Ja24223	CP	%	77			70-130	Pass	
Pyrene	S19-Ja24223	CP	%	102			70-130	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1					
TRH C6-C9	S19-Ja24224	CP	%	84			70-130	Pass	
Spike - % Recovery									
BTEX				Result 1					
Benzene	S19-Ja24224	CP	%	85			70-130	Pass	
Toluene	S19-Ja24224	CP	%	98			70-130	Pass	
Ethylbenzene	S19-Ja24224	CP	%	103			70-130	Pass	
m&p-Xylenes	S19-Ja24224	CP	%	105			70-130	Pass	
o-Xylene	S19-Ja24224	CP	%	106			70-130	Pass	
Xylenes - Total	S19-Ja24224	CP	%	105			70-130	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1					
Naphthalene	S19-Ja24224	CP	%	77			70-130	Pass	
TRH C6-C10	S19-Ja24224	CP	%	83			70-130	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Duplicate									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1	Result 2	RPD			
TRH C6-C9	M19-Ja26504	NCP	mg/kg	< 20	< 20	<1	30%	Pass	
TRH C10-C14	M19-Ja26902	NCP	mg/kg	63	64	2.0	30%	Pass	
TRH C15-C28	M19-Ja26902	NCP	mg/kg	210	210	2.0	30%	Pass	
TRH C29-C36	M19-Ja26902	NCP	mg/kg	< 50	< 50	<1	30%	Pass	
Duplicate									
BTEX				Result 1	Result 2	RPD			
Benzene	M19-Ja26504	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Toluene	M19-Ja26504	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Ethylbenzene	M19-Ja26504	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
m&p-Xylenes	M19-Ja26504	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
o-Xylene	M19-Ja26504	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Xylenes - Total	M19-Ja26504	NCP	mg/kg	< 0.3	< 0.3	<1	30%	Pass	
Duplicate									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1	Result 2	RPD			
Naphthalene	M19-Ja26504	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
TRH C6-C10	M19-Ja26504	NCP	mg/kg	< 20	< 20	<1	30%	Pass	
TRH >C10-C16	M19-Ja26902	NCP	mg/kg	120	120	4.0	30%	Pass	
TRH >C16-C34	M19-Ja26902	NCP	mg/kg	140	140	1.0	30%	Pass	
TRH >C34-C40	M19-Ja26902	NCP	mg/kg	< 100	< 100	<1	30%	Pass	
Duplicate									
Polycyclic Aromatic Hydrocarbons				Result 1	Result 2	RPD			
Acenaphthene	S19-Ja24219	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Acenaphthylene	S19-Ja24219	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Anthracene	S19-Ja24219	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benz(a)anthracene	S19-Ja24219	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(a)pyrene	S19-Ja24219	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(b&j)fluoranthene	S19-Ja24219	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	

