Douglas Partners
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Integrated Practical Solutions

Report on
Targeted Site Investigation for Contamination

Major Capital Works Upgrade, Hunter Sports High School
Pacific Highway, Gateshead

Prepared for
NSW Public Works

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The undersigned, on behalf of Douglas Partners Pty Ltd, confirm that this document and all attached drawings, logs and test results have been checked and reviewed for errors, omissions and inaccuracies.

	Signature	Date
Author		19 May 2016
Reviewer		19 May 2016

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Report on Targeted Site Investigation for Contamination
Major Capital Works Upgrade, Hunter Sports High School
Pacific Highway, Gateshead

1. Introduction

This report presents the results of a targeted site investigation for contamination undertaken as part of a major capital works upgrade at Hunter Sports High School, Pacific Highway, Gateshead. The investigation was commissioned in an email dated 11 April 2016 from Ms Jennifer Bates of NSW Public Works and was undertaken in accordance with Douglas Partners' (DP) proposal NCL160270 dated 8 April 2016.

It is understood that the development of the site will include demolition of some existing site structures in the central-northern portion of the site and construction of several new structures ('Block S', 'Block T' and 'Block U') with associated landscaping and site improvements. The proposed development is presented in the drawing by EJE Architecture in Appendix D

The aim of the targeted site investigation was to allow NSW Public Works to:

- Understand soil contamination on the site;
- Establish soil baseline conditions for comparison against relevant landuse criteria;
- Assess whether the site poses an unacceptable risk to human health or the environment;
- Allow assessment and/or management for contamination with reference to environmental legislative requirements;
- Provide a basis for the development of remediation strategies, contamination management and monitoring plans (if required).

The investigation comprised the following:

- Review of the preliminary site investigation (PSI) (Ref 1) conducted by DP at the site;
- Checking of underground services at proposed test locations;
- Drilling of boreholes at targeted locations within the site;
- Sampling of soil from the bores;
- Laboratory analysis of soil samples for a range of inorganic and organic contaminants;
- Preparation of this report which presents the results of the investigation and recommendations for future remediation and management of identified contamination.

This report has been prepared with reference to the NSW EPA 'Guidelines for Consultants Reporting on Contaminated Sites' (Ref 2) and NEPM (2013) (Ref 3).

As requested by the client, the targeted investigation focused on the proposed development area and localised areas identified to contain potential site contamination.

2. Site Description

The site is located at 2-4 Pacific Highway Gateshead, NSW and is identified as Lot 1540 DP 755233.

The site is bounded to the east by the Pacific Highway, to the north by Wiripaang Public School, to the west by Johnsons Creek and bushland and to the south by a playing field.

The site is shown on Drawing 1, Appendix C and in Figure 1 below.

Figure 1: Site location (shown in red)

3. Geology and Hydrogeology

Reference to the 1:100,000 Newcastle Coalfields Geology Sheet indicates that the majority of the site is underlain by Permian aged Adamstown subgroup of the Newcastle Coal Measures comprising conglomerate, sandstone, siltstone, coal and tuff. The south-western corner of the site is underlain by Quaternary aged alluvial deposits comprising gravel, silt, clay and sand.

Reference to the Acid Sulphate Soil Risk Map for Wallsend prepared by the Department of Land & Water Conservation indicates that there is no known occurrence of acid sulphate soils within the site.

Reference to the NSW Contours Hunter and Central Coast LiDAR indicates site levels range from approximately 32 m AHD in the north-eastern corner to approximately 15 m AHD in the south-western corner of the site.

The regional groundwater flow regime is believed to be towards the west to south west towards Johnsons Creek which is located adjacent to the western and southern site boundaries.

4. Background

4.1 Preliminary Site Investigation for Contamination (Ref 1)

DP completed a PSI for contamination for the site in October 2014 (Ref 1) which comprised the following tasks:

- Desktop review including review of previous assessments by DP and others, and review of geological, topographic and acid sulphate soil risk maps;
- Brief site history review to assess the potential for contamination at the site;
- Site inspection by a senior environmental engineer to identify areas of potential contamination and assess site conditions at the time of the assessment;
- Preparation of a reporting presenting the results of the assessment including a preliminary conceptual site model and recommendations for further assessment.

The brief history review for the site indicated the following:

- Prior to development of the school (conducted at some stage between the mid-1950s and mid 1960s), the site was bushland;
- Former Blocks G and H were likely demolished to make way for Block L in 1979.

At the time of the previous investigation, site conditions were characterised by observed filling in the vicinity of the playing fields, particularly the southern ends of the playing fields, and the presence of fibro fragments (potentially asbestos containing materials – ACM) observed at the various locations around the playing fields, and on the western side of Blocks F and L and on the northern side of Block D. Minor quantities of chemicals were stored in site sheds in the north-western portion of the site

On the basis of the site history assessment and observations made during the site inspection, a Conceptual Site Model was presented in the PSI. The CSM is reproduced in Table 1 below.

Table 1: Conceptual Site Model

Known and Potential Primary Sources	Primary Release Mechanism	Secondary Release Mechanism	Potential Impacted Media	Contaminants of Concern	Exposure Pathway	Potential Receptors	
						Current	Future
Imported / dumped filling	Placement of filling on-site	Long-term leaching / transport of contaminants via runoff, rain water infiltration / percolation	Soil, groundwater, surface water	TRH, BTEX, PAH, Metals, Pesticides, PCB, asbestos	Dermal contact, inhalation (dust / vapours), ingestion	Site users / staff, maintenance workers, consultants, groundwater, surface water	Site users / staff, maintenance workers, construction workers, consultants, groundwater, surface water
Demolition of Structures	Damage / incomplete removal of hazardous building materials prior to / during demolition	Spreading / burial of hazardous building materials during earthworks	Soil	Asbestos, lead, PCB, SMF	Dermal contact, inhalation (dust / vapours), ingestion		
Chemical / fuel storage / use	Spills / leaks from chemical use and storage	Long-term leaching of contaminants via runoff, rain water infiltration / percolation	Soil, groundwater, surface water	TRH, heavy metals, BTEX, PAH, pesticides, herbicides	Dermal contact, inhalation (dust / vapours), ingestion		
Observed fibro fragments	Dumping, damage to existing structures	Weathering, mechanical damage (crushing, breaking etc. from impact)	Soil	Asbestos	Dermal contact, inhalation		
Former substation	Spills / leaks of oil from electrical installations	Long-term leaching / transport of contaminants via runoff, rain water infiltration / percolation	Soil, groundwater, surface water	PCB, hydrocarbons	Dermal contact, inhalation (dust / vapours), ingestion		

The following additional works were recommended in the PSI prior to demolition and construction works for the proposed development:

- Interim remediation / management with appropriate control measures to address possible exposure and risks associated with potential ACM at the surface of the site;
- Additional subsurface investigation in areas of observed fibro fragments and filling containing building rubble to assess for the presence and extent of potential contamination;
- Near-surface soil sampling and laboratory testing to assess the potential for hydrocarbons, heavy metals and PCB in soil in the vicinity of the storage sheds and former substation;
- Site specific construction environmental management plan, including contingency for unexpected finds during earthworks and construction;
- Depending on the results of additional assessment, the following may also be required:
    - Remediation Action Plan for localised remediation / management of identified contamination (where required);
    - Validation of remediation works;
    - Long-term environmental management plan for ongoing management of potential contamination on the site (i.e. if remediation includes long-term management of contamination on site).

4.2 Geotechnical Investigation (Ref 4)

Douglas Partners conducted a geotechnical investigation in the area of the proposed development in October 2015. The investigation was required to provide information on subsurface conditions and comments on the following:

- Suitable footing types and indicative soil and rock parameters for footing design;
- Indicative geotechnical parameters for retaining wall design;
- Flexible pavement thickness design for the proposed car park;
- Mine Subsidence Desktop Study Risk Assessment (which was reported separately).

The investigation comprised the drilling of seven bores, laboratory testing, engineering analysis and reporting.

Subsurface conditions generally comprised near-surface filling over clayey silt/silty clay and sandstone/siltstone/coal/laminate bedrock.

The geotechnical report provided recommendations for shallow and deep footings, provided retaining wall parameters and pavement design parameters.

5. Site Condition

A site walkover was conducted by a senior environmental engineer from DP on 13 April 2016.

The site condition was similar to that encountered during the PSI. Details of the previous site condition are presented in Reference 1.

A summary of site features from the recent inspection are as follows:

- Former substation area in the central-eastern portion of the site (Figure 2);
- Former location of bus shed ('Building M') in the eastern portion of the site (Figure 3);
- Former location of dome structure ('Building G') in the central-eastern portion of the site (Figure 4);
- Asphalt paved area between Blocks B and L (i.e. area of demolition of former structures) (Figure 5);
- Storage shed on the western side of Block F, which included storage of small quantities of chemical, paints and fuels (Figure 6);
- Fill and fibro fragments at the surface adjacent to Blocks F and L (Figures 7 and 8);
- Filling at the southern/south-western extents of playing fields (Figures 9, 10 and 11);
- Fibro fragments observed at the surface across the site (Figure 12).

Figure 2: Former substation (brick structure in right of photo)

Figure 3: Former bus shed area in the eastern portion of the site

Figure 4: Former dome structure location in the central-eastern portion of the site

Figure 5: Paved area in the central-northern portion of the site (former demolition area)

Figure 6: Storage shed (right of photo) in the northern portion of the site

Figure 7: Area immediately west of Block F (fibro fragments observed at surface)

Figure 8: Area immediately west of Block L (fibro fragments observed at surface)

Figure 9: Fill mound between the two western playing fields, looking south-west

Figure 10: Filling with building rubble on the central-western site boundary, looking north

Figure 11: Filling with building rubble on the southern site boundary, looking east

Figure 12: Fibro fragment observed adjacent to the southern site boundary (sample location A5)

6. Field Work Methods

6.1 Subsurface Investigation

Field work for the current assessment was undertaken on 14 April 2016 and comprised the following:

- Checking for underground services at proposed bore locations by a professional service locator prior to drilling;
- Drilling of 15 boreholes (Bores 201 to 215) to depths of between 1.0 m and 2.5 m using a bobcat mounted solid flight auger;
- Collection of soil samples for contamination testing purposes from the boreholes;
- Screening of soil samples for volatile hydrocarbon impact with a photoionisation detector (PID);
- Sampling of surface fibro sheeting material potentially containing asbestos.

The test locations were set out by a senior environmental engineer from DP. A DP engineer logged the subsurface profile and collected samples for identification and testing purposes. The approximate test locations are shown on Drawing 1, Appendix D.

Test locations were selected to target the identified potential contaminant sources and to assess general site conditions. The number of test locations is considered to be less than the minimum required for a systematic assessment of site conditions. The presence of structures over much of the site restricted access to a large portion of the site area.

Soil samples were selected for analysis on the basis of the likely presence of contamination, based on material type, visual or olfactory evidence of possible contamination (i.e. odour or staining), proximity to a known source of contamination, and whether generally representative of soil / fill conditions.

6.2 Sampling Rationale

Testing was conducted at targeted and locations within the site, based on the results of previous site history and to further assess the identified areas of potential contamination, with reference to the Conceptual Site Model (CSM). Table 2 below provides a summary of test locations and rationale for selection.

Table 2: Sampling Rationale

Test Location	Rationale
201	Demolition of structure, bus storage, possible fuel storage
202-204	Filling, demolition of structures
205	Former substation
206	Demolition of structures
207	Filling, observed building rubble
208	Adjacent fuel/chemical storage
209-215	Filling, observed building rubble

7. Field Work Results

7.1 Subsurface Conditions

The subsurface conditions are presented in detail in the borehole report sheets, Appendix A. These should be read in conjunction with the general notes preceding them, which explain definitions of the classification methods and descriptive terms.

A summary of subsurface conditions is presented below.

From (m)	To (m)	Description
Surface (0.0)	0.15 / 2.2	FILLING: various filling types including sand, sandy clay, clayey sand, silty sand, silty clay and clay were encountered in all boreholes;
0.15 / 2.2	Termination	CLAY/SANDY CLAY/CLAYEY SAND/SILTY CLAY: generally comprising brown, orange brown or grey clayey natural materials, generally encountered to termination (1.0 m to 2.5 m);
0.9	Termination	SANDSTONE: grey and orange sandstone was encountered in Bore 208 at 0.9 m depth to termination

7.2 Contaminant Observations

Observations of potential contamination during field work are summarised in Table 3 below:

Table 3: Contamination Observations during Field Work - Soil

Potential Contamination Observation	Locations and Depths (m)
Slag cobbles / slag gravel	203/0.2-0.8, 204/0.06-0.2,
Construction Materials (brick, concrete, tile, etc.)[1]	202A/0.5, 206/0.0-0.2, 207/0.0-0.4, 210/0.0-0.4, 211/0.9-2.2, 214/0.05-0.7
Cement Sheet Fragments (fibro - potential ACM)	207/0.0-0.4, 210/0.0-0.4
Slight Hydrocarbon odour	202/0.05-0.15

Notes to Table 3:

1 - May contain asbestos due to possible association with building wastes

ACM – asbestos containing material

In addition to the above, several observations of fibro fragments were made at the surface, as shown on Drawing 1, Appendix D.

The results of PID screening on soil samples are shown on the borehole logs in Appendix A. PID screening suggested the absence of gross volatile hydrocarbon impact in all bores (i.e. < 1 ppm).

8. Data Quality Objectives

8.1 Data Quality Objectives

Table 4 summarises the data quality objectives (DQO) and the procedures designed to enable achievement of the DQOs.

Table 4: Data Quality Objectives

DQO	Achievement Evaluation Procedure
Step 1 – State the problem	Assess the presence and level of contamination, as identified in the CSM, relevant to the proposed landuse.
Step 2 – Identify the decision	Assess whether the site is suitable for the intended land use (high school) from a contamination perspective. Refer Appendix C for adopted site assessment criteria.
Step 3 – Identify the inputs to the decision	Findings of the previous investigations at the site (Ref 1). Site history review. Selection of appropriate contaminants of concern. Selection of appropriate site assessment criteria. Field and laboratory QA/QC data to assess the suitability of the environmental data for the assessment.
Step 4 – Define the Boundary of the Assessment	Lateral boundary - As defined in Section 2 and shown on Drawing 1. Vertical Boundary – to the extent of the proposed investigation, and to the depth of the absence of visual/olfactory indicators of contamination.
Step 5 – Develop of decision rule	Selected soil samples to be analysed for the contaminants of concern as outlined in Section 4. The field and laboratory data to be assessed as reliable by reference to the Data Quality Indicators (DQI) as outlined in Step 7.
Step 6 – Specify the acceptance criteria	The site assessment criteria were developed through reference to NEPC 2013. The acceptance limits for laboratory QA/QC parameters were based on the laboratory reported acceptance limits and those stated in NEPC 2013. Minimise decision errors (sampling and measurement errors) by implementing data quality indicators and by using experienced staff to sample and select samples for analysis.
Step 7 – Optimise the design for obtaining data	Design was optimised by the development of a plan for sample collection, handling and analysis, including undertaking quality assurance and quality control measures to allow assessment of the suitability of the data collected. Measurement to assess the project DQOs using data quality indicators (DQIs) as follows: **Completeness** – completion of field and laboratory chain of custody documentation, use of experienced field staff, compliance with holding times and documentation correct; **Comparability** – consistent sampling procedures, use of NATA certified laboratory and experienced field staff; **Representativeness** – appropriate media sampled; **Precision** - Analysis of field and laboratory replicates and achievement of acceptable RPDs, acceptable levels for laboratory QC criteria; **Accuracy** – Analysis of field duplicates, matrix spikes and surrogate spikes.

8.2 Sampling and Analysis

8.2.1 Soil Sample Collection, Decontamination and Preservation

Soil samples for contamination testing were collected with reference to environmental sampling protocols and chain of custody (C-O-C) documentation.

Soil samples were generally collected from the near surface and at regular depth intervals or changes in strata within each bore. Soil samples were collected directly from the auger or borehole using stainless steel sampling equipment and / or disposable gloves. Care was taken to remove any extraneous material deposited on the sample.

All sampling data was recorded on DP C-O-C. The general sampling procedure comprised:

- Decontamination of sampling equipment using a 3% solution of phosphate free detergent (Decon 90) and tap water prior to collecting each sample;
- The use of new disposable gloves for each sampling event;
- Transfer of samples into laboratory-prepared jars and capping immediately;
- Collection of replicate soil samples in zip-lock plastic bags at each depth for screening by PID;
- Collection of replicate samples for QA / QC purposes;
- Labelling of sample containers with individual and unique identification, including project number, sample location and sample depth;
- Placement of the sample containers, replicate sample bags and trip/spikes/blanks into a cooled, insulated and sealed container for transport to the laboratory.

The process of obtaining samples and their transportation, storage and delivery to laboratories for analysis was documented on a DP standard C-O-C. Copies of completed forms are provided in Appendix C.

Following each borehole, sampling equipment was decontaminated using tap water and phosphate free detergent (Decon 90) to minimise the potential for cross-contamination.

Replicate samples for each soil sample were screened for the presence of VOCs, using MiniRAE 3000 PIDs with a 10.6 eV lamp, calibrated to 100 ppm Isobutylene.

Information on quality assurance and quality control, including analysis of replicate samples, is found in the Data Quality report in Appendix C.

8.2.2 Laboratory QA/QC

The NATA accredited chemical laboratory undertook in-house QA / QC procedures involving the routine testing of:

- Reagent blanks;
- Spike recovery analysis;
- Laboratory duplicate analysis;
- Analysis of control standards;
- Calibration standards and blanks; and
- Statistical analysis of QC data.

An assessment of the overall data quality is presented in Appendix C.

9. Laboratory Testing

9.1 Analytical Program

Laboratory testing for the targeted assessment was undertaken by Envirolab Services Pty Ltd, a NATA registered laboratory. Analytical methods used are shown in the laboratory sheets in Appendix B.

A total of 19 soil samples (including two replicate soil samples) and six material samples (fibro sheeting fragments) were selected to provide an assessment of soil / fill conditions. The samples were selected to target the identified potential sources of contamination (see Section 4) and were analysed for some or all of the following potential contaminants:

- Total Recoverable Hydrocarbons (TRH);
- Benzene, Toluene, Ethylbenzene and Xylene (BTEX);
- Polycyclic Aromatic Hydrocarbons (PAH);
- Polychlorinated Biphenyls (PCB);
- Organochlorine and Organophosphorus Pesticides (OCP/OPP);
- Heavy metals (As, Cd, Cr, Cu, Pb, Hg, Ni, Zn, Mn, Fe);
- Asbestos identification.

QA / QC testing comprised analysis of two replicate (intra-lab) samples for the above analytes. The results of QA / QC testing are presented in Appendix C.

In addition to the above testing, selected soil samples were analysed for leachability using the following methods:

- Toxicity Characteristic Leaching Procedure (TCLP) for assessment of leachable characteristics for waste classification;
- Australian Standard Leaching Procedure (ASLP) for assessment of leaching characteristics in water, for assessment of possible on-site management of contaminated soils.

9.2 Analytical Results

The results of chemical analysis undertaken on soil samples and groundwater samples are presented in the laboratory reports in Appendix B and are summarised in Tables 5 to 8 below.