Duplicate									
Polycyclic Aromatic Hydrocarbons				Result 1	Result 2	RPD			
Benzo(g.h.i)perylene	S19-Ja24219	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(k)fluoranthene	S19-Ja24219	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Chrysene	S19-Ja24219	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Dibenz(a.h)anthracene	S19-Ja24219	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Fluoranthene	S19-Ja24219	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Fluorene	S19-Ja24219	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Indeno(1.2.3-cd)pyrene	S19-Ja24219	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Naphthalene	S19-Ja24219	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Phenanthrene	S19-Ja24219	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Pyrene	S19-Ja24219	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Duplicate									
Organochlorine Pesticides				Result 1	Result 2	RPD			
Chlordanes - Total	S19-Ja24219	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
4.4'-DDD	S19-Ja24219	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
4.4'-DDE	S19-Ja24219	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
4.4'-DDT	S19-Ja24219	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
a-BHC	S19-Ja24219	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Aldrin	S19-Ja24219	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
b-BHC	S19-Ja24219	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
d-BHC	S19-Ja24219	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Dieldrin	S19-Ja24219	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endosulfan I	S19-Ja24219	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endosulfan II	S19-Ja24219	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endosulfan sulphate	S19-Ja24219	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endrin	S19-Ja24219	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endrin aldehyde	S19-Ja24219	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endrin ketone	S19-Ja24219	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
g-BHC (Lindane)	S19-Ja24219	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Heptachlor	S19-Ja24219	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Heptachlor epoxide	S19-Ja24219	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Hexachlorobenzene	S19-Ja24219	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Methoxychlor	S19-Ja24219	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Arsenic	M19-Fe01747	NCP	mg/kg	12	12	1.0	30%	Pass	
Cadmium	M19-Fe01747	NCP	mg/kg	< 0.4	< 0.4	<1	30%	Pass	
Chromium	M19-Fe01747	NCP	mg/kg	51	51	<1	30%	Pass	
Copper	M19-Fe01747	NCP	mg/kg	41	41	<1	30%	Pass	
Lead	M19-Fe01747	NCP	mg/kg	31	31	<1	30%	Pass	
Mercury	M19-Fe01747	NCP	mg/kg	0.1	0.1	3.0	30%	Pass	
Nickel	M19-Fe01747	NCP	mg/kg	34	35	1.0	30%	Pass	
Zinc	M19-Fe01747	NCP	mg/kg	140	140	<1	30%	Pass	
Duplicate									
Polychlorinated Biphenyls				Result 1	Result 2	RPD			
Aroclor-1016	M19-Ja21623	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Aroclor-1221	M19-Ja21623	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Aroclor-1232	M19-Ja21623	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Aroclor-1242	M19-Ja21623	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Aroclor-1248	M19-Ja21623	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Aroclor-1254	M19-Ja21623	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Aroclor-1260	M19-Ja21623	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Total PCB*	M19-Ja21623	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
% Moisture	S19-Ja24225	CP	%	6.4	6.0	7.0	30%	Pass	

Comments

Sample Integrity

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

Qualifier Codes/Comments

Code	Description
N01	F2 is determined by arithmetically subtracting the "naphthalene" value from the ">C10-C16" value. The naphthalene value used in this calculation is obtained from volatiles (Purge & Trap analysis).
N02	Where we have reported both volatile (P&T GCMS) and semivolatile (GCMS) naphthalene data, results may not be identical. Provided correct sample handling protocols have been followed, any observed differences in results are likely to be due to procedural differences within each methodology. Results determined by both techniques have passed all QAQC acceptance criteria, and are entirely technically valid.
N04	F1 is determined by arithmetically subtracting the "Total BTEX" value from the "C6-C10" value. The "Total BTEX" value is obtained by summing the concentrations of BTEX analytes. The "C6-C10" value is obtained by quantitating against a standard of mixed aromatic/aliphatic analytes.
N07	Please note:- These two PAH isomers closely co-elute using the most contemporary analytical methods and both the reported concentration (and the TEQ) apply specifically to the total of the two co-eluting PAHs
R16	The LORs have been raised due to the high concentration of one or more analytes

Authorised By

Nibha Vaidya	Analytical Services Manager
Joseph Edouard	Senior Analyst-Organic (VIC)
Harry Bacalis	Senior Analyst-Volatile (VIC)
Nibha Vaidya	Senior Analyst-Asbestos (NSW)
Emily Rosenberg	Senior Analyst-Metal (VIC)

Glenn Jackson
General Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

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

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

From: Nibha Vaidya
Sent: Thursday, 7 February 2019 4:34 PM
To: Enviro Sample Vic
Cc: Alena Bounkeua
Subject: 1 DAY TAT - FW: Report 637818; Additional Analysis
Attachments: image001.png; image002.jpg

7/2/19 4:34
L.F 639419

Kind Regards,

Nibha Vaidya
Phone : +61 2 9900 8415
Mobile : +61 499 900 805
Email : NibhaVaidya@eurofins.com

From: Joshua Cranson [mailto:jcranson@jbsg.com.au]
Sent: Thursday, 7 February 2019 4:17 PM
To: Nibha Vaidya
Cc: Daniel Denaro
Subject: Report 637818; Additional Analysis

EXTERNAL EMAIL*

D.S 23/01

Ja24231 - ~~91246~~ HOLD 1268.

Good afternoon Nibha,

Could I please schedule sample **BH_P_02_0.4-0.5** from batch **637818** (received 25/1/19) to be analysed for PAHs 24-hour TAT?

Thankyou,
Josh

Joshua Cranson | Environmental Consultant | JBS&G
Sydney | Melbourne | Adelaide | Perth | Brisbane | Canberra | Darwin | Wollongong
Level 1, 50 Margaret Street Sydney NSW 2000
T: 02 8245 0300 | M: 0424 712 705 | E: jcranson@jbsg.com.au | W: www.jbsg.com.au
Contaminated Land | Groundwater Remediation | Environmental Approvals | Auditing and Compliance | Hygiene and Hazardous Materials | Due Diligence and Liability | Stakeholder and Risk Management

Company Name: JBS & G Australia (NSW) P/L
Address: Level 1, 50 Margaret St
Sydney
NSW 2000

Project Name: CHATSWOOD EDUCATION PRECINCT PRIMARY SCHOOL
Project ID: 55579

Order No.:
Report #: 639419
Phone: 02 8245 0300
Fax:

Received: Feb 7, 2019 4:34 PM
Due: Feb 8, 2019
Priority: 1 Day
Contact Name: Daniel Denaro

Eurofins | mgt Analytical Services Manager : Nibha Vaidya

Sample Detail						Polycyclic Aromatic Hydrocarbons	Moisture Set
Melbourne Laboratory - NATA Site # 1254 & 14271						X	X
Sydney Laboratory - NATA Site # 18217							
Brisbane Laboratory - NATA Site # 20794							
Perth Laboratory - NATA Site # 23736							
External Laboratory							
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**		
1	BH_P_02 0.4-0.5	Jan 23, 2019		Soil	M19-Fe08490	X	X
Test Counts						1	1

Certificate of Analysis

NATA Accredited
Accreditation Number 1261
Site Number 1254

Accredited for compliance with ISO/IEC 17025 – Testing
The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

JBS & G Australia (NSW) P/L
Level 1, 50 Margaret St
Sydney
NSW 2000

Attention: **Daniel Denaro**

Report **639419-S**
Project name CHATSWOOD EDUCATION PRECINCT PRIMARY SCHOOL
Project ID 55579
Received Date Feb 07, 2019

Client Sample ID			**BH_P_02 0.4-0.5**
Sample Matrix			**Soil**
Eurofins | mgt Sample No.			**M19-Fe08490**
Date Sampled			**Jan 23, 2019**
Test/Reference	LOR	Unit	
Polycyclic Aromatic Hydrocarbons			
Benzo(a)pyrene TEQ (lower bound) *	0.5	mg/kg	2.1
Benzo(a)pyrene TEQ (medium bound) *	0.5	mg/kg	2.3
Benzo(a)pyrene TEQ (upper bound) *	0.5	mg/kg	2.6
Acenaphthene	0.5	mg/kg	< 0.5
Acenaphthylene	0.5	mg/kg	< 0.5
Anthracene	0.5	mg/kg	< 0.5
Benz(a)anthracene	0.5	mg/kg	1.4
Benzo(a)pyrene	0.5	mg/kg	1.6
Benzo(b&j)fluoranthene^{N07}	0.5	mg/kg	1.1
Benzo(g.h.i)perylene	0.5	mg/kg	1.0
Benzo(k)fluoranthene	0.5	mg/kg	1.4
Chrysene	0.5	mg/kg	1.6
Dibenz(a.h)anthracene	0.5	mg/kg	< 0.5
Fluoranthene	0.5	mg/kg	3.5
Fluorene	0.5	mg/kg	< 0.5
Indeno(1.2.3-cd)pyrene	0.5	mg/kg	0.7
Naphthalene	0.5	mg/kg	< 0.5
Phenanthrene	0.5	mg/kg	1.2
Pyrene	0.5	mg/kg	3.6
Total PAH*	0.5	mg/kg	17.1
2-Fluorobiphenyl (surr.)	1	%	64
p-Terphenyl-d14 (surr.)	1	%	72
% Moisture	1	%	8.6