Table 5: Results of Soil Analysis - Metals

Bore	Depth (m)	PID (ppm)	As [3]	Cd	Cr [7]	Cu	Pb [4]	Pb TCLP	Pb ASLP	Hg [5,6]	Ni	Zn	Mn	Fe
202A	0.5	<1	10	<0.4	7	4	12	NT	NT	<0.1	1	12	110	41000
203	0.5	<1	6	<0.4	27	3	12	NT	NT	<0.1	1	9	1700	12000
204	0.1	<1	<4	<0.4	29	3	4	NT	NT	<0.1	1	14	2500	3800
BD1	-	<1	<4	<0.4	23	8	5	NT	NT	<0.1	2	24	1400	6700
205	0.01	<1	11	<0.4	11	21	53	NT	NT	<0.1	2	240	590	5700
206	0.01	<1	11	<0.4	17	15	18	NT	NT	<0.1	6	44	170	34000
BD2	-	<1	14	<0.4	14	16	13	NT	NT	<0.1	15	48	410	17000
207	0.01	<1	<4	<0.4	3	2	29	NT	NT	<0.1	<1	23	43	2700
208	0.01	<1	11	0.5	11	4	21	NT	NT	<0.1	1	210	24	46000
209	0.01	<1	14	<0.4	16	1	15	NT	NT	<0.1	1	10	11	61000
210	0.01	<1	9	0.5	14	13	32	NT	NT	<0.1	2	77	52	64000
211	1	<1	6	<0.4	8	13	25	NT	NT	<0.1	3	130	300	8400
212	0.5	<1	7	<0.4	6	12	39	NT	NT	<0.1	3	98	61	14000
213	0.3	<1	9	<0.4	5	4	19	NT	NT	<0.1	2	19	52	9300
214	0.5	<1	37	0.4	16	*370*	*1300*	0.46	7.8	<0.1	4	*8900*	2900	34000
215	0.5	<1	7	<0.4	13	1	12	NT	NT	<0.1	<1	19	16	17000
Laboratory PQL			4	0.4	1	1	1	NT	NT	0.1	1	1	1	1
NEPM HIL C [1] (Ref 3)			300	90	300	17000	600			80	1200	30000	19000	NC
Ecological Investigation Levels [8] (EILs) - Urban residential/Public open space			100	NC	410	110	1100	NC	NC	NC	220	310	NC	NC
NSW EPA - General Solid Waste Guidelines - CT1 (Ref 5)			100	20	100	NC	100/1500 [9]	5	NC	4	40	NC	NC	NC
NSW EPA - Restricted Solid Waste Guidelines - CT2 (Ref 5)			400	80	400	NC	400/6000 [9]	20	NC	16	160	NC	NC	NC
ANZECC 2000 - Trigger Values - Slightly to Moderately Disturbed Systems - Fresh (Ref 6)			NA	NA	NA	NA	NA	NA	0.0034	NA	NA	NA	NA	NA

Notes to Table 5:
All soil total concentration results in mg/kg on a dry weight basis
TCLP and ASLP results in mg/L
CT - Concentration Threshold
NA - Not Applicable
NC - No Criteria
NT - Not Tested
PID - Photoionisation Detector
PQL - Practical Quantitation Limits
SCC - Specific Contaminant Concentration
1 - Health Based Criteria for Recreational Land Use, including secondary schools
2- HIL generally applies to the top 3m of soil
3- HIL assumes 70% oral bioavailability. Site-specific bioavailability may be important and should be considered where appropriate (refer Schedule B7)
4- HIL is based on blood lead models (adult lead model where 50% bioavailability has been considered. Site-specific bioavailability may be important and should be considered where appropriate (refer Schedule B7)
5- Assessment of methyl mercury should only be considered if there is evidence of its potential source.
6- HIL does not address elemental mercury
7 - Chromium (VI) (Conservative)
8- EILs refer to contamination present in soil for at least two years
9- Total concentration for waste classification when used in conjunction with TCLP results
exceeds NEPM Health-Based Criteria for Recreational Landuse, including secondary schools
ANZECC 2000 Trigger values for slightly to moderately disturbed systems - fresh waters
Bold results exceed NSW EPA Waste Classification Guidelines for General Solid Waste following leachability testing
Italic results exceed NEPM Ecological Investigation Criteria for Urban Residential/Public Open Space
BD1 is a replicate sample of 204/0.1
BD2 is a replicate sample of 206/0.01

Table 6: Results of Soil Analysis – TRH, BTEX

Bore	Depth (m)	PID (ppm)	TRH				TRH (NEPM)						BTEX				
			C_6 - C_9	C_{10} - C_{14}	C_{15} - C_{28}	C_{29} - C_{36}	1 (C_6-C_{10}-BTEX)	F2 (>C_{10}-C_{16} - Naphthalene)	C_6-C_{10}	>C_{10}-C_{16}	F3 (>C_{16}-C_{34})	F4 (>C_{34}-C_{40})	Benzene	Toluene	Ethyl Benzene	Xylenes	Naphthalene
202A	0.5	<1	<25	<50	<100	<100	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<1
203	0.5	<1	<25	<50	<100	140	<25	<50	<25	<50	110	130	<0.2	<0.5	<1	<3	<1
204	0.1	<1	<25	<50	100	730	<25	<50	<25	<50	540	1000	<0.2	<0.5	<1	<3	<1
BD1	-	<1	<25	<50	190	680	<25	<50	<25	<50	600	1100	<0.2	<0.5	<1	<3	<1
205	0.01	<1	<25	<50	<100	210	<25	<50	<25	<50	220	110	<0.2	<0.5	<1	<3	<1
206	0.01	<1	<25	<50	<100	<100	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<1
BD2	-	<1	<25	<50	<100	<100	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<1
207	0.01	<1	<25	<50	<100	<100	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<1
208	0.01	<1	<25	<50	<100	<100	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<1
209	0.01	<1	<25	<50	<100	<100	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<1
210	0.01	<1	<25	<50	<100	<100	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<1
211	1	<1	<25	<50	<100	<100	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<1
212	0.5	<1	<25	<50	<100	<100	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<1
213	0.3	<1	<25	<50	<100	<100	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<1
214	0.5	<1	<25	<50	<100	<100	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<1
215	0.5	<1	<25	<50	<100	<100	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<1
Laboratory PQL			25	50	100	100	25	50	25	50	100	100	0.2	0.5	1	3	1
NEPM HSL C [1, 6] (Ref 3) SAND			NC	NC			NL/NL/NL/NL [1]	NL/NL/NL/NL [1]	NC	NC	NC	NC	NL/NL/NL/NL [1]	NL/NL/NL/NL [1]	L/NL/NL/NL	L/NL/NL/NL	NL/NL/NL/NL [1]
NEPM HSL C [2, 6] (Ref 3) SILT			NC	NC			NL/NL/NL/NL [2]	NL/NL/NL/NL [2]	NC	NC	NC	NC	NL/NL/NL/NL [2]	NL/NL/NL/NL [2]	L/NL/NL/NL	L/NL/NL/NL	NL/NL/NL/NL [2]
NEPM HSL C [3, 6] (Ref 3) CLAY			NC	NC			NL/NL/NL/NL [3]	NL/NL/NL/NL [3]	NC	NC	NC	NC	NL/NL/NL/NL [3]	NL/NL/NL/NL [3]	L/NL/NL/NL	L/NL/NL/NL	NL/NL/NL/NL [3]
NEPM ESL Residential A,B,C [4, 7] (Ref 3) - Coarse Soils			NC	NC			180 *	NC	NC	120 *	300	2800	50	85	70	105	NC
NEPM ESL Residential A,B,C [4, 7](Ref 3) - Fine Soils			NC	NC			180 *	NC	NC	120 *	1300	5600	65	105	125	45	NC
Management limits for TPH fractions in coarse soils - Residential A, B, C [5]			NC	NC			NC	NC	700	1000	2500	10000	NC	NC	NC	NC	NC
Management limits for TPH fractions in fine soils - Residential A, B, C [5]			NC	NC			NC	NC	800	1000	3500	10000	NC	NC	NC	NC	NC
NSW DECCW - General Solid Waste Guidelines - CT1 (Ref 5)			650 SCC1	10000 total SCC1			NC	NC	NC	NC	NC	NC	10	288	600	1000	NC
NSW DECCW - Restricted Solid Waste Guidelines - CT2 (Ref 5)			2600 SCC2	40000 total SCC2			NC	NC	NC	NC	NC	NC	40	1152	2400	4000	NC

Notes to Table 6:
All results in mg/kg on a dry weight basis
CT - Concentration Threshold
NA - Not Applicable
NC - No Criteria
NT - Not Tested
PID - Photoionisation Detector
PQL - Practical Quantitation Limits
SCC - Specific Contaminant Concentration
1- Soil HSLs for vapour intrusion (mg/kg) for SAND samples recovered from 0 m to <1 m / 1 m to <2 m / 2 m to <4 m / >=4 m
2- Soil HSLs for vapour intrusion (mg/kg) for SILT samples recovered from 0 m to <1 m / 1 m to <2 m / 2 m to <4 m / >=4 m
3- Soil HSLs for vapour intrusion (mg/kg) for CLAY samples recovered from 0 m to <1 m / 1 m to <2 m / 2 m to <4 m / >=4 m
4- ESLs are of low reliability except where indicated by * which indicates that the ESLs are of moderate reliability
5- Management limits are applied after consideration of relevant ESLs and HSLs
6- Multiplication factor may be applied (for depths >2m) subject to favourable biodegradation conditions - refer to 2.4.10
7- ESLs apply from the surface to 2 m depth below finished surface/ground level
8- Environmental Investigation Limit (EIL) - this value relates to fresh contamination.
exceeds NEPM HSL Health-Based Criteria for Recreational Landuse, including secondary schools
exceeds NEPM management limits for TPH fractions in fine soils - Residential A, B, C
Underlined results exceed the NEPM ESL guideline values for Recreational Landuse - coarse soils
Bold results exceed NSW DECCW Waste Classification Guidelines for General Solid Waste without leachability testing
BD1 is a replicate sample of 204/0.1
BD2 is a replicate sample of 206/0.01

Table 7: Results of Soil Analysis – PAH, PCB, OCP, OPP

Bore	Depth (m)	PID (ppm)	Total PAH	Benzo(a) Pyrene	Benzo(a) Pyrene TCLP	Benzo(a) Pyrene TEQ	PCB [3]	Total OPP	Chlorpyrifos	Total OCP	Aldrin + Dieldrin	Chlordane	DDT+DDE +DDD	Endosulphan	Endrin	Heptachlor	HCB	Methoxychlor
202A	0.5	<1	2.9	0.3	NT	0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
203	0.5	<1	7.7	*0.81*	<0.001	1.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
204	0.1	<1	3.6	0.1	NT	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BD1	-	<1	4.8	0.3	NT	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
205	0.01	<1	NIL (+)VE	<0.05	NT	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
206	0.01	<1	NIL (+)VE	<0.05	NT	<0.5	<0.1	<0.1	<0.1	4.3	3.5	0.3	<0.1	<0.1	<0.1	0.5	<0.1	<0.1
BD2	-	<1	NIL (+)VE	<0.05	NT	<0.5	<0.1	<0.1	<0.1	4	3.3	0.3	<0.1	<0.1	<0.1	0.4	<0.1	<0.1
207	0.01	<1	NIL (+)VE	<0.05	NT	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
208	0.01	<1	NIL (+)VE	<0.05	NT	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
209	0.01	<1	NIL (+)VE	<0.05	NT	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
210	0.01	<1	NIL (+)VE	<0.05	NT	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
211	1	<1	NIL (+)VE	<0.05	NT	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
212	0.5	<1	NIL (+)VE	<0.05	NT	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
213	0.3	<1	NIL (+)VE	<0.05	NT	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
214	0.5	<1	NIL (+)VE	<0.05	NT	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
215	0.5	<1	NIL (+)VE	<0.05	NT	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Laboratory PQL			0.05	0.05	0.001	0.5	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
NEPM HIL C [1] (Ref 3)			300	NC	NC	3	1	NC	250	NC	10	70	400	340	20	10	10	400
Ecological Investigation Levels [8] (EILs) - Urban residential/Public open space			NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	180 (DDT)	NC	NC	NC	NC	NC
NEPM ESL Residential A,B,C [7](Ref 3) - Coarse Soils			NC	0.7	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
NEPM ESL Residential A,B,C [7](Ref 3) - Fine Soils			NC	0.7	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
NSW DECCW - General Solid Waste Guidelines - CT1 (Ref 5)			200 SCC1	0.8/10 [5]	0.04	NC	50 SCC1	NC	4	NC	NC	NC	NC	60	NC	NC	NC	NC
NSW DECCW - Restricted Solid Waste Guidelines - CT2 (Ref 5)			800 SCC2	3.2/23 [5]	0.16	NC	50 SCC2	NC	16	NC	NC	NC	NC	240	NC	NC	NC	NC

Notes to Table 7:
All total soil concentration results in mg/kg on a dry weight basis
TCLP results in mg/L
CT - Concentration Threshold
NA - Not Applicable
NC - No Criteria
NT - Not Tested
PID - Photoionisation Detector
PQL - Practical Quantitation Limits
SCC - Specific Contaminant Concentration
TEQ - Toxicity Equivalent Quotient
Total PAH - Sum of positive and PQL values
1 - Health Based Criteria for Commercial Land Use
2- ESLs apply from the surface to 2 m depth below finished surface/ground level
3- PCB HILs relates to non-dioxin-like PCB only
4- Endosulphan is total of Endosulphan I, Endosulphan II and Endosulphan Sulphate
5- Total concentration for waste classification when used in conjunction with TCLP results
exceeds NSW EPA Health-Based Criteria for Recreational Landuse including secondary schools
Bold results exceed NSW DECCW Waste Classification Guidelines for General Solid Waste without leachability testing
Italic results exceed NEPM Ecological Screening Level for Urban Residential/Public Open Space
BD1 is a replicate sample of 204/0.1
BD2 is a replicate sample of 206/0.01

Table 8: Results of Asbestos Identification on Soil/Fibro Sheeting

Location	Depth	Sample Type	Asbestos Identification	Trace Analysis
206	0.01	Soil	No asbestos detected at reporting limit of 0.1g/kg. Organic fibres detected	No asbestos detected
207	0.01	Soil	No asbestos detected at reporting limit of 0.1g/kg. Organic fibres detected	No asbestos detected
207	0.1	Material (fibro)	Chrysotile asbestos detected	-
211	1.0	Soil	No asbestos detected at reporting limit of 0.1g/kg. Organic fibres detected	No asbestos detected
212	0.5	Soil	No asbestos detected at reporting limit of 0.1g/kg. Organic fibres detected	No asbestos detected
213	0.3	Soil	No asbestos detected at reporting limit of 0.1g/kg. Organic fibres detected	No asbestos detected
214	0.5	Soil	No asbestos detected at reporting limit of 0.1g/kg. Organic fibres detected	No asbestos detected
A1-soil[1]		Soil	No asbestos detected at reporting limit of 0.1g/kg. Organic fibres detected	No asbestos detected
A1-fibro		Material (fibro)	Chrysotile asbestos detected. Amosite asbestos detected	-
A2-soil[1]		Soil	No asbestos detected at reporting limit of 0.1g/kg. Organic fibres detected	No asbestos detected
A2-fibro		Material (fibro)	Chrysotile asbestos detected	-
A3-soil[1]		Soil	No asbestos detected at reporting limit of 0.1g/kg. Organic fibres detected	No asbestos detected
A3-fibro		Material (fibro)	Chrysotile asbestos detected	-
A4-fibro		Material (fibro)	Chrysotile asbestos detected	-
A5-fibro		Material (fibro)	Chrysotile asbestos detected. Amosite asbestos detected. Crocidolite asbestos detected	-

Notes to Table 8:

1 – Soil collected from immediately beneath fibro fragment

10. Site Assessment Criteria

Details of the site assessment criteria for the assessment are detailed in Appendix C.

11. Assessment of Contamination

Exceedances of the adopted soil and groundwater site assessment criteria are highlighted in the above laboratory results tables. The results generally indicate the following:

- The general absence of gross contamination within the site;
- Localised elevated lead concentrations in soil, exceeding health-based and ecological investigation levels at one location (Bore 214/0.5). The elevated lead concentrations were encountered in fill materials adjacent to the southern site boundary;
- Localised petroleum hydrocarbon concentrations ($<C_{16}$-C_{34}) exceeding the adopted ecological screening level in gravel filling in sample Bore 204/0.1, located immediately beneath asphalt pavement;
- Localised benzo(a)pyrene concentrations ($<C_{16}$-C_{34}) exceeding the adopted ecological investigation level in filling in sample Bore 203/0.5, located immediately beneath asphalt pavement;
- The results of asbestos testing (identification tests in soils) indicated the absence of asbestos fines contamination at the locations tested. Fibro fragments analysed from the surface and upper filling contained asbestos in all material samples tested;
- Waste classification analysis on soils (including leachability testing where required) indicated that the analysed soil samples were classified as 'General Solid Waste' for chemical contamination. The presence of asbestos, however, would influence waste classification.

Water leach testing was conducted on one sample with elevated lead concentrations (Bore 214/0.5). The water leach test involves tumbling the soil sample in distilled water for 18 hours and testing the resulting leachate. The results of the water leach test are used to assess the potential for contaminants to leach from soils if retained on site. The results of the water leach testing were compared to ANZECC criteria (where available) and indicated a relatively high concentration in the leach test, exceeding the adopted ANZECC criteria by several orders of magnitude. It is considered that the high total concentration of lead and the subsequent high lead concentration in the water leach result in the sample from Bore 214/0.5 are indicative of particulate metal in the sample.

12. Discussion

12.1 Recommendations for Proposed Development

The results of the site history review and site inspection conducted as part of the previous and current assessment indicated a history of site use as a school, with some demolition of structures and imported filling.

Subsurface investigation was undertaken to provide a targeted assessment of the principle potential contamination sources. The investigation identified fill materials across the site with minor soil impacts.

The results of the subsurface investigation and laboratory testing indicated the following:

- The presence of localised lead impact in filling at one location (Bore 214), likely to be attributed to particulate metal in the sample;
- The presence of localised hydrocarbon impact in filling at one location (Bore 204), likely to be attributed to the overlying asphalt pavement;
- The presence of localised and marginal benzo(a)pyrene impact in filling at one location (Bore 203);
- The presence of building rubble in filling at several locations, including asbestos containing materials in near surface filling and at the surface in several areas of the site.

The site is considered to be generally suitable for the proposed development, subject to remediation and/or management of identified impacts.

Remediation and/or management of impacted soils is required prior to, and as part of, development, as follows:

- Remediation of identified surface asbestos contamination, with subsequent site clearance by an appropriately qualified consultant. This remediation should be done as an immediate interim management measure, prior to the commencement of further works at the site;
- Remediation and/or management of filling containing elevated metal, non-volatile hydrocarbon concentrations and asbestos impact. The impacted filling was generally encountered within the top 1 m to 2 m of the soil profile. Remediation options generally include excavation and off-site disposal, or on-site management of impacted soils.

If fill materials are required to be removed from site as part of construction works, a preliminary classification of 'General Solid Waste' for general filling, or 'General Solid Waste' with bonded asbestos materials (Special Waste) would apply, depending on the presence of asbestos impact. Further detailed investigation and testing for waste classification, however, would be recommended for confirmation.

For areas of the site where excavation is not proposed, on-site management of identified impacts could be considered. On-site management of identified contamination would comprise the following, and will be subject to regulatory approvals:

- Capping of identified impacts with buildings, pavements and/or approved 'clean' soil capping;
- Notification of contamination management on the property title/planning certificate;
- Ongoing management of the contamination in accordance with a long-term environmental management plan for the site.

It is recommended that the presence and extent of identified impacts within the proposed development area is further assessed following demolition of site structures which currently cover a significant portion of the development area (Figure 2, Appendix D).

It is noted that fill materials are likely to be present across the school playing fields. The potential for contamination within filling has been identified within the site. These areas should be included in ongoing long-term site management as a precautionary measure.

Site remediation and management should be conducted in accordance with a site-specific Remediation Action Plan (RAP) which would present remediation strategies, procedures and validation criteria for remediation of the site for the proposed landuse.

In addition, the construction phase of works should be accompanied by a Construction Environmental Management Plan (CEMP) which outlines the strategies for management of identified contamination, and provides procedures if unexpected contamination is encountered during works (i.e. unexpected finds protocol).

On the basis of the investigation, the site can be made suitable for the proposed development subject to remediation/management of the identified contamination in accordance with a site-specific RAP. Additional investigation is also recommended following the demolition of site structures in order to confirm remediation requirements.

12.2 Duty to Report

Under section 60 of the Contaminated Land Management Act 1997, there is a duty to report contamination to the NSW EPA where that contamination is considered to pose an unacceptable risk to human health or the environment. The requirements and processes for reporting are presented in the NSW EPA "Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997" (Ref 7).

An assessment of the requirement to report contamination for the subject site has been made with reference to the EPA guidelines (Ref 7). With reference to the processes and notification triggers in the guidelines, it is considered that a notification to the NSW EPA is not required for the subject site.

Recommended control measures and ongoing management of identified contamination (as recommended in Section 12.1 above) are considered appropriate for the proposed development and ongoing site use.

13. References

1. Douglas Partners Pty Ltd, "Report on Preliminary Site Investigation (Contamination), Hunter Sports High School, Pacific Highway Gateshead, prepared for NSW Department of Public Works Government Architects Office, Project 81598, October 2014".
2. NSW EPA Contaminated Sites (2011), 'Guidelines for Consultants Reporting on Contaminated Sites', August 2011.
3. National Environment Protection Council (2013), 'National Environment Protection (Assessment of Site Contamination) Amendment Measure 2013', 11 April 2013".
4. Douglas Partners Pty Ltd, "Report on Geotechnical Investigation, Proposed Development, Hunter Sports High School, Pacific Highway Gateshead, prepared for NSW Public Works Department of Finance, Services and Innovation, Project 81598.01, October 2015".
5. NSW EPA (2009) 'Waste Classification Guidelines, Part 1: Classifying Waste', November 2014.
6. ANZECC (2000) 'Australian and New Zealand Guidelines for Fresh and Marine Water Quality', October 2000.