Sample History

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

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

Description	Testing Site	Extracted	Holding Time
Polycyclic Aromatic Hydrocarbons - Method: LTM-ORG-2130 PAH and Phenols in Soil and Water	Melbourne	Feb 07, 2019	14 Day
% Moisture - Method: LTM-GEN-7080 Moisture	Melbourne	Feb 07, 2019	14 Day

Company Name: JBS & G Australia (NSW) P/L
Address: Level 1, 50 Margaret St
Sydney
NSW 2000

Project Name: CHATSWOOD EDUCATION PRECINCT PRIMARY SCHOOL
Project ID: 55579

Order No.:
Report #: 639419
Phone: 02 8245 0300
Fax:

Received: Feb 7, 2019 4:34 PM
Due: Feb 8, 2019
Priority: 1 Day
Contact Name: Daniel Denaro

Eurofins | mgt Analytical Services Manager : Nibha Vaidya

Sample Detail						Polycyclic Aromatic Hydrocarbons	Moisture Set
Melbourne Laboratory - NATA Site # 1254 & 14271						X	X
Sydney Laboratory - NATA Site # 18217							
Brisbane Laboratory - NATA Site # 20794							
Perth Laboratory - NATA Site # 23736							
External Laboratory							
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**		
1	BH_P_02 0.4-0.5	Jan 23, 2019		Soil	M19-Fe08490	X	X
Test Counts						1	1

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure, April 2011 and are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. This report replaces any interim results previously issued.

Holding Times

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

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

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

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

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

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

Units

mg/kg: milligrams per kilogram	**mg/L:** milligrams per litre	**ug/L:** micrograms per litre
ppm: Parts per million	**ppb:** Parts per billion	**%:** Percentage
org/100mL: Organisms per 100 millilitres	**NTU:** Nephelometric Turbidity Units	**MPN/100mL:** Most Probable Number of organisms per 100 millilitres

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery.
CRM	Certified Reference Material - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
QSM	US Department of Defense Quality Systems Manual Version 5.2 2018
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

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

Results <10 times the LOR : No Limit

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

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

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

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.2 where no positive PFAS results have been reported have been reviewed and no data was affected.

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

QC Data General Comments

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

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Polycyclic Aromatic Hydrocarbons							
Acenaphthene	mg/kg	< 0.5			0.5	Pass	
Acenaphthylene	mg/kg	< 0.5			0.5	Pass	
Anthracene	mg/kg	< 0.5			0.5	Pass	
Benz(a)anthracene	mg/kg	< 0.5			0.5	Pass	
Benzo(a)pyrene	mg/kg	< 0.5			0.5	Pass	
Benzo(b&j)fluoranthene	mg/kg	< 0.5			0.5	Pass	
Benzo(g.h.i)perylene	mg/kg	< 0.5			0.5	Pass	
Benzo(k)fluoranthene	mg/kg	< 0.5			0.5	Pass	
Chrysene	mg/kg	< 0.5			0.5	Pass	
Dibenz(a.h)anthracene	mg/kg	< 0.5			0.5	Pass	
Fluoranthene	mg/kg	< 0.5			0.5	Pass	
Fluorene	mg/kg	< 0.5			0.5	Pass	
Indeno(1.2.3-cd)pyrene	mg/kg	< 0.5			0.5	Pass	
Naphthalene	mg/kg	< 0.5			0.5	Pass	
Phenanthrene	mg/kg	< 0.5			0.5	Pass	
Pyrene	mg/kg	< 0.5			0.5	Pass	
LCS - % Recovery							
Polycyclic Aromatic Hydrocarbons							
Acenaphthene	%	106			70-130	Pass	
Acenaphthylene	%	99			70-130	Pass	
Anthracene	%	97			70-130	Pass	
Benz(a)anthracene	%	91			70-130	Pass	
Benzo(a)pyrene	%	78			70-130	Pass	
Benzo(b&j)fluoranthene	%	109			70-130	Pass	
Benzo(g.h.i)perylene	%	77			70-130	Pass	
Benzo(k)fluoranthene	%	105			70-130	Pass	
Chrysene	%	104			70-130	Pass	
Dibenz(a.h)anthracene	%	82			70-130	Pass	
Fluoranthene	%	100			70-130	Pass	
Fluorene	%	104			70-130	Pass	
Indeno(1.2.3-cd)pyrene	%	81			70-130	Pass	
Naphthalene	%	108			70-130	Pass	
Phenanthrene	%	98			70-130	Pass	
Pyrene	%	103			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
Polycyclic Aromatic Hydrocarbons				Result 1					
Acenaphthene	M19-Fe03460	NCP	%	87			70-130	Pass	
Acenaphthylene	M19-Fe03460	NCP	%	81			70-130	Pass	
Anthracene	M19-Fe03460	NCP	%	88			70-130	Pass	
Benz(a)anthracene	M19-Fe03460	NCP	%	78			70-130	Pass	
Benzo(a)pyrene	M19-Fe03460	NCP	%	106			70-130	Pass	
Benzo(b&j)fluoranthene	M19-Fe03460	NCP	%	98			70-130	Pass	
Benzo(g.h.i)perylene	M19-Fe03460	NCP	%	89			70-130	Pass	
Benzo(k)fluoranthene	M19-Fe03460	NCP	%	125			70-130	Pass	
Chrysene	M19-Fe03460	NCP	%	91			70-130	Pass	
Dibenz(a.h)anthracene	M19-Fe03460	NCP	%	82			70-130	Pass	
Fluoranthene	M19-Fe03460	NCP	%	100			70-130	Pass	
Fluorene	M19-Fe03460	NCP	%	87			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Indeno(1.2.3-cd)pyrene	M19-Fe03460	NCP	%	87			70-130	Pass	
Naphthalene	M19-Fe03460	NCP	%	95			70-130	Pass	
Phenanthrene	M19-Fe03460	NCP	%	95			70-130	Pass	
Pyrene	M19-Fe03460	NCP	%	100			70-130	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Duplicate									
Polycyclic Aromatic Hydrocarbons				Result 1	Result 2	RPD			
Acenaphthene	M19-Fe07984	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Acenaphthylene	M19-Fe07984	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Anthracene	M19-Fe07984	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benz(a)anthracene	M19-Fe07984	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(a)pyrene	M19-Fe07984	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(b&j)fluoranthene	M19-Fe07984	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(g.h.i)perylene	M19-Fe07984	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(k)fluoranthene	M19-Fe07984	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Chrysene	M19-Fe07984	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Dibenz(a.h)anthracene	M19-Fe07984	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Fluoranthene	M19-Fe07984	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Fluorene	M19-Fe07984	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Indeno(1.2.3-cd)pyrene	M19-Fe07984	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Naphthalene	M19-Fe07984	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Phenanthrene	M19-Fe07984	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Pyrene	M19-Fe07984	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
% Moisture	M19-Fe08369	NCP	%	20	20	<1	30%	Pass	

Comments

Sample Integrity

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

Qualifier Codes/Comments

Code	Description
N07	Please note:- These two PAH isomers closely co-elute using the most contemporary analytical methods and both the reported concentration (and the TEQ) apply specifically to the total of the two co-eluting PAHs

Authorised By

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

Glenn Jackson

General Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

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

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

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CERTIFICATE OF ANALYSIS 228207

Client Details

Client	JBS & G (NSW & WA) Pty Ltd
Attention	Daniel Denaro
Address	Level 1, 50 Margaret St, Sydney, NSW, 2000

Sample Details

Your Reference	**55579, Chatswood Highschool**
Number of Samples	1 Soil
Date samples received	11/10/2019
Date completed instructions received	11/10/2019