7. NSW EPA, "Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997", September 2015.

14. Limitations

Douglas Partners (DP) has prepared this report for this project at Hunter Sports High School in accordance with DP's proposal dated 8 April 2016 and acceptance received from NSW Public Works dated 11 April 2016. The work was carried out under DP's Conditions of Engagement. This report is provided for the exclusive use of NSW Public Works for this project only and for the purposes as described in the report. It should not be used by or relied upon for other projects or purposes on the same or other site or by a third party. Any party so relying upon this report beyond its exclusive use and purpose as stated above, and without the express written consent of DP, does so entirely at its own risk and without recourse to DP for any loss or damage. In preparing this report DP has necessarily relied upon information provided by the client and/or their agents.

The results provided in the report are indicative of the sub-surface conditions on the site only at the specific sampling and/or testing locations, and then only to the depths investigated and at the time the work was carried out. Sub-surface conditions can change abruptly due to variable geological processes and also as a result of human influences. Such changes may occur after DP's field testing has been completed.

DP's advice is based upon the conditions encountered during this investigation. The accuracy of the advice provided by DP in this report may be affected by undetected variations in ground conditions across the site between and beyond the sampling and/or testing locations. The advice may also be limited by budget constraints imposed by others or by site accessibility.

This report must be read in conjunction with all of the attached and should be kept in its entirety without separation of individual pages or sections. DP cannot be held responsible for interpretations or conclusions made by others unless they are supported by an expressed statement, interpretation, outcome or conclusion stated in this report.

This report, or sections from this report, should not be used as part of a specification for a project, without review and agreement by DP. This is because this report has been written as advice and opinion rather than instructions for construction.

Asbestos has been detected by observation and by laboratory analysis, either on the surface of the site, or in filling materials at the test locations sampled and analysed. Building demolition materials, such as concrete, brick, tile, were also located in below-ground filling and at the surface, in areas where no asbestos was encountered. Building demolition materials are considered to be indicative of the possible presence of additional hazardous building materials (HBM), including asbestos.

Although the sampling plan adopted for this investigation is considered appropriate to achieve the stated project objectives, there are necessarily parts of the site that have not been sampled and analysed. This is either due to undetected variations in ground conditions or to budget constraints (as discussed above), or to parts of the site being inaccessible and not available for inspection/sampling, or to vegetation preventing visual inspection and reasonable access. It is therefore considered possible that additional HBM, including asbestos, may be present in unobserved or untested parts of the site, between and beyond sampling locations, and hence no warranty can be given that additional asbestos is not present.

The contents of this report do not constitute formal design components such as are required, by the Health and Safety Legislation and Regulations, to be included in a Safety Report specifying the hazards likely to be encountered during construction and the controls required to mitigate risk. This design process requires risk assessment to be undertaken, with such assessment being dependent upon factors relating to likelihood of occurrence and consequences of damage to property and to life. This, in turn, requires project data and analysis presently beyond the knowledge and project role respectively of DP. DP may be able, however, to assist the client in carrying out a risk assessment of potential hazards contained in the Comments section of this report, as an extension to the current scope of works, if so requested, and provided that suitable additional information is made available to DP. Any such risk assessment would, however, be necessarily restricted to the environmental components set out in this report and to their application by the project designers to project design, construction, maintenance and demolition.

Douglas Partners Pty Ltd

Appendix A

About This Report
Borehole Logs – Bores 201 to 215

About this Report

Douglas Partners

Introduction

These notes have been provided to amplify DP's report in regard to classification methods, field procedures and the comments section. Not all are necessarily relevant to all reports.

DP's reports are based on information gained from limited subsurface excavations and sampling, supplemented by knowledge of local geology and experience. For this reason, they must be regarded as interpretive rather than factual documents, limited to some extent by the scope of information on which they rely.

Copyright

Borehole and Test Pit Logs

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

Interpretation of the information and its application to design and construction should therefore take into account the spacing of boreholes or pits, the frequency of sampling, and the possibility of other than 'straight line' variations between the test locations.

Groundwater

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

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

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

Reports

The report has been prepared by qualified personnel, is based on the information obtained from field and laboratory testing, and has been undertaken to current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal, the information and interpretation may not be relevant if the design proposal is changed. If this happens, DP will be pleased to review the report and the sufficiency of the investigation work.

Every care is taken with the report as it relates to interpretation of subsurface conditions, discussion of geotechnical and environmental aspects, and recommendations or suggestions for design and construction. However, DP cannot always anticipate or assume responsibility for:

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

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

About this Report

Site Anomalies

In the event that conditions encountered on site during construction appear to vary from those which were expected from the information contained in the report, DP requests that it be immediately notified. Most problems are much more readily resolved when conditions are exposed rather than at some later stage, well after the event.

Information for Contractual Purposes

Where information obtained from this report is provided for tendering purposes, it is recommended that all information, including the written report and discussion, be made available. In circumstances where the discussion or comments section is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. DP would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

Site Inspection

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

Sampling

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

Disturbed samples taken during drilling provide information on colour, type, inclusions and, depending upon the degree of disturbance, some information on strength and structure.

Undisturbed samples are taken by pushing a thin-walled sample tube into the soil and withdrawing it to obtain a sample of the soil in a relatively undisturbed state. Such samples yield information on structure and strength, and are necessary for laboratory determination of shear strength and compressibility. Undisturbed sampling is generally effective only in cohesive soils.

Test Pits

Test pits are usually excavated with a backhoe or an excavator, allowing close examination of the in-situ soil if it is safe to enter into the pit. The depth of excavation is limited to about 3 m for a backhoe and up to 6 m for a large excavator. A potential disadvantage of this investigation method is the larger area of disturbance to the site.

Large Diameter Augers

Boreholes can be drilled using a rotating plate or short spiral auger, generally 300 mm or larger in diameter commonly mounted on a standard piling rig. The cuttings are returned to the surface at intervals (generally not more than 0.5 m) and are disturbed but usually unchanged in moisture content. Identification of soil strata is generally much more reliable than with continuous spiral flight augers, and is usually supplemented by occasional undisturbed tube samples.

Continuous Spiral Flight Augers

The borehole is advanced using 90-115 mm diameter continuous spiral flight augers which are withdrawn at intervals to allow sampling or in-situ testing. This is a relatively economical means of drilling in clays and sands above the water table. Samples are returned to the surface, or may be collected after withdrawal of the auger flights, but they are disturbed and may be mixed with soils from the sides of the hole. Information from the drilling (as distinct from specific sampling by SPTs or undisturbed samples) is of relatively low reliability, due to the remoulding, possible mixing or softening of samples by groundwater.

Non-core Rotary Drilling

The borehole is advanced using a rotary bit, with water or drilling mud being pumped down the drill rods and returned up the annulus, carrying the drill cuttings. Only major changes in stratification can be determined from the cuttings, together with some information from the rate of penetration. Where drilling mud is used this can mask the cuttings and reliable identification is only possible from separate sampling such as SPTs.

Continuous Core Drilling

A continuous core sample can be obtained using a diamond tipped core barrel, usually with a 50 mm internal diameter. Provided full core recovery is achieved (which is not always possible in weak rocks and granular soils), this technique provides a very reliable method of investigation.

Standard Penetration Tests

Standard penetration tests (SPT) are used as a means of estimating the density or strength of soils and also of obtaining a relatively undisturbed sample. The test procedure is described in Australian Standard 1289, Methods of Testing Soils for Engineering Purposes - Test 6.3.1.

The test is carried out in a borehole by driving a 50 mm diameter split sample tube under the impact of a 63 kg hammer with a free fall of 760 mm. It is normal for the tube to be driven in three successive 150 mm increments and the 'N' value is taken as the number of blows for the last 300 mm. In dense sands, very hard clays or weak rock, the full 450 mm penetration may not be practicable and the test is discontinued.

The test results are reported in the following form.

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

  4,6,7
  N=13

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

  15, 30/40 mm

The results of the SPT tests can be related empirically to the engineering properties of the soils.

Dynamic Cone Penetrometer Tests / Perth Sand Penetrometer Tests

Dynamic penetrometer tests (DCP or PSP) are carried out by driving a steel rod into the ground using a standard weight of hammer falling a specified distance. As the rod penetrates the soil the number of blows required to penetrate each successive 150 mm depth are recorded. Normally there is a depth limitation of 1.2 m, but this may be extended in certain conditions by the use of extension rods. Two types of penetrometer are commonly used.

- Perth sand penetrometer - a 16 mm diameter flat ended rod is driven using a 9 kg hammer dropping 600 mm (AS 1289, Test 6.3.3). This test was developed for testing the density of sands and is mainly used in granular soils and filling.
- Cone penetrometer - a 16 mm diameter rod with a 20 mm diameter cone end is driven using a 9 kg hammer dropping 510 mm (AS 1289, Test 6.3.2). This test was developed initially for pavement subgrade investigations, and correlations of the test results with California Bearing Ratio have been published by various road authorities.

Soil Descriptions

Douglas Partners

Description and Classification Methods

The methods of description and classification of soils and rocks used in this report are based on Australian Standard AS 1726, Geotechnical Site Investigations Code. In general, the descriptions include strength or density, colour, structure, soil or rock type and inclusions.

Soil Types

Soil types are described according to the predominant particle size, qualified by the grading of other particles present:

Type	Particle size (mm)
Boulder	>200
Cobble	63 - 200
Gravel	2.36 - 63
Sand	0.075 - 2.36
Silt	0.002 - 0.075
Clay	<0.002

The sand and gravel sizes can be further subdivided as follows:

Type	Particle size (mm)
Coarse gravel	20 - 63
Medium gravel	6 - 20
Fine gravel	2.36 - 6
Coarse sand	0.6 - 2.36
Medium sand	0.2 - 0.6
Fine sand	0.075 - 0.2

The proportions of secondary constituents of soils are described as:

Term	Proportion	Example
And	Specify	Clay (60%) and Sand (40%)
Adjective	20 - 35%	Sandy Clay
Slightly	12 - 20%	Slightly Sandy Clay
With some	5 - 12%	Clay with some sand
With a trace of	0 - 5%	Clay with a trace of sand

Definitions of grading terms used are:

- Well graded - a good representation of all particle sizes
- Poorly graded - an excess or deficiency of particular sizes within the specified range
- Uniformly graded - an excess of a particular particle size
- Gap graded - a deficiency of a particular particle size with the range

Cohesive Soils

Cohesive soils, such as clays, are classified on the basis of undrained shear strength. The strength may be measured by laboratory testing, or estimated by field tests or engineering examination. The strength terms are defined as follows:

Description	Abbreviation	Undrained shear strength (kPa)
Very soft	vs	<12
Soft	s	12 - 25
Firm	f	25 - 50
Stiff	st	50 - 100
Very stiff	vst	100 - 200
Hard	h	>200

Cohesionless Soils

Cohesionless soils, such as clean sands, are classified on the basis of relative density, generally from the results of standard penetration tests (SPT), cone penetration tests (CPT) or dynamic penetrometers (PSP). The relative density terms are given below:

Relative Density	Abbreviation	SPT N value	CPT qc value (MPa)
Very loose	vl	<4	<2
Loose	l	4 - 10	2 -5
Medium dense	md	10 - 30	5 - 15
Dense	d	30 - 50	15 - 25
Very dense	vd	>50	>25

Soil Descriptions

Soil Origin

It is often difficult to accurately determine the origin of a soil. Soils can generally be classified as:

- Residual soil - derived from in-situ weathering of the underlying rock;
- Transported soils - formed somewhere else and transported by nature to the site; or
- Filling - moved by man.

Transported soils may be further subdivided into:

- Alluvium - river deposits
- Lacustrine - lake deposits
- Aeolian - wind deposits
- Littoral - beach deposits
- Estuarine - tidal river deposits
- Talus - scree or coarse colluvium
- Slopewash or Colluvium - transported downslope by gravity assisted by water. Often includes angular rock fragments and boulders.

Symbols & Abbreviations

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Introduction

These notes summarise abbreviations commonly used on borehole logs and test pit reports.

Drilling or Excavation Methods

C	Core Drilling
R	Rotary drilling
SFA	Spiral flight augers
NMLC	Diamond core - 52 mm dia
NQ	Diamond core - 47 mm dia
HQ	Diamond core - 63 mm dia
PQ	Diamond core - 81 mm dia

Water

▷	Water seep
▽	Water level

Sampling and Testing

A	Auger sample
B	Bulk sample
D	Disturbed sample
E	Environmental sample
U_{50}	Undisturbed tube sample (50mm)
W	Water sample
pp	pocket penetrometer (kPa)
PID	Photo ionisation detector
PL	Point load strength Is(50) MPa
S	Standard Penetration Test
V	Shear vane (kPa)

Description of Defects in Rock

The abbreviated descriptions of the defects should be in the following order: Depth, Type, Orientation, Coating, Shape, Roughness and Other. Drilling and handling breaks are not usually included on the logs.

Defect Type

B	Bedding plane
Cs	Clay seam
Cv	Cleavage
Cz	Crushed zone
Ds	Decomposed seam
F	Fault
J	Joint
Lam	lamination
Pt	Parting
Sz	Sheared Zone
V	Vein

Orientation

The inclination of defects is always measured from the perpendicular to the core axis.

h	horizontal
v	vertical
sh	sub-horizontal
sv	sub-vertical

Coating or Infilling Term

cln	clean
co	coating
he	healed
inf	infilled
stn	stained
ti	tight
vn	veneer

Coating Descriptor

ca	calcite
cbs	carbonaceous
cly	clay
fe	iron oxide
mn	manganese
slt	silty

Shape

cu	curved
ir	irregular
pl	planar
st	stepped
un	undulating

Roughness

po	polished
ro	rough
sl	slickensided
sm	smooth
vr	very rough

Other

fg	fragmented
bnd	band
qtz	quartz

Symbols & Abbreviations

Graphic Symbols for Soil and Rock

General


Asphalt


Road base


Concrete


Filling

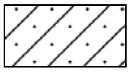
Soils


Topsoil

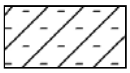

Peat


Clay

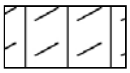

Silty clay

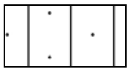

Sandy clay

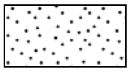

Gravelly clay

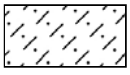

Shaly clay

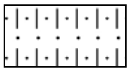

Silt


Clayey silt


Sandy silt

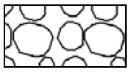

Sand

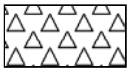

Clayey sand


Silty sand


Gravel


Sandy gravel


Cobbles, boulders

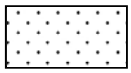

Talus

Sedimentary Rocks

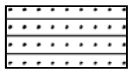

Boulder conglomerate

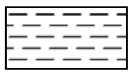

Conglomerate


Conglomeratic sandstone

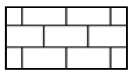

Sandstone


Siltstone


Laminite

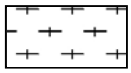

Mudstone, claystone, shale

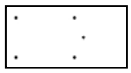

Coal


Limestone

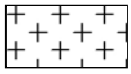
Metamorphic Rocks

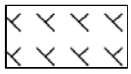

Slate, phyllite, schist

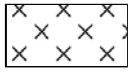

Gneiss

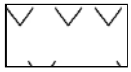

Quartzite

Igneous Rocks


Granite


Dolerite, basalt, andesite


Dacite, epidote


Tuff, breccia


Porphyry

BOREHOLE LOG

CLIENT: NSW Public Works
PROJECT: Major Capital Works Upgrade, Hunter Sports High
LOCATION: Pacific Highway, Gateshead

SURFACE LEVEL: --
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 201
PROJECT No: 81961.00
DATE: 14/4/2016
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
		FILLING - Brown, medium grained sand filling, with trace gravel, moist		E	0.01		PID<1		
	0.25	CLAYEY SAND - Brown, fine grained clayey sand, humid (possible filling)		E	0.5		PID<1		
	0.7	CLAY - Stiff to very stiff, grey mottled orange clay, M~Wp							
	1			E	1.0		pp = 250-300 PID<1		1
	1.5	Bore discontinued at 1.5m, limit of investigation		E	1.5		pp = 350-450 PID<1		
	2								2

RIG: Bobcat **DRILLER:** Paice **LOGGED:** Falla **CASING:**
TYPE OF BORING: 180mm diameter solid flight auger
WATER OBSERVATIONS: No free groundwater observed
REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: NSW Public Works
PROJECT: Major Capital Works Upgrade, Hunter Sports High
LOCATION: Pacific Highway, Gateshead

SURFACE LEVEL: --
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 202
PROJECT No: 81961.00
DATE: 14/4/2016
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
	0.05	ASPHALTIC CONCRETE		E	0.06		PID<1		
	0.15	FILLING - Grey, gravelly sand filling, with trace clay, slight hydrocarbon odour, moist							
		FILLING - Orange brown, medium grained sand filling, moist		E	0.5		PID<1		
	0.7	Bore discontinued at 0.7m, borehole discontinued due to underground service. Continued adjacent as BH202A							
	1								1
	2								2

RIG: Bobcat **DRILLER:** Paice **LOGGED:** Falla **CASING:**
TYPE OF BORING: 180mm diameter solid flight auger
WATER OBSERVATIONS: No free groundwater observed
REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: NSW Public Works
PROJECT: Major Capital Works Upgrade, Hunter Sports High
LOCATION: Pacific Highway, Gateshead

SURFACE LEVEL: --
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 203
PROJECT No: 81961.00
DATE: 14/4/2016
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
	0.04	ASPHALTIC CONCRETE							
		FILLING - Grey-black, gravelly sand filling, damp		E	0.05		PID<1		
	0.2	FILLING - Brown and orange clay filling, with trace gravel and slag, M~Wp							
				E	0.5		PID<1		
	0.8	CLAY - Stiff, mottled orange and grey clay, with trace sand, M~Wp							
	1			E	1.0		pp = 200 PID<1		1
	1.5	Bore discontinued at 1.5m, limit of investigation		E	1.5		PID<1		
	2								2

RIG: Bobcat **DRILLER:** Paice **LOGGED:** Falla **CASING:**
TYPE OF BORING: 180mm diameter solid flight auger
WATER OBSERVATIONS: No free groundwater observed
REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: NSW Public Works
PROJECT: Major Capital Works Upgrade, Hunter Sports High
LOCATION: Pacific Highway, Gateshead

SURFACE LEVEL: --
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 204
PROJECT No: 81961.00
DATE: 14/4/2016
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
	0.06	ASPHALTIC CONCRETE							
		FILLING - Grey sandy gravel filling (0.02m to 0.07m in diameter), with some slag gravel, humid		E	0.1		PID<1		
	0.2	FILLING - Orange brown clay filling, with trace sand and gravel, M~Wp		E	0.3		PID<1		
	0.4	SANDY CLAY - Stiff, orange mottled grey sandy clay, M~Wp							
1	1.0	Bore discontinued at 1.0m, limit of investigation		E	1.0		pp = 250 PID<1		1
2									2

RIG: Bobcat **DRILLER:** Paice **LOGGED:** Falla **CASING:**
TYPE OF BORING: 180mm diameter solid flight auger
WATER OBSERVATIONS: No free groundwater observed
REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: NSW Public Works
PROJECT: Major Capital Works Upgrade, Hunter Sports High
LOCATION: Pacific Highway, Gateshead

SURFACE LEVEL: --
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 205
PROJECT No: 81961.00
DATE: 14/4/2016
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
		FILLING - Brown, fine grained silty sand filling, with trace rootlets, damp		E	0.01		PID<1		
	0.15	FILLING - Brown clayey sandy silt filling, with trace roots, M<~Wp		E	0.3		PID<1		
	0.4	CLAY - Very stiff, grey and orange clay, M~Wp							
	1.0	Bore discontinued at 1.0m, limit of investigation		E	1.0		pp = 400-500 PID<1		

RIG: Bobcat **DRILLER:** Paice **LOGGED:** Falla **CASING:**
TYPE OF BORING: 180mm diameter solid flight auger
WATER OBSERVATIONS: No free groundwater observed
REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: NSW Public Works
PROJECT: Major Capital Works Upgrade, Hunter Sports High
LOCATION: Pacific Highway, Gateshead

SURFACE LEVEL: --
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 206
PROJECT No: 81961.00
DATE: 14/4/2016
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
		FILLING - Brown, medium grained silty sand filling, with trace gravel and concrete boulders and rootlets, humid		E	0.01		PID<1		
	0.2	FILLING - Dark brown, clayey sandy silt filling, M~Wp		E	0.3		PID<1		
	0.4	CLAY - Firm to stiff, yellow-brown mottled grey clay, M~Wp		E	0.5		pp = 100-150 PID<1		
1	1.0	Bore discontinued at 1.0m, limit of investigation		E	1.0		pp = 150-250 PID<1		1
2									2

RIG: Bobcat **DRILLER:** Paice **LOGGED:** Falla **CASING:**
TYPE OF BORING: 180mm diameter solid flight auger
WATER OBSERVATIONS: No free groundwater observed
REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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Geotechnics / Environment / Groundwater

BOREHOLE LOG

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LOCATION: Pacific Highway, Gateshead

SURFACE LEVEL: --
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 207
PROJECT No: 81961.00
DATE: 14/4/2016
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
		FILLING - Yellow and brown, medium grained sand filling, with trace gravel, brick and glass, damp		E	0.01		PID<1		
				D	0.1		(fibro sample)		
	0.4	FILLING - Orange and brown sandy clay filling, M~Wp		E	0.5		PID<1		
	1			E	1.0		PID<1		1
	1.2	SANDY CLAY - Very stiff, orange and brown sandy clay, with some gravel, M~Wp							
				E	1.5		pp = 250 PID<1		
	1.6	CLAY - Very stiff, grey clay, with trace sand and ironstone gravel, M~Wp							
	2 2.0	Bore discontinued at 2.0m, limit of investigation		E	2.0		pp = 250-350 PID<1		2

RIG: Bobcat **DRILLER:** Paice **LOGGED:** Falla **CASING:**

TYPE OF BORING: 180mm diameter solid flight auger

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: NSW Public Works
PROJECT: Major Capital Works Upgrade, Hunter Sports High
LOCATION: Pacific Highway, Gateshead

SURFACE LEVEL: --
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 208
PROJECT No: 81961.00
DATE: 14/4/2016
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
		FILLING - Dark brown sandy silty clay, with trace rootlets, M~Wp		E	0.01		PID<1		
	0.25	CLAY - Very stiff, brown orange brown clay, with trace sand, M<Wp		E	0.5		pp = 350-400 PID<1		
	0.9	SANDSTONE - Very low strength, white and orange sandstone							
1	1.0	Bore discontinued at 1.0m, limit of investigation		E	1.0		PID<1		1
2									2

RIG: Bobcat **DRILLER:** Paice **LOGGED:** Falla **CASING:**
TYPE OF BORING: 180mm diameter solid flight auger
WATER OBSERVATIONS: No free groundwater observed
REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: NSW Public Works
PROJECT: Major Capital Works Upgrade, Hunter Sports High
LOCATION: Pacific Highway, Gateshead

SURFACE LEVEL: --
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 209
PROJECT No: 81961.00
DATE: 14/4/2016
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
		FILLING - Red-brown silty clay filling, some gravel at surface, M<Wp		E	0.01		PID<1		
	0.15	CLAY - Very stiff, mottled orange and grey clay, with some sand, M<Wp							
				E	0.5		pp = 350 PID<1		
	1 1.0	Bore discontinued at 1.0m, limit of investigation		E	1.0		PID<1		1
	2								2

RIG: Bobcat **DRILLER:** Paice **LOGGED:** Falla **CASING:**
TYPE OF BORING: 180mm diameter solid flight auger
WATER OBSERVATIONS: No free groundwater observed
REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: NSW Public Works
PROJECT: Major Capital Works Upgrade, Hunter Sports High
LOCATION: Pacific Highway, Gateshead

SURFACE LEVEL: --
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 210
PROJECT No: 81961.00
DATE: 14/4/2016
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
		FILLING - Orange-brown silty clay filling, with trace sand and bricks and fibro, M<Wp		E	0.01		PID<1		
	0.4	SILTY CLAY - Orange-brown silty clay, with trace fine grained sand and gravel, M<Wp		E	0.5		pp = 450 PID<1		
1	1.0	Bore discontinued at 1.0m, limit of investigation		E	1.0		PID<1		1
2									2

RIG: Bobcat **DRILLER:** Paice **LOGGED:** Falla **CASING:**
TYPE OF BORING: 180mm diameter solid flight auger
WATER OBSERVATIONS: No free groundwater observed
REMARKS: Material sample collected at surface

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: NSW Public Works
PROJECT: Major Capital Works Upgrade, Hunter Sports High
LOCATION: Pacific Highway, Gateshead

SURFACE LEVEL: --
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 211
PROJECT No: 81961.00
DATE: 14/4/2016
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
		FILLING - Dark brown clayey sand filling, with trace gravel, damp		E	0.01		PID<1		
				E	0.5		PID<1		
	0.9	FILLING - Brown clay filling, with some sand and trace clay pipe and bitumen, M<Wp		E	1.0		PID<1		
	1.2	FILLING - Dark brown sandy clay/clayey sand filling, with trace gravel and tiles, wet		E	1.5		PID<1		
				E	2.0		PID<1		
	2.2	CLAY - Yellow brown clay, with trace sand, M~Wp							
	2.5	Bore discontinued at 2.5m, limit of investigation		E	2.5		PID<1		

RIG: Bobcat **DRILLER:** Paice **LOGGED:** Falla **CASING:**
TYPE OF BORING: 180mm diameter solid flight auger
WATER OBSERVATIONS: No free groundwater observed
REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: NSW Public Works
PROJECT: Major Capital Works Upgrade, Hunter Sports High
LOCATION: Pacific Highway, Gateshead

SURFACE LEVEL: --
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 212
PROJECT No: 81961.00
DATE: 14/4/2016
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
		FILLING - Brown silt filling, with some sand and trace rootlets, M<Wp		E	0.01		PID<1		
	0.15	FILLING - Dark brown, fine grained clayey silty sand filling, damp							
				E	0.5		PID<1		
	0.7	CLAYEY SILT - Grey mottled orange clayey silt, M<Wp							
	1			E	1.0		PID<1		1
	1.5	Bore discontinued at 1.5m, limit of investigation		E	1.5		PID<1		
	2								2

RIG: Bobcat **DRILLER:** Paice **LOGGED:** Falla **CASING:**
TYPE OF BORING: 180mm diameter solid flight auger
WATER OBSERVATIONS: No free groundwater observed
REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: NSW Public Works
PROJECT: Major Capital Works Upgrade, Hunter Sports High
LOCATION: Pacific Highway, Gateshead

SURFACE LEVEL: --
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 213
PROJECT No: 81961.00
DATE: 14/4/2016
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
	0.015	TOPSOIL - Brown, silty sand topsoil, humid (filling?)		E	0.01		PID<1		
		SANDY CLAY - Grey and brown sandy clay, with trace gravel, M~Wp (possibly filling)		E	0.3		PID<1		
	0.4	SILTY CLAY - Grey mottled orange silty clay, M~Wp		E	0.5		PID<1		
	1.0	Bore discontinued at 1.0m, limit of investigation		E	1.0		PID<1		

RIG: Bobcat **DRILLER:** Paice **LOGGED:** Falla **CASING:**
TYPE OF BORING: 180mm diameter solid flight auger
WATER OBSERVATIONS: No free groundwater observed
REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: NSW Public Works
PROJECT: Major Capital Works Upgrade, Hunter Sports High
LOCATION: Pacific Highway, Gateshead

SURFACE LEVEL: --
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 214
PROJECT No: 81961.00
DATE: 14/4/2016
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
	0.05	FILLING - Generally comprising brown silty sand filling, with trace rootlets, humid		E	0.01		PID<1		
		FILLING - Dark brown clayey silty sand filling, with trace brick, concrete, damp		E	0.5		PID<1		
	0.7	SILTY CLAY - Soft to firm, grey silty clay, M~Wp		E	1.0		pp = 100 PID<1		
	1.5	Bore discontinued at 1.5m, limit of investigation		E	1.5		PID<1		

RIG: Bobcat **DRILLER:** Paice **LOGGED:** Falla **CASING:**
TYPE OF BORING: 180mm diameter solid flight auger
WATER OBSERVATIONS: No free groundwater observed
REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: NSW Public Works
PROJECT: Major Capital Works Upgrade, Hunter Sports High
LOCATION: Pacific Highway, Gateshead

SURFACE LEVEL: --
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 215
PROJECT No: 81961.00
DATE: 14/4/2016
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
		FILLING - Dark brown silty sand filling with trace gravel, humid		E	0.01		PID<1		
	0.1								
		FILLING - Brown, fine to medium grained sand filling, with trace gravel, humid		E	0.15		PID<1		
	0.2								
		FILLING - Brown, orange and red sandy clay filling, M~Wp							
				E	0.5		PID<1		
	0.9								
		SANDY CLAY - Grey mottled orange sandy clay, M~Wp							
1				E	1.0		PID<1		1
	1.2								
		SILTY CLAY - (Soft), grey silty clay, M>Wp							
	1.5			E	1.5		PID<1		
		Bore discontinued at 1.5m, limit of investigation							
2									2

RIG: Bobcat **DRILLER:** Paice **LOGGED:** Falla **CASING:**
TYPE OF BORING: 180mm diameter solid flight auger
WATER OBSERVATIONS: No free groundwater observed
REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: NSW Public Works
PROJECT: Major Capital Works Upgrade, Hunter Sports High
LOCATION: Pacific Highway, Gateshead

SURFACE LEVEL: --
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 202A
PROJECT No: 81961.00
DATE: 14/4/2016
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
	0.075	ASPHALTIC CONCRETE							
		FILLING - Grey-black gravelly sand filling, damp		E	0.1		PID<1		
	0.2	FILLING - Brown and orange sandy clay filling, M~Wp							
		At 0.5m, trace brick		E	0.5		PID<1		
	0.8	CLAY - Stiff to very stiff, orange mottled grey clay, with trace sand, M~Wp							
	1			E	1.0		pp = 250 PID<1		1
	1.3	CLAYEY SAND - Yellow, fine grained clayey sand, damp							
	1.5	Bore discontinued at 1.5m, limit of investigation		E	1.5		PID<1		
	2								2

RIG: Bobcat **DRILLER:** Paice **LOGGED:** Falla **CASING:**
TYPE OF BORING: 180mm diameter solid flight auger
WATER OBSERVATIONS: No free groundwater observed
REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

Appendix B

Laboratory Test Reports

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envirolab.com.au

Envirolab Services Pty Ltd - Sydney | ABN 37 112 535 645

CERTIFICATE OF ANALYSIS 145118

Client:

Douglas Partners Newcastle
Box 324 Hunter Region Mail Centre
Newcastle
NSW 2310

Attention: Patrick Heads

Sample log in details:

Your Reference:	**81961, Gateshead**
No. of samples:	19 Soils, 6 Materials
Date samples received / completed instructions received	19/04/2016 / 19/04/2016

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: / Issue Date:	27/04/16 / 26/04/16
Date of Preliminary Report:	Not Issued

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

Results Approved By:

Jacinta Hurst
Laboratory Manager

vTRH(C6-C10)/BTEXN in Soil						
Our Reference:	UNITS	145118-1	145118-2	145118-3	145118-4	145118-5
Your Reference	---------- -	202A	203	204	205	206
Depth	----------	0.5	0.5	0.1	0.01	0.01
Date Sampled		14/04/2016	14/04/2016	14/04/2016	14/04/2016	14/04/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	20/04/2016	20/04/2016	20/04/2016	20/04/2016	20/04/2016
Date analysed	-	21/04/2016	21/04/2016	21/04/2016	21/04/2016	21/04/2016
TRHC$_6$ - C$_9$	mg/kg	<25	<25	<25	<25	<25
TRHC$_6$ - C$_{10}$	mg/kg	<25	<25	<25	<25	<25
vTPHC$_6$ - C$_{10}$ less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
naphthalene	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	105	102	113	107	108

vTRH(C6-C10)/BTEXN in Soil						
Our Reference:	UNITS	145118-6	145118-8	145118-9	145118-10	145118-11
Your Reference	---------- -	207	208	209	210	211
Depth	----------	0.01	0.01	0.01	0.01	1.0
Date Sampled		14/04/2016	14/04/2016	14/04/2016	14/04/2016	14/04/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	20/04/2016	20/04/2016	20/04/2016	20/04/2016	20/04/2016
Date analysed	-	21/04/2016	21/04/2016	21/04/2016	21/04/2016	21/04/2016
TRHC$_6$ - C$_9$	mg/kg	<25	<25	<25	<25	<25
TRHC$_6$ - C$_{10}$	mg/kg	<25	<25	<25	<25	<25
vTPHC$_6$ - C$_{10}$ less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
naphthalene	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	112	106	103	100	100

vTRH(C6-C10)/BTEXN in Soil						
Our Reference:	UNITS	145118-12	145118-13	145118-14	145118-15	145118-24
Your Reference	---------- -	212	213	214	215	BD1
Depth	----------	0.5	0.3	0.5	0.5	-
Date Sampled		14/04/2016	14/04/2016	14/04/2016	14/04/2016	14/04/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	20/04/2016	20/04/2016	20/04/2016	20/04/2016	20/04/2016
Date analysed	-	21/04/2016	21/04/2016	21/04/2016	21/04/2016	21/04/2016
TRHC$_6$ - C$_9$	mg/kg	<25	<25	<25	<25	<25
TRHC$_6$ - C$_{10}$	mg/kg	<25	<25	<25	<25	<25
vTPHC$_6$ - C$_{10}$ less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
naphthalene	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	105	111	105	109	110

vTRH(C6-C10)/BTEXN in Soil		
Our Reference:	UNITS	145118-25
Your Reference	---------- -	BD2
Depth	----------	-
Date Sampled		14/04/2016
Type of sample		Soil
Date extracted	-	20/04/2016
Date analysed	-	21/04/2016
TRHC$_6$ - C$_9$	mg/kg	<25
TRHC$_6$ - C$_{10}$	mg/kg	<25
vTPHC$_6$ - 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
Surrogate aaa-Trifluorotoluene	%	105

svTRH (C10-C40) in Soil						
Our Reference:	UNITS	145118-1	145118-2	145118-3	145118-4	145118-5
Your Reference	----------	202A	203	204	205	206
Depth	- ----------	0.5	0.5	0.1	0.01	0.01
Date Sampled		14/04/2016	14/04/2016	14/04/2016	14/04/2016	14/04/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	20/04/2016	20/04/2016	20/04/2016	20/04/2016	20/04/2016
Date analysed	-	21/04/2016	21/04/2016	21/04/2016	21/04/2016	21/04/2016
TRHC$_{10}$ - C$_{14}$	mg/kg	<50	<50	<50	<50	<50
TRHC$_{15}$ - C$_{28}$	mg/kg	<100	<100	100	<100	<100
TRHC$_{29}$ - C$_{36}$	mg/kg	<100	140	730	210	<100
TRH>C$_{10}$-C$_{16}$	mg/kg	<50	<50	<50	<50	<50
TRH>C$_{10}$ - C$_{16}$ less Naphthalene (F2)	mg/kg	<50	<50	<50	<50	<50
TRH>C$_{16}$-C$_{34}$	mg/kg	<100	110	540	220	<100
TRH>C$_{34}$-C$_{40}$	mg/kg	<100	130	1,000	110	<100
Surrogate o-Terphenyl	%	77	78	87	79	79

svTRH (C10-C40) in Soil						
Our Reference:	UNITS	145118-6	145118-8	145118-9	145118-10	145118-11
Your Reference	----------	207	208	209	210	211
Depth	- ----------	0.01	0.01	0.01	0.01	1.0
Date Sampled		14/04/2016	14/04/2016	14/04/2016	14/04/2016	14/04/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	20/04/2016	20/04/2016	20/04/2016	20/04/2016	20/04/2016
Date analysed	-	21/04/2016	21/04/2016	21/04/2016	21/04/2016	21/04/2016
TRHC$_{10}$ - C$_{14}$	mg/kg	<50	<50	<50	<50	<50
TRHC$_{15}$ - C$_{28}$	mg/kg	<100	<100	<100	<100	<100
TRHC$_{29}$ - C$_{36}$	mg/kg	<100	<100	<100	<100	<100
TRH>C$_{10}$-C$_{16}$	mg/kg	<50	<50	<50	<50	<50
TRH>C$_{10}$ - C$_{16}$ less Naphthalene (F2)	mg/kg	<50	<50	<50	<50	<50
TRH>C$_{16}$-C$_{34}$	mg/kg	<100	<100	<100	<100	<100
TRH>C$_{34}$-C$_{40}$	mg/kg	<100	<100	<100	<100	<100
Surrogate o-Terphenyl	%	78	77	77	78	76

svTRH (C10-C40) in Soil						
Our Reference:	UNITS	145118-12	145118-13	145118-14	145118-15	145118-24
Your Reference	---------- -	212	213	214	215	BD1
Depth	----------	0.5	0.3	0.5	0.5	-
Date Sampled		14/04/2016	14/04/2016	14/04/2016	14/04/2016	14/04/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	20/04/2016	20/04/2016	20/04/2016	20/04/2016	20/04/2016
Date analysed	-	21/04/2016	21/04/2016	21/04/2016	21/04/2016	21/04/2016
TRHC$_{10}$ - C$_{14}$	mg/kg	<50	<50	<50	<50	<50
TRHC$_{15}$ - C$_{28}$	mg/kg	<100	<100	<100	<100	190
TRHC$_{29}$ - C$_{36}$	mg/kg	<100	<100	<100	<100	680
TRH>C$_{10}$-C$_{16}$	mg/kg	<50	<50	<50	<50	<50
TRH>C$_{10}$ - C$_{16}$ less Naphthalene (F2)	mg/kg	<50	<50	<50	<50	<50
TRH>C$_{16}$-C$_{34}$	mg/kg	<100	<100	<100	<100	600
TRH>C$_{34}$-C$_{40}$	mg/kg	<100	<100	<100	<100	1,100
Surrogate o-Terphenyl	%	77	76	77	76	91

svTRH (C10-C40) in Soil		
Our Reference:	UNITS	145118-25
Your Reference	---------- -	BD2
Depth	----------	-
Date Sampled		14/04/2016
Type of sample		Soil
Date extracted	-	20/04/2016
Date analysed	-	21/04/2016
TRHC$_{10}$ - C$_{14}$	mg/kg	<50
TRHC$_{15}$ - C$_{28}$	mg/kg	<100
TRHC$_{29}$ - 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
Surrogate o-Terphenyl	%	78

PAHs in Soil Our Reference: Your Reference Depth Date Sampled Type of sample	UNITS ---------- - ---------- 	145118-1 202A 0.5 14/04/2016 Soil	145118-2 203 0.5 14/04/2016 Soil	145118-3 204 0.1 14/04/2016 Soil	145118-4 205 0.01 14/04/2016 Soil	145118-5 206 0.01 14/04/2016 Soil
Date extracted	-	20/04/2016	20/04/2016	20/04/2016	20/04/2016	20/04/2016
Date analysed	-	21/04/2016	21/04/2016	21/04/2016	21/04/2016	21/04/2016
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	0.1	0.3	0.7	<0.1	<0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	0.4	1.1	0.9	<0.1	<0.1
Pyrene	mg/kg	0.5	1.2	0.7	<0.1	<0.1
Benzo(a)anthracene	mg/kg	0.2	0.6	0.2	<0.1	<0.1
Chrysene	mg/kg	0.2	0.5	0.3	<0.1	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	0.5	1	0.4	<0.2	<0.2
Benzo(a)pyrene	mg/kg	0.3	0.81	0.1	<0.05	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	0.4	0.8	0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	0.3	0.7	0.1	<0.1	<0.1
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	1.2	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	1.2	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	0.5	1.2	<0.5	<0.5	<0.5
Total Positive PAHs	mg/kg	2.9	7.7	3.6	NIL (+)VE	NIL (+)VE
Surrogate p-Terphenyl-d14	%	98	92	95	90	93