Analysis Details

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

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

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

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

Report Details

Date results requested by	18/10/2019
Date of Issue	17/10/2019

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Asbestos Approved By
Analysed by Asbestos Approved Identifier: Aida Marner
Authorised by Asbestos Approved Signatory: Lucy Zhu

Results Approved By
Jaimie Loa-Kum-Cheung, Metals Supervisor
Josh Williams, Chemist
Lucy Zhu, Senior Asbestos Analyst
Steven Luong, Organics Supervisor

Authorised By

Nancy Zhang, Laboratory Manager

vTRH(C6-C10)/BTEXN in Soil		
Our Reference		228207-1
Your Reference	UNITS	QA01
Date Sampled		10/10/2019
Type of sample		Soil
Date extracted	-	14/10/2019
Date analysed	-	16/10/2019
TRH C_6 - C_9	mg/kg	<25
TRH C_6 - C_{10}	mg/kg	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25
Benzene	mg/kg	<0.2
Toluene	mg/kg	<0.5
Ethylbenzene	mg/kg	<1
m+p-xylene	mg/kg	<2
o-Xylene	mg/kg	<1
naphthalene	mg/kg	<1
Total +ve Xylenes	mg/kg	<3
Surrogate aaa-Trifluorotoluene	%	83

svTRH (C10-C40) in Soil		
Our Reference		228207-1
Your Reference	UNITS	QA01
Date Sampled		10/10/2019
Type of sample		Soil
Date extracted	-	14/10/2019
Date analysed	-	14/10/2019
TRH C_{10} - C_{14}	mg/kg	<50
TRH C_{15} - C_{28}	mg/kg	<100
TRH C_{29} - C_{36}	mg/kg	<100
TRH >C_{10} -C_{16}	mg/kg	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50
TRH >C_{16} -C_{34}	mg/kg	<100
TRH >C_{34} -C_{40}	mg/kg	<100
Total +ve TRH (>C10-C40)	mg/kg	<50
Surrogate o-Terphenyl	%	78

PAHs in Soil		
Our Reference		228207-1
Your Reference	UNITS	QA01
Date Sampled		10/10/2019
Type of sample		Soil
Date extracted	-	14/10/2019
Date analysed	-	15/10/2019
Naphthalene	mg/kg	<0.1
Acenaphthylene	mg/kg	<0.1
Acenaphthene	mg/kg	<0.1
Fluorene	mg/kg	<0.1
Phenanthrene	mg/kg	0.1
Anthracene	mg/kg	<0.1
Fluoranthene	mg/kg	0.5
Pyrene	mg/kg	0.5
Benzo(a)anthracene	mg/kg	0.3
Chrysene	mg/kg	0.3
Benzo(b,j+k)fluoranthene	mg/kg	0.3
Benzo(a)pyrene	mg/kg	0.4
Indeno(1,2,3-c,d)pyrene	mg/kg	0.2
Dibenzo(a,h)anthracene	mg/kg	<0.1
Benzo(g,h,i)perylene	mg/kg	0.3
Total +ve PAH's	mg/kg	2.9
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	0.6
Surrogate p-Terphenyl-d14	%	96

Acid Extractable metals in soil		
Our Reference		228207-1
Your Reference	UNITS	QA01
Date Sampled		10/10/2019
Type of sample		Soil
Date prepared	-	14/10/2019
Date analysed	-	14/10/2019
Arsenic	mg/kg	19
Cadmium	mg/kg	<0.4
Chromium	mg/kg	9
Copper	mg/kg	31
Lead	mg/kg	37
Mercury	mg/kg	<0.1
Nickel	mg/kg	5
Zinc	mg/kg	30

Moisture		
Our Reference		228207-1
Your Reference	UNITS	QA01
Date Sampled		10/10/2019
Type of sample		Soil
Date prepared	-	14/10/2019
Date analysed	-	15/10/2019
Moisture	%	21