PAHs in Soil Our Reference: Your Reference	UNITS ----------	145118-6 207	145118-8 208	145118-9 209	145118-10 210	145118-11 211
Depth	----------	0.01	0.01	0.01	0.01	1.0
Date Sampled		14/04/2016	14/04/2016	14/04/2016	14/04/2016	14/04/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	20/04/2016	20/04/2016	20/04/2016	20/04/2016	20/04/2016
Date analysed	-	21/04/2016	21/04/2016	21/04/2016	21/04/2016	21/04/2016
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chrysene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Benzo(a)pyrene	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Total Positive PAHs	mg/kg	NIL (+)VE	NIL (+)VE	NIL (+)VE	NIL (+)VE	NIL (+)VE
Surrogate p-Terphenyl-d14	%	95	97	91	93	91

PAHs in Soil Our Reference: Your Reference	UNITS ----------	145118-12 212	145118-13 213	145118-14 214	145118-15 215	145118-24 BD1
Depth	-	0.5	0.3	0.5	0.5	-
Date Sampled	----------	14/04/2016	14/04/2016	14/04/2016	14/04/2016	14/04/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	20/04/2016	20/04/2016	20/04/2016	20/04/2016	20/04/2016
Date analysed	-	21/04/2016	21/04/2016	21/04/2016	21/04/2016	21/04/2016
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	<0.1	<0.1	<0.1	0.5
Anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	<0.1	<0.1	<0.1	<0.1	1.2
Pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	1
Benzo(a)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	0.4
Chrysene	mg/kg	<0.1	<0.1	<0.1	<0.1	0.4
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	<0.2	<0.2	<0.2	0.6
Benzo(a)pyrene	mg/kg	<0.05	<0.05	<0.05	<0.05	0.3
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	0.2
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1	<0.1	<0.1	0.2
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Total Positive PAHs	mg/kg	NIL (+)VE	NIL (+)VE	NIL (+)VE	NIL (+)VE	4.8
Surrogate p-Terphenyl-d14	%	98	96	97	95	94

PAHs in Soil		
Our Reference:	UNITS	145118-25
Your Reference	----------	BD2
	-	
Depth	----------	-
Date Sampled		14/04/2016
Type of sample		Soil
Date extracted	-	20/04/2016
Date analysed	-	21/04/2016
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	<0.1
Pyrene	mg/kg	<0.1
Benzo(a)anthracene	mg/kg	<0.1
Chrysene	mg/kg	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2
Benzo(a)pyrene	mg/kg	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1
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	<0.5
Total Positive PAHs	mg/kg	NIL (+)VE
Surrogate p-Terphenyl-d14	%	87

Organochlorine Pesticides in soil						
Our Reference:	UNITS	145118-1	145118-2	145118-3	145118-4	145118-5
Your Reference	----------	202A	203	204	205	206
Depth	----------	0.5	0.5	0.1	0.01	0.01
Date Sampled		14/04/2016	14/04/2016	14/04/2016	14/04/2016	14/04/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	20/04/2016	20/04/2016	20/04/2016	20/04/2016	20/04/2016
Date analysed	-	21/04/2016	21/04/2016	21/04/2016	21/04/2016	21/04/2016
HCB	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1	<0.1	<0.1	0.5
delta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	2.5
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	0.3
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	1
Endrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	102	119	98	95	93

Organochlorine Pesticides in soil						
Our Reference:	UNITS	145118-6	145118-8	145118-9	145118-10	145118-11
Your Reference	----------	207	208	209	210	211
Depth	- ----------	0.01	0.01	0.01	0.01	1.0
Date Sampled		14/04/2016	14/04/2016	14/04/2016	14/04/2016	14/04/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	20/04/2016	20/04/2016	20/04/2016	20/04/2016	20/04/2016
Date analysed	-	21/04/2016	21/04/2016	21/04/2016	21/04/2016	21/04/2016
HCB	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	94	95	94	93	94

Organochlorine Pesticides in soil						
Our Reference:	UNITS	145118-12	145118-13	145118-14	145118-15	145118-24
Your Reference	----------	212	213	214	215	BD1
Depth	----------	0.5	0.3	0.5	0.5	-
Date Sampled		14/04/2016	14/04/2016	14/04/2016	14/04/2016	14/04/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	20/04/2016	20/04/2016	20/04/2016	20/04/2016	20/04/2016
Date analysed	-	21/04/2016	21/04/2016	21/04/2016	21/04/2016	21/04/2016
HCB	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	91	94	90	96	94

Organochlorine Pesticides in soil		
Our Reference:	UNITS	145118-25
Your Reference	----------	BD2
	-	
Depth	----------	-
Date Sampled		14/04/2016
Type of sample		Soil
Date extracted	-	20/04/2016
Date analysed	-	21/04/2016
HCB	mg/kg	<0.1
alpha-BHC	mg/kg	<0.1
gamma-BHC	mg/kg	<0.1
beta-BHC	mg/kg	<0.1
Heptachlor	mg/kg	0.4
delta-BHC	mg/kg	<0.1
Aldrin	mg/kg	2.0
Heptachlor Epoxide	mg/kg	<0.1
gamma-Chlordane	mg/kg	0.3
alpha-chlordane	mg/kg	<0.1
Endosulfan I	mg/kg	<0.1
pp-DDE	mg/kg	<0.1
Dieldrin	mg/kg	1.3
Endrin	mg/kg	<0.1
pp-DDD	mg/kg	<0.1
Endosulfan II	mg/kg	<0.1
pp-DDT	mg/kg	<0.1
Endrin Aldehyde	mg/kg	<0.1
Endosulfan Sulphate	mg/kg	<0.1
Methoxychlor	mg/kg	<0.1
Surrogate TCMX	%	94

Organophosphorus Pesticides						
Our Reference:	UNITS	145118-1	145118-2	145118-3	145118-4	145118-5
Your Reference	----------	202A	203	204	205	206
Depth	----------	0.5	0.5	0.1	0.01	0.01
Date Sampled		14/04/2016	14/04/2016	14/04/2016	14/04/2016	14/04/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	20/04/2016	20/04/2016	20/04/2016	20/04/2016	20/04/2016
Date analysed	-	21/04/2016	21/04/2016	21/04/2016	21/04/2016	21/04/2016
Azinphos-methyl (Guthion)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Bromophos-ethyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos-methyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Diazinon	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dichlorvos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dimethoate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ethion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fenitrothion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Malathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Parathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ronnel	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	102	119	98	95	93

Organophosphorus Pesticides						
Our Reference:	UNITS	145118-6	145118-8	145118-9	145118-10	145118-11
Your Reference	----------	207	208	209	210	211
Depth	----------	0.01	0.01	0.01	0.01	1.0
Date Sampled		14/04/2016	14/04/2016	14/04/2016	14/04/2016	14/04/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	20/04/2016	20/04/2016	20/04/2016	20/04/2016	20/04/2016
Date analysed	-	21/04/2016	21/04/2016	21/04/2016	21/04/2016	21/04/2016
Azinphos-methyl (Guthion)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Bromophos-ethyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos-methyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Diazinon	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dichlorvos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dimethoate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ethion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fenitrothion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Malathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Parathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ronnel	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	94	95	94	93	94

Organophosphorus Pesticides Our Reference: Your Reference Depth Date Sampled Type of sample	UNITS ---------- - ---------- 	145118-12 212 0.5 14/04/2016 Soil	145118-13 213 0.3 14/04/2016 Soil	145118-14 214 0.5 14/04/2016 Soil	145118-15 215 0.5 14/04/2016 Soil	145118-24 BD1 - 14/04/2016 Soil
Date extracted	-	20/04/2016	20/04/2016	20/04/2016	20/04/2016	20/04/2016
Date analysed	-	21/04/2016	21/04/2016	21/04/2016	21/04/2016	21/04/2016
Azinphos-methyl (Guthion)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Bromophos-ethyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos-methyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Diazinon	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dichlorvos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dimethoate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ethion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fenitrothion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Malathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Parathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ronnel	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	91	94	90	96	94

Organophosphorus Pesticides Our Reference: Your Reference Depth Date Sampled Type of sample	UNITS ---------- - ---------- 	145118-25 BD2 - 14/04/2016 Soil
Date extracted	-	20/04/2016
Date analysed	-	21/04/2016
Azinphos-methyl (Guthion)	mg/kg	<0.1
Bromophos-ethyl	mg/kg	<0.1
Chlorpyriphos	mg/kg	<0.1
Chlorpyriphos-methyl	mg/kg	<0.1
Diazinon	mg/kg	<0.1
Dichlorvos	mg/kg	<0.1
Dimethoate	mg/kg	<0.1
Ethion	mg/kg	<0.1
Fenitrothion	mg/kg	<0.1
Malathion	mg/kg	<0.1
Parathion	mg/kg	<0.1
Ronnel	mg/kg	<0.1
Surrogate TCMX	%	94

PCBs in Soil						
Our Reference:	UNITS	145118-1	145118-2	145118-3	145118-4	145118-5
Your Reference	----------	202A	203	204	205	206
	-					
Depth	----------	0.5	0.5	0.1	0.01	0.01
Date Sampled		14/04/2016	14/04/2016	14/04/2016	14/04/2016	14/04/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	20/04/2016	20/04/2016	20/04/2016	20/04/2016	20/04/2016
Date analysed	-	21/04/2016	21/04/2016	21/04/2016	21/04/2016	21/04/2016
Aroclor 1016	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1221	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1232	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1242	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1248	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1254	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1260	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCLMX	%	102	119	98	95	93

PCBs in Soil						
Our Reference:	UNITS	145118-6	145118-8	145118-9	145118-10	145118-11
Your Reference	----------	207	208	209	210	211
	-					
Depth	----------	0.01	0.01	0.01	0.01	1.0
Date Sampled		14/04/2016	14/04/2016	14/04/2016	14/04/2016	14/04/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	20/04/2016	20/04/2016	20/04/2016	20/04/2016	20/04/2016
Date analysed	-	21/04/2016	21/04/2016	21/04/2016	21/04/2016	21/04/2016
Aroclor 1016	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1221	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1232	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1242	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1248	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1254	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1260	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCLMX	%	94	95	94	93	94

PCBs in Soil						
Our Reference:	UNITS	145118-12	145118-13	145118-14	145118-15	145118-24
Your Reference	----------	212	213	214	215	BD1
	-					
Depth	----------	0.5	0.3	0.5	0.5	-
Date Sampled		14/04/2016	14/04/2016	14/04/2016	14/04/2016	14/04/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	20/04/2016	20/04/2016	20/04/2016	20/04/2016	20/04/2016
Date analysed	-	21/04/2016	21/04/2016	21/04/2016	21/04/2016	21/04/2016
Aroclor 1016	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1221	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1232	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1242	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1248	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1254	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1260	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCLMX	%	91	94	90	96	94

PCBs in Soil		
Our Reference:	UNITS	145118-25
Your Reference	----------	BD2
	-	
Depth	----------	-
Date Sampled		14/04/2016
Type of sample		Soil
Date extracted	-	20/04/2016
Date analysed	-	21/04/2016
Aroclor 1016	mg/kg	<0.1
Aroclor 1221	mg/kg	<0.1
Aroclor 1232	mg/kg	<0.1
Aroclor 1242	mg/kg	<0.1
Aroclor 1248	mg/kg	<0.1
Aroclor 1254	mg/kg	<0.1
Aroclor 1260	mg/kg	<0.1
Surrogate TCLMX	%	94

Acid Extractable metals in soil						
Our Reference:	UNITS	145118-1	145118-2	145118-3	145118-4	145118-5
Your Reference	----------	202A	203	204	205	206
Depth	- ----------	0.5	0.5	0.1	0.01	0.01
Date Sampled		14/04/2016	14/04/2016	14/04/2016	14/04/2016	14/04/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	20/04/2016	20/04/2016	20/04/2016	20/04/2016	20/04/2016
Date analysed	-	20/04/2016	20/04/2016	20/04/2016	20/04/2016	20/04/2016
Arsenic	mg/kg	10	6	<4	11	11
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	7	27	29	11	17
Copper	mg/kg	4	3	3	21	15
Lead	mg/kg	12	12	4	53	18
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	1	1	1	2	6
Zinc	mg/kg	12	9	14	240	44
Manganese	mg/kg	110	1,700	2,500	590	170
Iron	mg/kg	41,000	12,000	3,800	5,700	34,000

Acid Extractable metals in soil						
Our Reference:	UNITS	145118-6	145118-8	145118-9	145118-10	145118-11
Your Reference	----------	207	208	209	210	211
Depth	- ----------	0.01	0.01	0.01	0.01	1.0
Date Sampled		14/04/2016	14/04/2016	14/04/2016	14/04/2016	14/04/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	20/04/2016	20/04/2016	20/04/2016	20/04/2016	20/04/2016
Date analysed	-	20/04/2016	20/04/2016	20/04/2016	20/04/2016	20/04/2016
Arsenic	mg/kg	<4	11	14	9	6
Cadmium	mg/kg	<0.4	0.5	<0.4	0.5	<0.4
Chromium	mg/kg	3	11	16	14	8
Copper	mg/kg	2	4	1	13	13
Lead	mg/kg	29	21	15	32	25
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	<1	1	1	2	3
Zinc	mg/kg	23	210	10	77	130
Manganese	mg/kg	43	24	11	52	300
Iron	mg/kg	2,700	46,000	61,000	64,000	8,400

Acid Extractable metals in soil						
Our Reference:	UNITS	145118-12	145118-13	145118-14	145118-15	145118-24
Your Reference	---------- -	212	213	214	215	BD1
Depth	----------	0.5	0.3	0.5	0.5	-
Date Sampled		14/04/2016	14/04/2016	14/04/2016	14/04/2016	14/04/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	20/04/2016	20/04/2016	20/04/2016	20/04/2016	20/04/2016
Date analysed	-	20/04/2016	20/04/2016	20/04/2016	20/04/2016	20/04/2016
Arsenic	mg/kg	7	9	37	7	<4
Cadmium	mg/kg	<0.4	<0.4	0.4	<0.4	<0.4
Chromium	mg/kg	6	5	16	13	23
Copper	mg/kg	12	4	370	1	8
Lead	mg/kg	39	19	1,300	12	5
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	3	2	4	<1	2
Zinc	mg/kg	98	19	8,900	19	24
Manganese	mg/kg	61	52	2,900	16	1,400
Iron	mg/kg	14,000	9,300	34,000	17,000	6,700

Acid Extractable metals in soil			
Our Reference:	UNITS	145118-25	145118-26
Your Reference	---------- -	BD2	202A - TRIPLICATE
Depth	----------	-	0.5
Date Sampled		14/04/2016	14/04/2016
Type of sample		Soil	Soil
Date prepared	-	20/04/2016	20/04/2016
Date analysed	-	20/04/2016	20/04/2016
Arsenic	mg/kg	14	6
Cadmium	mg/kg	<0.4	<0.4
Chromium	mg/kg	14	11
Copper	mg/kg	16	5
Lead	mg/kg	13	13
Mercury	mg/kg	<0.1	<0.1
Nickel	mg/kg	15	2
Zinc	mg/kg	48	26
Manganese	mg/kg	410	470
Iron	mg/kg	17,000	18,000

Moisture						
Our Reference:	UNITS	145118-1	145118-2	145118-3	145118-4	145118-5
Your Reference	---------- -	202A	203	204	205	206
Depth	----------	0.5	0.5	0.1	0.01	0.01
Date Sampled		14/04/2016	14/04/2016	14/04/2016	14/04/2016	14/04/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	20/04/2016	20/04/2016	20/04/2016	20/04/2016	20/04/2016
Date analysed	-	21/04/2016	21/04/2016	21/04/2016	21/04/2016	21/04/2016
Moisture	%	13	15	2.7	13	6.0

Moisture						
Our Reference:	UNITS	145118-6	145118-8	145118-9	145118-10	145118-11
Your Reference	---------- -	207	208	209	210	211
Depth	----------	0.01	0.01	0.01	0.01	1.0
Date Sampled		14/04/2016	14/04/2016	14/04/2016	14/04/2016	14/04/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	20/04/2016	20/04/2016	20/04/2016	20/04/2016	20/04/2016
Date analysed	-	21/04/2016	21/04/2016	21/04/2016	21/04/2016	21/04/2016
Moisture	%	4.0	17	20	14	30

Moisture						
Our Reference:	UNITS	145118-12	145118-13	145118-14	145118-15	145118-24
Your Reference	---------- -	212	213	214	215	BD1
Depth	----------	0.5	0.3	0.5	0.5	-
Date Sampled		14/04/2016	14/04/2016	14/04/2016	14/04/2016	14/04/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	20/04/2016	20/04/2016	20/04/2016	20/04/2016	20/04/2016
Date analysed	-	21/04/2016	21/04/2016	21/04/2016	21/04/2016	21/04/2016
Moisture	%	14	23	13	17	2.3

Moisture		
Our Reference:	UNITS	145118-25
Your Reference	---------- -	BD2
Depth	----------	-
Date Sampled		14/04/2016
Type of sample		Soil
Date prepared	-	20/04/2016
Date analysed	-	21/04/2016
Moisture	%	5.0

Asbestos ID - soils						
Our Reference:	UNITS	145118-5	145118-6	145118-11	145118-12	145118-13
Your Reference	---------- -	206	207	211	212	213
Depth	----------	0.01	0.01	1.0	0.5	0.3
Date Sampled		14/04/2016	14/04/2016	14/04/2016	14/04/2016	14/04/2016
Type of sample		Soil	Soil	Soil	Soil	Soil
Date analysed	-	22/04/2016	22/04/2016	22/04/2016	22/04/2016	22/04/2016
Sample mass tested	g	Approx 25	Approx 35	Approx 25	Approx 25	Approx 30
Sample Description	-	Brown fine-grained soil & rocks	Brown fine-grained soil & rocks	Brown fine-grained soil & rocks	Brown fine-grained soil & rocks	Brown fine-grained soil & rocks
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg Organic Fibre Detected	No asbestos detected at reporting limit of 0.1g/kg Organic Fibre Detected	No asbestos detected at reporting limit of 0.1g/kg Organic Fibre Detected	No asbestos detected at reporting limit of 0.1g/kg Organic Fibre Detected	No asbestos detected at reporting limit of 0.1g/kg Organic Fibre Detected
Trace Analysis	-	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected

Asbestos ID - soils					
Our Reference:	UNITS	145118-14	145118-17	145118-19	145118-21
Your Reference	---------- -	214	A1-soil	A2-soil	A3-soil
Depth	----------	0.5	-	-	-
Date Sampled		14/04/2016	14/04/2016	14/04/2016	14/04/2016
Type of sample		Soil	Soil	Soil	Soil
Date analysed	-	22/04/2016	22/04/2016	22/04/2016	22/04/2016
Sample mass tested	g	Approx 40	Approx 45	Approx 65	Approx 35
Sample Description	-	Brown fine-grained soil & rocks	Brown fine-grained soil & rocks	Brown fine-grained soil & rocks	Brown fine-grained soil & rocks
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg Organic Fibre Detected	No asbestos detected at reporting limit of 0.1g/kg Organic Fibre Detected	No asbestos detected at reporting limit of 0.1g/kg Organic Fibre Detected	No asbestos detected at reporting limit of 0.1g/kg Organic Fibre Detected
Trace Analysis	-	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected

Asbestos ID - materials						
Our Reference:	UNITS	145118-7	145118-16	145118-18	145118-20	145118-22
Your Reference	---------- -	207	A1-fibro	A2-fibro	A3-fibro	A4-fibro
Depth	----------	0.1	-	-	-	-
Date Sampled		14/04/2016	14/04/2016	14/04/2016	14/04/2016	14/04/2016
Type of sample		Material	Material	Material	Material	Material
Date analysed	-	26/04/2016	26/04/2016	26/04/2016	26/04/2016	26/04/2016
Mass / Dimension of Sample	-	110x70x10mm	60x40x4mm	40x28x4mm	65x25x4mm	50x27x9mm
Sample Description	-	Grey compressed fibre cement material	Grey compressed fibre cement material	Beige compressed fibre cement material	Beige compressed fibre cement material	Beige compressed fibre cement material
Asbestos ID in materials	-	Chrysotile asbestos detected	Chrysotile asbestos detected Amosite asbestos detected	Chrysotile asbestos detected	Chrysotile asbestos detected	Chrysotile asbestos detected

Asbestos ID - materials		
Our Reference:	UNITS	145118-23
Your Reference	---------- -	A5-fibro
Depth	----------	-
Date Sampled		14/04/2016
Type of sample		Material
Date analysed	-	26/04/2016
Mass / Dimension of Sample	-	110x90x6mm
Sample Description	-	Grey compressed fibre cement material
Asbestos ID in materials	-	Chrysotile asbestos detected Amosite asbestos detected Crocidolite asbestos detected

Method ID	Methodology Summary
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-014	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS.
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-012	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013. For soil results:- 1. 'TEQ 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. 'TEQ 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. 'TEQ 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-005	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC with dual ECD's.
Org-008	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC with dual ECD's.
Org-006	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD.
Metals-020 ICP-AES	Determination of various metals by ICP-AES.
Metals-021 CV-AAS	Determination of Mercury by Cold Vapour AAS.
Inorg-008	Moisture content determined by heating at 105+/-5 deg C for a minimum of 12 hours.
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.

QUALITY CONTROL vTRH(C6-C10)/BTEXN in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base || Duplicate || %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			20/04/2016	145118-1	20/04/2016 || 20/04/2016	LCS-4	20/04/2016
Date analysed	-			21/04/2016	145118-1	21/04/2016 || 21/04/2016	LCS-4	21/04/2016
TRHC$_{6}$ - C$_{9}$	mg/kg	25	Org-016	<25	145118-1	<25 || <25	LCS-4	111%
TRHC$_{6}$ - C$_{10}$	mg/kg	25	Org-016	<25	145118-1	<25 || <25	LCS-4	111%
Benzene	mg/kg	0.2	Org-016	<0.2	145118-1	<0.2 || <0.2	LCS-4	104%
Toluene	mg/kg	0.5	Org-016	<0.5	145118-1	<0.5 || <0.5	LCS-4	107%
Ethylbenzene	mg/kg	1	Org-016	<1	145118-1	<1 || <1	LCS-4	115%
m+p-xylene	mg/kg	2	Org-016	<2	145118-1	<2 || <2	LCS-4	114%
o-Xylene	mg/kg	1	Org-016	<1	145118-1	<1 || <1	LCS-4	114%
naphthalene	mg/kg	1	Org-014	<1	145118-1	<1 || <1	[NR]	[NR]
Surrogate aaa-Trifluorotoluene	%		Org-016	108	145118-1	105 || 101 || RPD: 4	LCS-4	106%

QUALITY CONTROL svTRH (C10-C40) in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base || Duplicate || %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			20/04/2016	145118-1	20/04/2016 || 20/04/2016	LCS-4	20/04/2016
Date analysed	-			21/04/2016	145118-1	21/04/2016 || 21/04/2016	LCS-4	21/04/2016
TRHC$_{10}$ - C$_{14}$	mg/kg	50	Org-003	<50	145118-1	<50 || <50	LCS-4	115%
TRHC$_{15}$ - C$_{28}$	mg/kg	100	Org-003	<100	145118-1	<100 || <100	LCS-4	125%
TRHC$_{29}$ - C$_{36}$	mg/kg	100	Org-003	<100	145118-1	<100 || <100	LCS-4	111%
TRH>C$_{10}$-C$_{16}$	mg/kg	50	Org-003	<50	145118-1	<50 || <50	LCS-4	115%
TRH>C$_{16}$-C$_{34}$	mg/kg	100	Org-003	<100	145118-1	<100 || <100	LCS-4	125%
TRH>C$_{34}$-C$_{40}$	mg/kg	100	Org-003	<100	145118-1	<100 || <100	LCS-4	111%
Surrogate o-Terphenyl	%		Org-003	78	145118-1	77 || 77 || RPD: 0	LCS-4	93%

QUALITY CONTROL PAHs in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base || Duplicate || %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			20/04/2016	145118-1	20/04/2016 || 20/04/2016	LCS-4	20/04/2016
Date analysed	-			21/04/2016	145118-1	21/04/2016 || 21/04/2016	LCS-4	21/04/2016
Naphthalene	mg/kg	0.1	Org-012	<0.1	145118-1	<0.1 || <0.1	LCS-4	90%
Acenaphthylene	mg/kg	0.1	Org-012	<0.1	145118-1	<0.1 || <0.1	[NR]	[NR]
Acenaphthene	mg/kg	0.1	Org-012	<0.1	145118-1	<0.1 || <0.1	[NR]	[NR]
Fluorene	mg/kg	0.1	Org-012	<0.1	145118-1	<0.1 || <0.1	LCS-4	97%
Phenanthrene	mg/kg	0.1	Org-012	<0.1	145118-1	0.1 || <0.1	LCS-4	93%
Anthracene	mg/kg	0.1	Org-012	<0.1	145118-1	<0.1 || <0.1	[NR]	[NR]
Fluoranthene	mg/kg	0.1	Org-012	<0.1	145118-1	0.4 || 0.2 || RPD: 67	LCS-4	89%
Pyrene	mg/kg	0.1	Org-012	<0.1	145118-1	0.5 || 0.3 || RPD: 50	LCS-4	95%
Benzo(a)anthracene	mg/kg	0.1	Org-012	<0.1	145118-1	0.2 || 0.1 || RPD: 67	[NR]	[NR]
Chrysene	mg/kg	0.1	Org-012	<0.1	145118-1	0.2 || 0.1 || RPD: 67	LCS-4	82%
Benzo(b,j +k)fluoranthene	mg/kg	0.2	Org-012	<0.2	145118-1	0.5 || 0.3 || RPD: 50	[NR]	[NR]

QUALITY CONTROL PAHs in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Benzo(a)pyrene	mg/kg	0.05	Org-012	<0.05	145118-1	0.3 || 0.2 || RPD: 40	LCS-4	93%
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-012	<0.1	145118-1	0.4 || 0.2 || RPD: 67	[NR]	[NR]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-012	<0.1	145118-1	<0.1 || <0.1	[NR]	[NR]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-012	<0.1	145118-1	0.3 || 0.2 || RPD: 40	[NR]	[NR]
Surrogate p-Terphenyl-d14	%		Org-012	101	145118-1	98 || 96 || RPD: 2	LCS-4	95%

QUALITY CONTROL Organochlorine Pesticides in soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			20/04/2016	145118-1	20/04/2016 || 20/04/2016	LCS-4	20/04/2016
Date analysed	-			21/04/2016	145118-1	21/04/2016 || 21/04/2016	LCS-4	21/04/2016
HCB	mg/kg	0.1	Org-005	<0.1	145118-1	<0.1 || <0.1	[NR]	[NR]
alpha-BHC	mg/kg	0.1	Org-005	<0.1	145118-1	<0.1 || <0.1	LCS-4	93%
gamma-BHC	mg/kg	0.1	Org-005	<0.1	145118-1	<0.1 || <0.1	[NR]	[NR]
beta-BHC	mg/kg	0.1	Org-005	<0.1	145118-1	<0.1 || <0.1	LCS-4	90%
Heptachlor	mg/kg	0.1	Org-005	<0.1	145118-1	<0.1 || <0.1	LCS-4	92%
delta-BHC	mg/kg	0.1	Org-005	<0.1	145118-1	<0.1 || <0.1	[NR]	[NR]
Aldrin	mg/kg	0.1	Org-005	<0.1	145118-1	<0.1 || <0.1	LCS-4	90%
Heptachlor Epoxide	mg/kg	0.1	Org-005	<0.1	145118-1	<0.1 || <0.1	LCS-4	89%
gamma-Chlordane	mg/kg	0.1	Org-005	<0.1	145118-1	<0.1 || <0.1	[NR]	[NR]
alpha-chlordane	mg/kg	0.1	Org-005	<0.1	145118-1	<0.1 || <0.1	[NR]	[NR]
Endosulfan I	mg/kg	0.1	Org-005	<0.1	145118-1	<0.1 || <0.1	[NR]	[NR]
pp-DDE	mg/kg	0.1	Org-005	<0.1	145118-1	<0.1 || <0.1	LCS-4	95%
Dieldrin	mg/kg	0.1	Org-005	<0.1	145118-1	<0.1 || <0.1	LCS-4	92%
Endrin	mg/kg	0.1	Org-005	<0.1	145118-1	<0.1 || <0.1	LCS-4	98%
pp-DDD	mg/kg	0.1	Org-005	<0.1	145118-1	<0.1 || <0.1	LCS-4	88%
Endosulfan II	mg/kg	0.1	Org-005	<0.1	145118-1	<0.1 || <0.1	[NR]	[NR]
pp-DDT	mg/kg	0.1	Org-005	<0.1	145118-1	<0.1 || <0.1	[NR]	[NR]
Endrin Aldehyde	mg/kg	0.1	Org-005	<0.1	145118-1	<0.1 || <0.1	[NR]	[NR]
Endosulfan Sulphate	mg/kg	0.1	Org-005	<0.1	145118-1	<0.1 || <0.1	LCS-4	84%
Methoxychlor	mg/kg	0.1	Org-005	<0.1	145118-1	<0.1 || <0.1	[NR]	[NR]
Surrogate TCMX	%		Org-005	98	145118-1	102 || 100 || RPD: 2	LCS-4	110%

QUALITY CONTROL Organophosphorus Pesticides	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			20/04/2016	145118-1	20/04/2016 || 20/04/2016	LCS-4	20/04/2016
Date analysed	-			21/04/2016	145118-1	21/04/2016 || 21/04/2016	LCS-4	21/04/2016
Azinphos-methyl (Guthion)	mg/kg	0.1	Org-008	<0.1	145118-1	<0.1 || <0.1	[NR]	[NR]
Bromophos-ethyl	mg/kg	0.1	Org-008	<0.1	145118-1	<0.1 || <0.1	[NR]	[NR]
Chlorpyriphos	mg/kg	0.1	Org-008	<0.1	145118-1	<0.1 || <0.1	LCS-4	92%
Chlorpyriphos-methyl	mg/kg	0.1	Org-008	<0.1	145118-1	<0.1 || <0.1	[NR]	[NR]
Diazinon	mg/kg	0.1	Org-008	<0.1	145118-1	<0.1 || <0.1	[NR]	[NR]
Dichlorvos	mg/kg	0.1	Org-008	<0.1	145118-1	<0.1 || <0.1	LCS-4	81%
Dimethoate	mg/kg	0.1	Org-008	<0.1	145118-1	<0.1 || <0.1	[NR]	[NR]
Ethion	mg/kg	0.1	Org-008	<0.1	145118-1	<0.1 || <0.1	LCS-4	95%
Fenitrothion	mg/kg	0.1	Org-008	<0.1	145118-1	<0.1 || <0.1	LCS-4	87%
Malathion	mg/kg	0.1	Org-008	<0.1	145118-1	<0.1 || <0.1	LCS-4	86%
Parathion	mg/kg	0.1	Org-008	<0.1	145118-1	<0.1 || <0.1	LCS-4	85%
Ronnel	mg/kg	0.1	Org-008	<0.1	145118-1	<0.1 || <0.1	LCS-4	98%
Surrogate TCMX	%		Org-008	98	145118-1	102 || 100 || RPD: 2	LCS-4	93%

QUALITY CONTROL PCBs in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			20/04/2016	145118-1	20/04/2016 || 20/04/2016	LCS-4	20/04/2016
Date analysed	-			21/04/2016	145118-1	21/04/2016 || 21/04/2016	LCS-4	21/04/2016
Aroclor 1016	mg/kg	0.1	Org-006	<0.1	145118-1	<0.1 || <0.1	[NR]	[NR]
Aroclor 1221	mg/kg	0.1	Org-006	<0.1	145118-1	<0.1 || <0.1	[NR]	[NR]
Aroclor 1232	mg/kg	0.1	Org-006	<0.1	145118-1	<0.1 || <0.1	[NR]	[NR]
Aroclor 1242	mg/kg	0.1	Org-006	<0.1	145118-1	<0.1 || <0.1	[NR]	[NR]
Aroclor 1248	mg/kg	0.1	Org-006	<0.1	145118-1	<0.1 || <0.1	[NR]	[NR]
Aroclor 1254	mg/kg	0.1	Org-006	<0.1	145118-1	<0.1 || <0.1	LCS-4	107%
Aroclor 1260	mg/kg	0.1	Org-006	<0.1	145118-1	<0.1 || <0.1	[NR]	[NR]
Surrogate TCLMX	%		Org-006	98	145118-1	102 || 100 || RPD: 2	LCS-4	104%

QUALITY CONTROL Acid Extractable metals in soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			20/04/2016	145118-1	20/04/2016 || 20/04/2016	LCS-4	20/04/2016
Date analysed	-			20/04/2016	145118-1	20/04/2016 || 20/04/2016	LCS-4	20/04/2016
Arsenic	mg/kg	4	Metals-020 ICP-AES	<4	145118-1	10 || 7 || RPD: 35	LCS-4	110%
Cadmium	mg/kg	0.4	Metals-020 ICP-AES	<0.4	145118-1	<0.4 || <0.4	LCS-4	102%
Chromium	mg/kg	1	Metals-020 ICP-AES	<1	145118-1	7 || 7 || RPD: 0	LCS-4	110%
Copper	mg/kg	1	Metals-020 ICP-AES	<1	145118-1	4 || 3 || RPD: 29	LCS-4	113%
Lead	mg/kg	1	Metals-020 ICP-AES	<1	145118-1	12 || 12 || RPD: 0	LCS-4	105%
Mercury	mg/kg	0.1	Metals-021 CV-AAS	<0.1	145118-1	<0.1 || <0.1	LCS-4	77%
Nickel	mg/kg	1	Metals-020 ICP-AES	<1	145118-1	1 || 1 || RPD: 0	LCS-4	104%
Zinc	mg/kg	1	Metals-020 ICP-AES	<1	145118-1	12 || 14 || RPD: 15	LCS-4	105%
Manganese	mg/kg	1	Metals-020 ICP-AES	<1	145118-1	110 || 100 || RPD: 10	LCS-4	124%
Iron	mg/kg	1	Metals-020 ICP-AES	<1	145118-1	41000 || 18000 || RPD: 78	LCS-4	106%

QUALITY CONTROL vTRH(C6-C10)/BTEXN in Soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	145118-12	20/04/2016 || 20/04/2016	145118-2	20/04/2016
Date analysed	-	145118-12	21/04/2016 || 21/04/2016	145118-2	21/04/2016
TRHC$_6$ - C$_9$	mg/kg	145118-12	<25 || <25	145118-2	115%
TRHC$_6$ - C$_{10}$	mg/kg	145118-12	<25 || <25	145118-2	115%
Benzene	mg/kg	145118-12	<0.2 || <0.2	145118-2	109%
Toluene	mg/kg	145118-12	<0.5 || <0.5	145118-2	114%
Ethylbenzene	mg/kg	145118-12	<1 || <1	145118-2	117%
m+p-xylene	mg/kg	145118-12	<2 || <2	145118-2	117%
o-Xylene	mg/kg	145118-12	<1 || <1	145118-2	117%
naphthalene	mg/kg	145118-12	<1 || <1	[NR]	[NR]
Surrogate aaa-Trifluorotoluene	%	145118-12	105 || 98 || RPD: 7	145118-2	107%

QUALITY CONTROL svTRH (C10-C40) in Soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	145118-12	20/04/2016 || 20/04/2016	145118-2	20/04/2016
Date analysed	-	145118-12	21/04/2016 || 21/04/2016	145118-2	21/04/2016
TRHC$_{10}$ - C$_{14}$	mg/kg	145118-12	<50 || <50	145118-2	101%
TRHC$_{15}$ - C$_{28}$	mg/kg	145118-12	<100 || <100	145118-2	90%
TRHC$_{29}$ - C$_{36}$	mg/kg	145118-12	<100 || <100	145118-2	118%
TRH>C$_{10}$-C$_{16}$	mg/kg	145118-12	<50 || <50	145118-2	101%
TRH>C$_{16}$-C$_{34}$	mg/kg	145118-12	<100 || <100	145118-2	90%
TRH>C$_{34}$-C$_{40}$	mg/kg	145118-12	<100 || <100	145118-2	118%
Surrogate o-Terphenyl	%	145118-12	77 || 78 || RPD: 1	145118-2	78%
QUALITY CONTROL PAHs in Soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	145118-12	20/04/2016 || 20/04/2016	145118-2	20/04/2016
Date analysed	-	145118-12	21/04/2016 || 21/04/2016	145118-2	21/04/2016
Naphthalene	mg/kg	145118-12	<0.1 || <0.1	145118-2	106%
Acenaphthylene	mg/kg	145118-12	<0.1 || <0.1	[NR]	[NR]
Acenaphthene	mg/kg	145118-12	<0.1 || <0.1	[NR]	[NR]
Fluorene	mg/kg	145118-12	<0.1 || <0.1	145118-2	116%
Phenanthrene	mg/kg	145118-12	<0.1 || <0.1	145118-2	110%
Anthracene	mg/kg	145118-12	<0.1 || <0.1	[NR]	[NR]
Fluoranthene	mg/kg	145118-12	<0.1 || <0.1	145118-2	94%
Pyrene	mg/kg	145118-12	<0.1 || <0.1	145118-2	100%
Benzo(a)anthracene	mg/kg	145118-12	<0.1 || <0.1	[NR]	[NR]
Chrysene	mg/kg	145118-12	<0.1 || <0.1	145118-2	90%
Benzo(b,j+k)fluoranthene	mg/kg	145118-12	<0.2 || <0.2	[NR]	[NR]
Benzo(a)pyrene	mg/kg	145118-12	<0.05 || <0.05	145118-2	106%
Indeno(1,2,3-c,d)pyrene	mg/kg	145118-12	<0.1 || <0.1	[NR]	[NR]
Dibenzo(a,h)anthracene	mg/kg	145118-12	<0.1 || <0.1	[NR]	[NR]
Benzo(g,h,i)perylene	mg/kg	145118-12	<0.1 || <0.1	[NR]	[NR]
Surrogate p-Terphenyl-d14	%	145118-12	98 || 94 || RPD: 4	145118-2	107%

QUALITY CONTROL Organochlorine Pesticides in soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	145118-12	20/04/2016 || 20/04/2016	145118-2	20/04/2016
Date analysed	-	145118-12	21/04/2016 || 21/04/2016	145118-2	21/04/2016
HCB	mg/kg	145118-12	<0.1 || <0.1	[NR]	[NR]
alpha-BHC	mg/kg	145118-12	<0.1 || <0.1	145118-2	98%
gamma-BHC	mg/kg	145118-12	<0.1 || <0.1	[NR]	[NR]
beta-BHC	mg/kg	145118-12	<0.1 || <0.1	145118-2	92%
Heptachlor	mg/kg	145118-12	<0.1 || <0.1	145118-2	96%
delta-BHC	mg/kg	145118-12	<0.1 || <0.1	[NR]	[NR]
Aldrin	mg/kg	145118-12	<0.1 || <0.1	145118-2	86%
Heptachlor Epoxide	mg/kg	145118-12	<0.1 || <0.1	145118-2	93%
gamma-Chlordane	mg/kg	145118-12	<0.1 || <0.1	[NR]	[NR]
alpha-chlordane	mg/kg	145118-12	<0.1 || <0.1	[NR]	[NR]
Endosulfan I	mg/kg	145118-12	<0.1 || <0.1	[NR]	[NR]
pp-DDE	mg/kg	145118-12	<0.1 || <0.1	145118-2	99%
Dieldrin	mg/kg	145118-12	<0.1 || <0.1	145118-2	96%
Endrin	mg/kg	145118-12	<0.1 || <0.1	145118-2	102%
pp-DDD	mg/kg	145118-12	<0.1 || <0.1	145118-2	91%
Endosulfan II	mg/kg	145118-12	<0.1 || <0.1	[NR]	[NR]
pp-DDT	mg/kg	145118-12	<0.1 || <0.1	[NR]	[NR]
Endrin Aldehyde	mg/kg	145118-12	<0.1 || <0.1	[NR]	[NR]
Endosulfan Sulphate	mg/kg	145118-12	<0.1 || <0.1	145118-2	93%
Methoxychlor	mg/kg	145118-12	<0.1 || <0.1	[NR]	[NR]
Surrogate TCMX	%	145118-12	91 || 92 || RPD: 1	145118-2	115%