Asbestos ID - soils NEPM - ASB-001		
Our Reference		228207-1
Your Reference	UNITS	QA01
Date Sampled		10/10/2019
Type of sample		Soil
Date analysed	-	14/10/2019
Sample mass tested	g	657.61
Sample Description	-	Brown coarse-grained soil & rocks
Asbestos ID in soil (AS4964) >0.1g/kg	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Trace Analysis	-	No asbestos detected
Total Asbestos#1	g/kg	<0.1
Asbestos ID in soil <0.1g/kg*	-	No visible asbestos detected
ACM >7mm Estimation*	g	–
FA and AF Estimation*	g	–
ACM >7mm Estimation*	%(w/w)	<0.01
FA and AF Estimation*#2	%(w/w)	<0.001

Method ID	Methodology Summary
ASB-001	Asbestos ID - Qualitative identification of asbestos in bulk samples using Polarised Light Microscopy and Dispersion Staining Techniques including Synthetic Mineral Fibre and Organic Fibre as per Australian Standard 4964-2004.
ASB-001	Asbestos ID - Identification of asbestos in soil samples using Polarised Light Microscopy and Dispersion Staining Techniques. Minimum 500mL soil sample was analysed as recommended by "National Environment Protection (Assessment of site contamination) Measure, Schedule B1 and "The Guidelines from the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia - May 2009" with a reporting limit of 0.1g/kg (0.01% w/w) as per Australian Standard AS4964-2004. Results reported denoted with * are outside our scope of NATA accreditation. **NOTE** #1 Total Asbestos g/kg was analysed and reported as per Australian Standard AS4964 (This is the sum of ACM >7mm, <7mm and FA/AF) **NOTE** #2 The screening level of 0.001% w/w asbestos in soil for FA and AF only applies where the FA and AF are able to be quantified by gravimetric procedures. This screening level is not applicable to free fibres. Estimation = Estimated asbestos weight Results reported with "--" is equivalent to no visible asbestos identified using Polarised Light microscopy and Dispersion Staining Techniques.
Inorg-008	Moisture content determined by heating at 105+/-5 °C for a minimum of 12 hours.
Metals-020	Determination of various metals by ICP-AES.
Metals-021	Determination of Mercury by Cold Vapour AAS.
Org-003	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
Org-003	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).

Method ID	Methodology Summary
Org-012/017	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS and/or GC-MS/MS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013. For soil results:- 1. ‘EQ PQL’values are assuming all contributing PAHs reported as <PQL are actually at the PQL. This is the most conservative approach and can give false positive TEQs given that PAHs that contribute to the TEQ calculation may not be present. 2. ‘EQ zero’values are assuming all contributing PAHs reported as <PQL are zero. This is the least conservative approach and is more susceptible to false negative TEQs when PAHs that contribute to the TEQ calculation are present but below PQL. 3. ‘EQ half PQL’values are assuming all contributing PAHs reported as <PQL are half the stipulated PQL. Hence a mid-point between the most and least conservative approaches above. Note, the Total +ve PAHs PQL is reflective of the lowest individual PQL and is therefore "Total +ve PAHs" is simply a sum of the positive individual PAHs.
Org-014	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS.
Org-016	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.
Org-016	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater. Note, the Total +ve Xylene PQL is reflective of the lowest individual PQL and is therefore "Total +ve Xylenes" is simply a sum of the positive individual Xylenes.

Client Reference: 55579, Chatswood Highschool

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-16	[NT]
Date extracted	-			14/10/2019	1	14/10/2019	14/10/2019		14/10/2019	[NT]
Date analysed	-			16/10/2019	1	16/10/2019	16/10/2019		16/10/2019	[NT]
TRH C_6 - C_9	mg/kg	25	Org-016	<25	1	<25	<25	0	95	[NT]
TRH C_6 - C_{10}	mg/kg	25	Org-016	<25	1	<25	<25	0	95	[NT]
Benzene	mg/kg	0.2	Org-016	<0.2	1	<0.2	<0.2	0	105	[NT]
Toluene	mg/kg	0.5	Org-016	<0.5	1	<0.5	<0.5	0	99	[NT]
Ethylbenzene	mg/kg	1	Org-016	<1	1	<1	<1	0	91	[NT]
m+p-xylene	mg/kg	2	Org-016	<2	1	<2	<2	0	89	[NT]
o-Xylene	mg/kg	1	Org-016	<1	1	<1	<1	0	91	[NT]
naphthalene	mg/kg	1	Org-014	<1	1	<1	<1	0	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-016	90	1	83	82	1	89	[NT]