QUALITY CONTROL Organophosphorus Pesticides	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	145118-12	20/04/2016 || 20/04/2016	145118-2	20/04/2016
Date analysed	-	145118-12	21/04/2016 || 21/04/2016	145118-2	21/04/2016
Azinphos-methyl (Guthion)	mg/kg	145118-12	<0.1 || <0.1	[NR]	[NR]
Bromophos-ethyl	mg/kg	145118-12	<0.1 || <0.1	[NR]	[NR]
Chlorpyriphos	mg/kg	145118-12	<0.1 || <0.1	145118-2	94%
Chlorpyriphos-methyl	mg/kg	145118-12	<0.1 || <0.1	[NR]	[NR]
Diazinon	mg/kg	145118-12	<0.1 || <0.1	[NR]	[NR]
Dichlorvos	mg/kg	145118-12	<0.1 || <0.1	145118-2	94%
Dimethoate	mg/kg	145118-12	<0.1 || <0.1	[NR]	[NR]
Ethion	mg/kg	145118-12	<0.1 || <0.1	145118-2	98%
Fenitrothion	mg/kg	145118-12	<0.1 || <0.1	145118-2	112%
Malathion	mg/kg	145118-12	<0.1 || <0.1	145118-2	105%
Parathion	mg/kg	145118-12	<0.1 || <0.1	145118-2	86%
Ronnel	mg/kg	145118-12	<0.1 || <0.1	145118-2	70%
Surrogate TCMX	%	145118-12	91 || 92 || RPD: 1	145118-2	100%
QUALITY CONTROL PCBs in Soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	145118-12	20/04/2016 || 20/04/2016	145118-2	20/04/2016
Date analysed	-	145118-12	21/04/2016 || 21/04/2016	145118-2	21/04/2016
Aroclor 1016	mg/kg	145118-12	<0.1 || <0.1	[NR]	[NR]
Aroclor 1221	mg/kg	145118-12	<0.1 || <0.1	[NR]	[NR]
Aroclor 1232	mg/kg	145118-12	<0.1 || <0.1	[NR]	[NR]
Aroclor 1242	mg/kg	145118-12	<0.1 || <0.1	[NR]	[NR]
Aroclor 1248	mg/kg	145118-12	<0.1 || <0.1	[NR]	[NR]
Aroclor 1254	mg/kg	145118-12	<0.1 || <0.1	145118-2	108%
Aroclor 1260	mg/kg	145118-12	<0.1 || <0.1	[NR]	[NR]
Surrogate TCLMX	%	145118-12	91 || 92 || RPD: 1	145118-2	95%
QUALITY CONTROL Acid Extractable metals in soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	145118-12	20/04/2016 || 20/04/2016	145118-2	20/04/2016
Date analysed	-	145118-12	20/04/2016 || 20/04/2016	145118-2	20/04/2016
Arsenic	mg/kg	145118-12	7 || 7 || RPD: 0	145118-2	92%
Cadmium	mg/kg	145118-12	<0.4 || <0.4	145118-2	92%
Chromium	mg/kg	145118-12	6 || 6 || RPD: 0	145118-2	80%
Copper	mg/kg	145118-12	12 || 10 || RPD: 18	145118-2	110%
Lead	mg/kg	145118-12	39 || 37 || RPD: 5	145118-2	97%
Mercury	mg/kg	145118-12	<0.1 || <0.1	145118-2	79%
Nickel	mg/kg	145118-12	3 || 2 || RPD: 40	145118-2	92%
Zinc	mg/kg	145118-12	98 || 81 || RPD: 19	145118-2	92%
Manganese	mg/kg	145118-12	61 || 59 || RPD: 3	145118-2	#

QUALITY CONTROL Acid Extractable metals in soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Iron	mg/kg	145118-12	14000 || 14000 || RPD: 0	145118-2	#

Report Comments:

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

Acid Extractable Metals in Soil: The laboratory RPD acceptance criteria has been exceeded for 145118-1 for Fe. Therefore a triplicate result has been issued as laboratory sample number 145118-26.

Asbestos ID was analysed by Approved Identifier: Lulu Scott, Paul Ching
Asbestos ID was authorised by Approved Signatory: Lulu Scott

INS: Insufficient sample for this test
NR: Test not required
<: Less than
PQL: Practical Quantitation Limit
RPD: Relative Percent Difference
>: Greater than
NT: Not tested
NA: Test not required
LCS: Laboratory Control Sample

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.

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: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.
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.

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Envirolab Services Pty Ltd - Sydney | ABN 37 112 535 645

CERTIFICATE OF ANALYSIS 145118-A

Client:

Douglas Partners Newcastle
Box 324 Hunter Region Mail Centre
Newcastle
NSW 2310

Attention: Patrick Heads

Sample log in details:

Your Reference:	**81961, Gateshead**
No. of samples:	Additional Testing on 2 Soils
Date samples received / completed instructions received	19/04/2016 / 05/05/16

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: / Issue Date:	11/05/16 / 10/05/16
Date of Preliminary Report:	Not Issued

NATA accreditation number 2901. This document shall not be reproduced except in full.
Accredited for compliance with ISO/IEC 17025. **Tests not covered by NATA are denoted with *.**

Results Approved By:

Jacinta Hurst
Laboratory Manager

Metals in TCLP USEPA1311			
Our Reference:	UNITS	145118-A-2	145118-A-14
Your Reference	----------	203	214
	-		
Depth	----------	0.5	0.5
Date Sampled		14/04/2016	14/04/2016
Type of sample		Soil	Soil
Date extracted	-	06/05/2016	06/05/2016
Date analysed	-	[NA]	06/05/2016
pH of soil for fluid# determ.	pH units	7.4	7.3
pH of soil TCLP (after HCl)	pH units	1.6	1.6
Extraction fluid used	-	1	1
pH of final Leachate	pH units	5.0	8.4
Lead in TCLP	mg/L	[NA]	0.46

PAHs in TCLP (USEPA 1311)		
Our Reference:	UNITS	145118-A-2
Your Reference	----------	203
	-	
Depth	----------	0.5
Date Sampled		14/04/2016
Type of sample		Soil
Date extracted	-	06/05/2016
Date analysed	-	06/05/2016
Naphthalene in TCLP	mg/L	<0.001
Acenaphthylene in TCLP	mg/L	<0.001
Acenaphthene in TCLP	mg/L	<0.001
Fluorene in TCLP	mg/L	<0.001
Phenanthrene in TCLP	mg/L	<0.001
Anthracene in TCLP	mg/L	<0.001
Fluoranthene in TCLP	mg/L	<0.001
Pyrene in TCLP	mg/L	<0.001
Benzo(a)anthracene in TCLP	mg/L	<0.001
Chrysene in TCLP	mg/L	<0.001
Benzo(bjk)fluoranthene in TCLP	mg/L	<0.002
Benzo(a)pyrene in TCLP	mg/L	<0.001
Indeno(1,2,3-c,d)pyrene - TCLP	mg/L	<0.001
Dibenzo(a,h)anthracene in TCLP	mg/L	<0.001
Benzo(g,h,i)perylene in TCLP	mg/L	<0.001
Total +ve PAH's	mg/L	NIL (+)VE
Surrogate p-Terphenyl-d14	%	102

Metals-ASLP Neutral (ICP-MS)		
Our Reference:	UNITS	145118-A-14
Your Reference	----------	214
	-	
Depth	----------	0.5
Date Sampled		14/04/2016
Type of sample		Soil
Date extracted	-	05/05/2016
Date analysed	-	06/05/2016
pH of final Leachate	pH units	5.2
Lead in ASLP	µg/L	7,800

Method ID	Methodology Summary
Inorg-004	Toxicity Characteristic Leaching Procedure (TCLP) using in house method INORG-004.
EXTRACT.7	Toxicity Characteristic Leaching Procedure (TCLP).
Inorg-001	pH - Measured using pH meter and electrode in accordance with APHA latest edition, 4500-H+. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times.
Metals-020 ICP-AES	Determination of various metals by ICP-AES.
Org-012	Leachates are extracted with Dichloromethane and analysed by GC-MS.
Org-012	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013.
Org-012	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS.
Metals-022 ICP-MS	Determination of various metals by ICP-MS following leaching using neutralised deionised water by AS 4439.3 - 1997.

QUALITY CONTROL Metals in TCLP USEPA1311	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			06/05/2016	[NT]	[NT]	LCS-W2	06/05/2016
Date analysed	-			06/05/2016	[NT]	[NT]	LCS-W2	06/05/2016
Lead in TCLP	mg/L	0.03	Metals-020 ICP-AES	<0.03	[NT]	[NT]	LCS-W2	94%
QUALITY CONTROL PAHs in TCLP (USEPA 1311)	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			06/05/2016	[NT]	[NT]	LCS-W1	06/05/2016
Date analysed	-			06/05/2016	[NT]	[NT]	LCS-W1	06/05/2016
Naphthalene in TCLP	mg/L	0.001	Org-012	<0.001	[NT]	[NT]	LCS-W1	76%
Acenaphthylene in TCLP	mg/L	0.001	Org-012	<0.001	[NT]	[NT]	[NR]	[NR]
Acenaphthene in TCLP	mg/L	0.001	Org-012	<0.001	[NT]	[NT]	[NR]	[NR]
Fluorene in TCLP	mg/L	0.001	Org-012	<0.001	[NT]	[NT]	LCS-W1	82%
Phenanthrene in TCLP	mg/L	0.001	Org-012	<0.001	[NT]	[NT]	LCS-W1	86%
Anthracene in TCLP	mg/L	0.001	Org-012	<0.001	[NT]	[NT]	[NR]	[NR]
Fluoranthene in TCLP	mg/L	0.001	Org-012	<0.001	[NT]	[NT]	LCS-W1	82%
Pyrene in TCLP	mg/L	0.001	Org-012	<0.001	[NT]	[NT]	LCS-W1	88%
Benzo(a)anthracene in TCLP	mg/L	0.001	Org-012	<0.001	[NT]	[NT]	[NR]	[NR]
Chrysene in TCLP	mg/L	0.001	Org-012	<0.001	[NT]	[NT]	LCS-W1	78%
Benzo(bjk)fluoranthene in TCLP	mg/L	0.002	Org-012	<0.002	[NT]	[NT]	[NR]	[NR]
Benzo(a)pyrene in TCLP	mg/L	0.001	Org-012	<0.001	[NT]	[NT]	LCS-W1	85%
Indeno(1,2,3-c,d)pyrene -TCLP	mg/L	0.001	Org-012	<0.001	[NT]	[NT]	[NR]	[NR]
Dibenzo(a,h)anthracene in TCLP	mg/L	0.001	Org-012	<0.001	[NT]	[NT]	[NR]	[NR]
Benzo(g,h,i)perylene in TCLP	mg/L	0.001	Org-012	<0.001	[NT]	[NT]	[NR]	[NR]
Surrogate p-Terphenyl-d14	%		Org-012	116	[NT]	[NT]	LCS-W1	96%

QUALITY CONTROL Metals-ASLP Neutral (ICP-MS)	UNITS	PQL	METHOD	Blank
Date extracted	-			06/05/2016
Date analysed	-			06/05/2016
Lead in ASLP	µg/L	1	Metals-022 ICP-MS	<1

Report Comments:

Asbestos ID was analysed by Approved Identifier:	Not applicable for this job
Asbestos ID was authorised by Approved Signatory:	Not applicable for this job

INS: Insufficient sample for this test	PQL: Practical Quantitation Limit	NT: Not tested
NR: Test not required	RPD: Relative Percent Difference	NA: Test not required
<: Less than	>: Greater than	LCS: Laboratory Control Sample

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.

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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.
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Spikes for Physical and Aggregate Tests are not applicable.
For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.
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.

Appendix C

Data Quality Report (QA/QC)
Chain of Custody Sheets (Field and Despatch)
Sample Receipts
Site Assessment Criteria

Data Quality Assessment Report
Report on Targeted Site Investigation (Contamination)
Major Capital Works Upgrade
Hunter Sports High School, Pacific Highway, Gateshead

1. Data Quality Objectives

The Targeted Site Investigation was prepared with reference to the seven step data quality objective (DQO) process which is provided in Appendix B, Schedule B2 of the *National Environment Protection (Assessment of Site Contamination) Measure* 1999 as amended 2013 (NEPC, 2013). The DQO process is outlined as follows:

- Stating the Problem;
- Identifying the Decision;
- Identifying Inputs to the Decision;
- Defining the Boundary of the Assessment;
- Developing a Decision Rule;
- Specifying Acceptable Limits on Decision Errors; and
- Optimising the Design for Obtaining Data.

The DQOs have been addressed in Table 4 of the report, Section 8.

2. Field and Laboratory Quality Control

2.1 Introduction

The field and laboratory quality control (QC) procedures and results are summarised in Tables 1 and 2. Reference should be made to the field work and analysis procedures in Section 8.2 and the laboratory results certificates in Appendix B for further details.

Table 1: Field QC

Item	Frequency	Acceptance Criteria	Achievement
Intra-laboratory replicates	10% primary samples	RPD <30% inorganics), <50% (organics)	no[1]

Notes to Table 1:

1 qualitative assessment of RPD results overall; refer Section 2.2

Table 2: Laboratory QC

Item	Frequency	Acceptance Criteria	Achievement
Analytical laboratories used		NATA accreditation	yes
Holding times		In accordance with NEPC (2013) which references various Australian and international standards	yes
Laboratory / Reagant Blanks	1 per lab batch	<PQL	yes
Laboratory duplicates	10% primary samples	Laboratory specific [1]	yes
Matrix Spikes	1 per lab batch	70-130% recovery (inorganics); 60-140% (organics); 10-140% (SVOC, speciated phenols)	yes
Surrogate Spikes	organics by GC	70-130% recovery (inorganics); 60-140% (organics); 10-140% (SVOC, speciated phenols)	yes
Control Samples	1 per lab batch	70-130% recovery (inorganics); 60-140% (organics); 10-140% (SVOC, speciated phenols)	yes

Notes to Table 2:

1 ELS: <5xPQL – any RPD; >5xPQL – 0-50%RPD

In summary, the QC data is considered to be of sufficient quality to be acceptable for the assessment.

2.2 Intra-Laboratory Replicates

Intra-laboratory replicates were analysed as an internal check of the reproducibility within the primary laboratory (Envirolab Services) and as a measure of consistency of sampling techniques. The comparative results of analysis between original and intra-laboratory replicate samples are summarised in Table 3.

Table 3: Relative Percentage Difference Results – Intra-laboratory Replicates

Analyte		204/0.1	BD1	RPD (%)	206/0.01	BD2	RPD (%)
Metals	As	<4	<4	N/A	11	14	24
	Cd	<0.4	<0.4	N/A	<0.4	<0.4	N/A
	Cr	29	23	23	17	14	19
	Cu	3	8	**91**	15	16	6
	Pb	4	5	22	18	13	32
	Hg	<0.1	<0.1	N/A	<0.1	<0.1	N/A
	Ni	1	2	**67**	6	15	**86**
	Zn	14	24	**53**	44	48	9
	Mn	2500	1400	**56**	170	410	**83**
	Fe	3800	6700	**55**	34000	17000	**67**
TRH	C_6-C_{10}	<25	<25	N/A	<25	<25	N/A
	$>C_{10}$-C_{16}	<50	<50	N/A	<50	<50	N/A
	F3 ($>C_{16}$-C_{34})	540	600	11	<100	<100	N/A
	F4 ($>C_{34}$-C_{40})	1000	1100	10	<100	<100	N/A
	C_6 - C_9	<25	<25	N/A	<25	<25	N/A
	C_{10} - C_{14}	<50	<50	N/A	<50	<50	N/A
	C_{15} - C_{28}	100	190	**62**	<100	<100	N/A
	C_{29} - C_{36}	730	680	7	<100	<100	N/A
BTEX	Benzene	<0.2	<0.2	N/A	<0.2	<0.2	N/A
	Toluene	<0.5	<0.5	N/A	<0.5	<0.5	N/A
	Ethyl Benzene	<1	<1	N/A	<1	<1	N/A
	Xylene	<3	<3	N/A	<3	<3	N/A
PAH	Total	3.6	4.8	29	NIL (+)VE	NIL (+)VE	N/A
	Benzo(a)pyrene	0.1	0.3	**100**	<0.05	<0.05	N/A
OCPs	Total	<0.1	<0.1	N/A	4.3	4	7
	Aldrin + Dieldrin	<0.1	<0.1	N/A	3.5	3.3	6
	Chlordane	<0.1	<0.1	N/A	0.3	0.3	0
	DDT	<0.1	<0.1	N/A	<0.1	<0.1	N/A
	Heptachlor	<0.1	<0.1	N/A	0.5	0.4	22
OPPs		<0.1	<0.1	N/A	<0.1	<0.1	N/A
PCBs		<0.1	<0.1	N/A	<0.1	<0.1	N/A

The calculated RPD values were within the acceptable range of ± 30 for inorganic analytes and ± 50% for organics with the with the exception of those in bold. However, this is not considered to be significant because:

- The typically low actual differences in the concentrations of the replicate pairs where some RPD exceedances occurred. High RPD values reflect the small differences between two small numbers;
- The number of replicate pairs being collected from fill soils which were heterogeneous in nature;
- Soil replicates, rather than homogenised soil duplicates, were used to minimise the risk of possible volatile loss, hence greater variability can be expected;
- All other QA/QC parameters met the DQIs.

Overall, the intra-laboratory replicate comparisons indicate that the sampling techniques were generally consistent and repeatable.

3. Data Quality Indicators

The reliability of field procedures and analytical results was assessed against the following data quality indicators (DQIs):

- Completeness – a measure of the amount of usable data from a data collection activity;
- Comparability – the confidence (qualitative) that data may be considered to be equivalent for each sampling and analytical event;
- Representativeness – the confidence (qualitative) of data representativeness of media present on site;
- Precision – a measure of variability or reproducibility of data; and
- Accuracy – a measure of closeness of the data to the 'true' value.

The DQIs were assessed as outlined in Table 4, Section 8 of the report.

Based on the information provided in Section 8 of the report, it is considered that the DQIs have been complied with. As such, it is concluded that the field and laboratory test data obtained are reliable and useable for this assessment.

Douglas Partners Pty Ltd

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CHAIN OF CUSTODY FIELD SHEET

Project No:81961	**Client Project Name: Gateshead**
Client: NSW Public Works	**Location:** Hunter Sports High Pacific Hwy
Project Manager: Patrick Heads	**DP Lab Received** By: CF Date: 14/11/16
Do samples contain 'potential' HBM? Yes ☑ No ☐ (If YES, then handle, transport and store in accordance with FPM HAZID)	

Field									DP Lab	For Despatch to			Notes
Sample ID	Depth (m)	Duplicate Sample	Sample Type S-soil W water	Container Type G-glass P-plastic	ASS Samples	Sampling By	Sampling Date	Sampling Time	Storage Locn*	ENVICOMB 18/11/16			
201	0.01		S	G/P		CF	14/11						
	0.5												
	1.0												
	1.5												
202	0.06												
	0.3												
202A	0.1												
	0.5									✓			
	1.0												
	1.5												
203	0.05												
	0.5									✓			
	1.0												
	1.5												
204	0.1	901								✓+BD1			
	0.3												
	1.0												

*Default storage: glass containers in fridge, plastic containers shelved, ASS in freezer, water samples in fridge

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CHAIN OF CUSTODY FIELD SHEET

Project No:81961	**Client Project Name: Gateshead**
Client: NSW Public Works	**Location:** Hunter Sports High School
Project Manager: Patrick Heads	**DP Lab Received** By: CF Date: 14/9/16
Do samples contain 'potential' HBM? Yes ☑ No ☐ (If YES, then handle, transport and store in accordance with FPM HAZID)	

Field									DP Lab	For Despatch to			Notes
Sample ID	Depth (m)	Duplicate Sample	Sample Type S-soil W water	Container Type G-glass P-plastic	ASS Samples	Sampling By	Sampling Date	Sampling Time	Storage Locn*	Envirolab 18/9/16			
205	0.01		S	G/P		CF	14/9			✓			
	0.3												
	1.0												
206	0.01	BD2								✓ x BD2			
	0.3												
	0.5												
	1.0												
207	0.01									✓			
	0.5												
	1.0												
	1.5												
	2.0												
208	0.01									✓			
	0.5												
	1.0												
209	0.01									✓			
	0.5												
	1.0		↓	↓		↓	↓						

*Default storage: glass containers in fridge, plastic containers shelved, ASS in freezer, water samples in fridge

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CHAIN OF CUSTODY FIELD SHEET

Project No:81961	**Client Project Name: Gateshead**
Client: NSW Public Works	**Location:** Hawker Sports High, Pacific Hwy
Project Manager: Patrick Heads	**DP Lab Received** By: CF Date: 14/4/16
Do samples contain 'potential' HBM? Yes ☑ No ☐ (If YES, then handle, transport and store in accordance with FPM HAZID)	

Field									DP Lab	For Despatch to			Notes
Sample ID	Depth (m)	Duplicate Sample	Sample Type S-soil W water	Container Type G-glass P-plastic	ASS Samples	Sampling By	Sampling Date	Sampling Time	Storage Locn*	Envirolab 18/4/16			
210	0.01		S	G/P		CF	14/4			✓			
	0.5												
	1.0												
211	0.01												
	0.5	BD3											
	1.0									✓			
	1.5												
	2.0												
	2.5												
212	0.01							1:20pm					
	0.5									✓			
	1.0												
	1.5												
213	0.01												
	0.3									✓			
	0.5												
	1.0												
			↓	↓		↓	↓						