QUALITY CONTROL: svTRH (C10-C40) in Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-16	[NT]
Date extracted	-			14/10/2019	1	14/10/2019	14/10/2019		14/10/2019	[NT]
Date analysed	-			14/10/2019	1	14/10/2019	14/10/2019		14/10/2019	[NT]
TRH C_{10} - C_{14}	mg/kg	50	Org-003	<50	1	<50	<50	0	118	[NT]
TRH C_{15} - C_{28}	mg/kg	100	Org-003	<100	1	<100	<100	0	84	[NT]
TRH C_{29} - C_{36}	mg/kg	100	Org-003	<100	1	<100	<100	0	92	[NT]
TRH >C_{10} -C_{16}	mg/kg	50	Org-003	<50	1	<50	<50	0	118	[NT]
TRH >C_{16} -C_{34}	mg/kg	100	Org-003	<100	1	<100	<100	0	84	[NT]
TRH >C_{34} -C_{40}	mg/kg	100	Org-003	<100	1	<100	<100	0	92	[NT]
Surrogate o-Terphenyl	%		Org-003	81	1	78	79	1	101	[NT]

QUALITY CONTROL: PAHs in Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-16	[NT]
Date extracted	-			14/10/2019	1	14/10/2019	14/10/2019		14/10/2019	[NT]
Date analysed	-			15/10/2019	1	15/10/2019	15/10/2019		15/10/2019	[NT]
Naphthalene	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	<0.1	0	116	[NT]
Acenaphthylene	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Fluorene	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	<0.1	0	100	[NT]
Phenanthrene	mg/kg	0.1	Org-012/017	<0.1	1	0.1	0.2	67	106	[NT]
Anthracene	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-012/017	<0.1	1	0.5	0.6	18	110	[NT]
Pyrene	mg/kg	0.1	Org-012/017	<0.1	1	0.5	0.5	0	112	[NT]
Benzo(a)anthracene	mg/kg	0.1	Org-012/017	<0.1	1	0.3	0.3	0	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-012/017	<0.1	1	0.3	0.2	40	100	[NT]
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-012/017	<0.2	1	0.3	0.3	0	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-012/017	<0.05	1	0.4	0.3	29	108	[NT]
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-012/017	<0.1	1	0.2	0.2	0	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-012/017	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-012/017	<0.1	1	0.3	0.2	40	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-012/017	95	1	96	95	1	110	[NT]

QUALITY CONTROL: Acid Extractable metals in soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-16	[NT]
Date prepared	-			14/10/2019	1	14/10/2019	14/10/2019		14/10/2019	[NT]
Date analysed	-			14/10/2019	1	14/10/2019	14/10/2019		14/10/2019	[NT]
Arsenic	mg/kg	4	Metals-020	<4	1	19	10	62	106	[NT]
Cadmium	mg/kg	0.4	Metals-020	<0.4	1	<0.4	<0.4	0	105	[NT]
Chromium	mg/kg	1	Metals-020	<1	1	9	10	11	117	[NT]
Copper	mg/kg	1	Metals-020	<1	1	31	32	3	110	[NT]
Lead	mg/kg	1	Metals-020	<1	1	37	37	0	115	[NT]
Mercury	mg/kg	0.1	Metals-021	<0.1	1	<0.1	<0.1	0	81	[NT]
Nickel	mg/kg	1	Metals-020	<1	1	5	4	22	106	[NT]
Zinc	mg/kg	1	Metals-020	<1	1	30	31	3	109	[NT]

Result Definitions

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

Quality Control Definitions

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

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

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.

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

Report Comments

Asbestos-ID in soil: NEPM

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