*Default storage: glass containers in fridge, plastic containers shelved, ASS in freezer, water samples in fridge

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CHAIN OF CUSTODY FIELD SHEET

Project No:81961	**Client Project Name: Gateshead**
Client: NSW Public Works	**Location:** Hon'. South High Pacific School
Project Manager: Patrick Heads	**DP Lab Received** By: CF Date: 14/4/16
Do samples contain 'potential' HBM? Yes ☑ No ☐ (If YES, then handle, transport and store in accordance with FPM HAZID)	

Field									DP Lab	For Despatch to			Notes
Sample ID	Depth (m)	Duplicate Sample	Sample Type S-soil W water	Container Type G-glass P-plastic	ASS Samples	Sampling By	Sampling Date	Sampling Time	Storage Locn*	Envirolab 14/4/16			
21	0.01		S	G/P		CR	11/4						
	0.5									✓			
	1.0												
	1.5												
215	0.01												
	0.15												
	0.5									✓			
	1.0												
	1.5		↓	↓									
207	0.1		M	P						✓			
210	0.1		M	P									
			U			↓	↓						

*Default storage: glass containers in fridge, plastic containers shelved, ASS in freezer, water samples in fridge

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CHAIN OF CUSTODY FIELD SHEET

Project No:	84961	**Client Project Name:**	Major Public Works Upgrade, HSHS
Client:	NSW Public Works	**Location:**	Pacific Highway Gateshead
Project Manager:	PH	**DP Lab Received** By:	PH Date: 19/4/16

Do samples contain 'potential' HBM? Yes ☑ No ☐ (If YES, then handle, transport and store in accordance with FPM HAZID)

Field									DP Lab	For Despatch to			Notes
Sample ID	Depth (m)	Duplicate Sample	Sample Type S-soil W water	Container Type G-glass P-plastic	ASS Samples	Sampling By	Sampling Date	Sampling Time	Storage Locn*	Envirolab 18/4/16			
A1 - fibro	surface		fibro	P		PH	14/4/16	9am		✓			
A1 - soil	↓		S	↓		↓	↓	↓		✓			
A2 - fibro	↓		fibro	↓		↓	↓	↓		✓			
A2 - soil	↓		S	↓		↓	↓	↓		✓			
A3 - fibro	↓		fibro	↓		↓	↓	↓		✓			
A3 - soil	↓		S	↓		↓	↓	↓		✓			
AA - fibro	↓		fibro	↓		↓	↓	↓		✓			
AA - soil	↓		S	↓		↓	↓	↓					
A5 - fibro	↓		fibro	↓		↓	↓	↓		✓			
A5 - soil	↓		S	↓		↓	↓	9.40am					

*Default storage: glass containers in fridge, plastic containers shelved, ASS in freezer, water samples in fridge

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CHAIN OF CUSTODY DESPATCH SHEET (1)

Project No: 81961	**Suburb/Town: Gateshead**	**To: Envirolab Services**	
DP Order No: 125993	**DP Contact Person: Patrick Heads**	**Chatswood**	
Prior Storage: Esky ☐ Fridge ✓Shelved ☐		**Ph:**	**Attn: Aileen**
Do samples contain 'potential' HBM? Yes ☑ No ☐ (If YES, then handle, transport and store in accordance with FPM HAZID)			

	Sample				Analytes									TCLP	Notes
	DP ID 145116	Date Sampled	Type S-soil W-water	Lab ID	Metals *	Total Phenol	BTEX/ TRH	OCs/ OPs	PAHs	PCBs	Asbestos ID	pH	CEC		
1	202A/0.5	14/9/16	S		✓		✓	✓	✓	✓					combo 6
2	203/0.5				✓		✓	✓	✓	✓					
3	204/0.1				✓		✓	✓	✓	✓					
4	205/0.01				✓		✓	✓	✓	✓					
5	206/0.01				✓		✓	✓	✓	✓	✓				combo 6a
6	207/0.01				✓		✓	✓	✓	✓	✓				
7	207/0.1		material								✓				
8	208/0.01		S		✓		✓	✓	✓	✓					combo 6
9	209/0.01				✓		✓	✓	✓	✓					
10	210/0.01				✓		✓	✓	✓	✓					
11	211/1.0				✓		✓	✓	✓	✓	✓				combo 6a
12	212/0.5				✓		✓	✓	✓	✓	✓				
	PQL (S) mg/kg														
	PQL (W) mg/L	ANZECC PQLs req'd for all water analytes ☐													

ENVIROLAB
Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: (02) 9910 6200
Job No: 145116
Date Received: 19/9/16
Time Received: 11:00
Received by: JA
Temp: Cool/Ambient
Cooling: Ice/Icepack
Security: Intact/Broken/None

PQL = practical quantitation limit. If none given, default to Laboratory Method Detection Limit

*Metals to Analyse (Please circle): As, Cd, Cr, Cu, Pb, Zn, Hg, Ni, Mn, Fe

Total number of samples in container: 25

Date relinquished: 16/9/16 By: PH

Results required by: 27/9/16

☐ Same day ☐ 24 hours ☐ 48 hours ☐ 72 hours ✓ Standard

SAMPLES RECEIVED BY LAB
Please sign and date to acknowledge receipt of samples and return by email

Signature:

Date: 19/9/16 11:00

Lab Ref: 145116

Send results to:
Douglas Partners Pty Ltd
Address: .....
.....
.....
.....
Email: .....

Douglas Partners
Geotechnics | Environment | Groundwater

CHAIN OF CUSTODY DESPATCH SHEET (1)

Project No: 81961	**Suburb/Town: Gateshead**	**To: Envirolab Services Chatswood**	
DP Order No: 125993	**DP Contact Person: Patrick Heads**		
Prior Storage: Esky ☐ Fridge ✓Shelved ☐		**Ph:**	**Attn: Aileen**
Do samples contain 'potential' HBM? Yes ☑ No ☐ (If YES, then handle, transport and store in accordance with FPM HAZID)			

	Sample				Analytes										TCLP	Notes
	DP ID 145118	Date Sampled	Type S-soil W-water	Lab ID	Metals *	Total Phenol	BTEX/ TRH	OCs/ OPs	PAHs	PCBs	Asbestos ID	pH	CEC			
3	213/0.3	14/4/16	S		✓		✓	✓	✓	✓	✓					combo 6a
14	214/0.5		↓		✓		✓	✓	✓	✓	✓					↓
15	215/0.5		↓		✓		✓	✓	✓	✓	.					combo 6
16	A1 - fibro		material								✓					
17	A1 - soil		soil								✓					
18	A2 - fibro		material								✓					
19	A2 - soil		soil								✓					
20	A3 - fibro		material								✓					
21	A3 - soil		soil								✓					
22	A4 - fibro		material								✓					
23	A5 - fibro		material								✓					
15	B01	↓	S		✓		✓	✓	✓	✓						combo 6
24	PQL (S) mg/kg															
	PQL (W) mg/L	ANZECC PQLs req'd for all water analytes ☐														

PQL = practical quantitation limit. If none given, default to Laboratory Method Detection Limit

*Metals to Analyse (Please circle) As, Cd, Cr, Cu, Pb, Zn, Hg, Ni, Mn, Fe

Total number of samples in container: 25

Date relinquished: 18/4/16 By: PH

Results required by: 27/4/16

☐ Same day ☐ 24 hours ☐ 48 hours ☐ 72 hours ☑ Standard

SAMPLES RECEIVED BY LAB
Please sign and date to acknowledge receipt of samples and return by email

Signature: .....

Date: 19/4/16 11:00

Lab Ref: 145118

Send results to:
Douglas Partners Pty Ltd
Address: .....
.....
.....
.....
Email: .....

Douglas Partners
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CHAIN OF CUSTODY DESPATCH SHEET (1)

Project No: 81961	**Suburb/Town: Gateshead**	**To: Envirolab Services**	
DP Order No: 125993	**DP Contact Person: Patrick Heads**	**Chatswood**	
Prior Storage: Esky ☐ Fridge ✓Shelved ☐		**Ph:**	**Attn: Aileen**

Do samples contain 'potential' HBM? Yes ☑ No ☐ (If YES, then handle, transport and store in accordance with FPM HAZID)

Sample				Analytes									TCLP	Notes
DP ID 145116	Date Sampled	Type S-soil W-water	Lab ID	Metals *	Total Phenol	BTEX/ TRH	OCs/ OPs	PAHs	PCBs					
BD2	14/4/16	S		✓		✓	✓	✓	✓					combo 6
PQL (S) mg/kg														
PQL (W) mg/L	ANZECC PQLs req'd for all water analytes ☐													

PQL = practical quantitation limit. If none given, default to Laboratory Method Detection Limit

*Metals to Analyse (Please circle) As, Cd, Cr, Cu, Pb, Zn, Hg, Ni, Mn, Fe

Total number of samples in container: 25

Date relinquished: 14/4/16 By: PH

Results required by: 27/4/16

☐ Same day ☐ 24 hours ☐ 48 hours ☐ 72 hours ✓ Standard

SAMPLES RECEIVED BY LAB
Please sign and date to acknowledge receipt of samples and return by email

Signature:

Date: 19/4/16 11:00

Lab Ref: 145116

Send results to:
Douglas Partners Pty Ltd
Address: .....
.....
.....
.....
Email: .....

Douglas Partners
Geotechnics | Environment | Groundwater

CHAIN OF CUSTODY DESPATCH SHEET (2)

Project No: 81961	Suburb/Town: Gateshead	To: Envirolab Services Chatswood	
DP Order No: 125558	DP Contact Person: Patrick Heads		
Prior Storage: Esky ☐ Fridge ☐ Shelved ☐ AT LAB		Ph:	Attn: Aileen/Jacinta
Do samples contain 'potential' HBM? Yes ☐ No ☑ (If YES, then handle, transport and store in accordance with FPM HAZID)			

Sample				Analytes										Notes
DP ID	Date Sampled	Type S-soil W-water	Lab ID	TCLP PAH	TCLP Pb	ASLP Pb								
203/0.5	14/9/16	S	2	✓										
214/0.5	↓	S	14		✓	✓								
PQL (S) mg/kg														
PQL (W) mg/L	ANZECC PQLs req'd for all water analytes ☐													

PQL = practical quantitation limit. If none given, default to Laboratory Method Detection Limit

*Metals to Analyse (Please circle) As, Cd, Cr, Cu, Pb, Zn, Hg, Ni, Mn, Fe

Total number of samples in container: AT LAB

Date relinquished: AT LAB By: PH

Results required by: 11/5/16

☐ Same day ☐ 24 hours ☐ 48 hours ☐ 72 hours ☑ Standard

SAMPLES RECEIVED BY LAB
Please sign and date to acknowledge receipt of samples and return by email

Signature: AH

Date: 5/5/16

Lab Ref: 145118 A

Send results to:
Douglas Partners Pty Ltd
Address: .....
.....
.....
.....
Email: .....

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

SAMPLE RECEIPT ADVICE

Client Details	
Client	Douglas Partners Newcastle
Attention	Patrick Heads

Sample Login Details	
Your Reference	81961, Gateshead
Envirolab Reference	**145118**
Date Sample Received	19/04/2016
Date Instructions Received	19/04/2016
Date Results Expected to be Reported	**27/04/2016**

Sample Condition	
Samples received in appropriate condition for analysis	YES
No. of Samples Provided	19 Soils, 6 Materials
Turnaround Time Requested	Standard
Temperature on receipt (°C)	9.8
Cooling Method	Ice
Sampling Date Provided	YES

Comments
Samples will be held for 1 month for water samples and 2 months for soil samples from date of receipt of samples

Please direct any queries to:

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

Sample and Testing Details on following page

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

Sample Id	*vTRH(C6-C10)/BTEXN in Soil*	*svTRH (C10-C40) in Soil*	*PAHs in Soil*	*Organochlorine Pesticides in soil*	*Organophosphorus Pesticides*	*PCBs in Soil*	*Acid Extractable metals in soil*	*Asbestos ID - soils*	*Asbestos ID - materials*
202A-0.5	✓	✓	✓	✓	✓	✓	✓		
203-0.5	✓	✓	✓	✓	✓	✓	✓		
204-0.1	✓	✓	✓	✓	✓	✓	✓		
205-0.01	✓	✓	✓	✓	✓	✓	✓		
206-0.01	✓	✓	✓	✓	✓	✓	✓	✓	
207-0.01	✓	✓	✓	✓	✓	✓	✓	✓	
207-0.1									✓
208-0.01	✓	✓	✓	✓	✓	✓	✓		
209-0.01	✓	✓	✓	✓	✓	✓	✓		
210-0.01	✓	✓	✓	✓	✓	✓	✓		
211-1.0	✓	✓	✓	✓	✓	✓	✓	✓	
212-0.5	✓	✓	✓	✓	✓	✓	✓	✓	
213-0.3	✓	✓	✓	✓	✓	✓	✓	✓	
214-0.5	✓	✓	✓	✓	✓	✓	✓	✓	
215-0.5	✓	✓	✓	✓	✓	✓	✓		
A1-fibro									✓
A1-soil								✓	
A2-fibro									✓
A2-soil								✓	
A3-fibro									✓
A3-soil								✓	
A4-fibro									✓
A5-fibro									✓
BD1	✓	✓	✓	✓	✓	✓	✓		
BD2	✓	✓	✓	✓	✓	✓	✓		

Site Assessment Criteria
Targeted Site Investigation
Major Capital Works Upgrade
Pacific Highway, Gateshead

1. Site Assessment Criteria

1.1 Introduction

It is understood that the proposed development area within Hunter Sports High will be redeveloped for ongoing secondary school use.

The Site Assessment Criteria (SAC) applied in the current investigation are informed by the CSM which identified human and ecological receptors to potential contamination on the site (refer to Section 4 of the report). Analytical results were assessed (as a Tier 1 assessment) against the SAC comprising primarily the investigation and screening levels of Schedule B1, *National Environment Protection (Assessment of Site Contamination) Measure* 1999, as amended 2013 (NEPC, 2013). NEPC (2013) is endorsed by the NSW EPA under the CLM Act 1997.

The investigation and screening levels applied in the current investigation comprise levels adopted for a generic recreational / open space land use scenario, which includes secondary schools.

1.2 Soils

1.2.1 Health Investigation and Screening Levels

The generic HIL and HSL are considered to be appropriate for the assessment of contamination at the site. The adopted soil HIL and HSL for the potential contaminants of concern are presented in Table C1.

Table C1: HIL and HSL in mg/kg Unless Otherwise

Contaminants		HIL- C and HSL-C Direct Contact	HSL- C[4]
Metals	Arsenic	300	NC
	Cadmium	90	NC
	Chromium (VI)	300	NC
	Copper	17000	NC
	Iron	NC	NC
	Lead	600	NC
	Magnesium	NC	NC
	Manganese	19000	NC
	Mercury (inorganic)	80	NC

Contaminants		HIL- C and HSL-C Direct Contact	HSL- C[4]
	Nickel	1200	NC
	Selenium	700	NC
	Zinc	30000	NC
PAH	Benzo(a)pyrene TEQ[1]	3	NC
	Naphthalene	1900	NL
	Total PAH	300	NC
TRH	C6 – C10 (less BTEX) [F1]	5100	NL
	>C10-C16 (less Naphthalene) [F2]	3800	NL
	>C16-C34 [F3]	5300	NC
	>C34-C40 [F4]	7400	NC
BTEX	Benzene	120	NL
	Toluene	18000	NL
	Ethylbenzene	5300	NL
	Xylenes	15000	NL
OCP	Aldrin + Dieldrin	10	NC
	Chlordane	70	NC
	DDT+DDE+DDD	400	NC
	Endosulfan	340	NC
	Endrin	20	NC
	Heptachlor	10	NC
	HCB	10	NC
	Methoxychlor	400	NC
OPP	Chlorpyrifos	250	NC
PCB [2]		1	NC

Notes to Table C1:

1 Sum of carcinogenic PAH

2 Non dioxin-like PCBs only.

3 The soil saturation concentration (Csat) is defined as the soil concentration at which the porewater phase cannot dissolve any more of an individual chemical. The soil vapour that is in equilibrium with the porewater will be at its maximum. If the derived soil HSL exceeds Csat, a soil vapour source concentration for a petroleum mixture could not exceed a level that would results in the maximum allowable vapour risk for the given scenario. For these scenarios, no HSL is presented for these chemicals and the HSL is shown as 'not limiting' or 'NL'.

4 The HSL have been calculated for a potential vapour intrusion pathway, a conservative sand soil based on the variable fill conditions encountered (Section 9 of the report) and an assumed depth to contamination of 0 m to <1 m.

NC – No Criteria

As shown in Table C1 the adopted HSLs are predicated on a potential vapour intrusion pathway, as identified in the CSM. The CSM also identifies a direct contact pathway and construction worker receptors. The direct contact HSLs for open space has therefore been listed. As the HSLs for intrusive maintenance workers are significantly higher than HSLs for direct contact they have not been listed.

1.2.2 Ecological Investigation Levels

EIL and Added Contaminant Limits (ACLs), where appropriate, have been derived in NEPC (2013) for only a short list of contaminants comprising As, Cu, Cr (III), DDT, naphthalene, Ni, Pb and Zn. The adopted EIL, derived using the *Interactive (Excel) Calculation Spreadsheet* (Standing Council on Environment and Water (SCEW) website (http://www.scew.gov.au/node/941)) are shown in the following Table C2.

Table C2: EIL in mg/kg

Analyte		EIL	Comments
Metals	Arsenic	100	**Adopted parameters** pH = 5 (conservative value based on residual soil type) CEC = 15 $cmol_c/kg$; assumed clay content 10% "Aged" (>2 years) source of contamination high for traffic volumes in NSW
	Copper	110	
	Nickel	220	
	Chromium III	410	
	Lead	1100	
	Zinc	310	
PAH	Naphthalene	170	
OCP	DDT	180	

1.2.3 Ecological Screening Levels

ESL are used to assess the risk of selected petroleum hydrocarbon compounds, BTEX and benzo(a)pyrene to terrestrial ecosystems. The adopted ESL are shown in the following Table C3.

Table C3: ESL in mg/kg

Analyte		ESL (coarse)	ESL (fine)	Comments
TRH	C6 – C10 (less BTEX) [F1]	180*	180*	All ESLs are low reliability apart from those marked with * which are moderate reliability
	>C10-C16 (less Naphthalene) [F2]	120*	120*	
	>C16-C34 [F3]	300	1300	
	>C34-C40 [F4]	2800	5600	
BTEX	Benzene	50	65	
	Toluene	85	105	
	Ethylbenzene	70	125	
	Xylenes	105	45	
PAH	Benzo(a)pyrene	0.7	0.7	

Notes to Table C3:

1 The ESL have been calculated for an public open space landuse

1.2.4 Management Limits

In addition to appropriate consideration and application of the HSL and ESL, there are additional considerations which reflect the nature and properties of petroleum hydrocarbons, including:

- Formation of observable light non-aqueous phase liquids (LNAPL);
- Fire and explosion hazards;
- Effects on buried infrastructure e.g. penetration of, or damage to, in-ground services.

The adopted management limits from Schedule B1 of NEPC (2013) are shown in the following Table C4.

Table C4: Management Limits in mg/kg

Analyte		Management Limit	
TRH	$C_6 - C_{10}$ (F1) #	700	The management limits have been calculated for a conservative coarse soil based on the variable fill conditions encountered (Section 9 of report) and parkland and public open space landuse
	$>C_{10}$-C_{16} (F2) #	1000	
	$>C_{16}$-C_{34} (F3)	2500	
	$>C_{34}$-C_{40} (F4)	10000	

Separate management limits for BTEX and naphthalene are not available hence these have not been subtracted from the relevant fractions to obtain F1 and F2

1.2.5 Asbestos in Soil

Asbestos only poses a risk to human health when asbestos fibres are made airborne and inhaled. If asbestos is bound in a matrix such as cement or resin, it is not readily made airborne except through substantial physical damage. Bonded Asbestos Containing Materials (ACM) in sound condition represents a low human health risk, whilst both Fibrous Asbestos (FA) and Asbestos Fines (AF) materials have the potential to generate, or be associated with, free asbestos fibres. Consequently, FA and AF must be carefully managed to prevent the release of asbestos fibres into the air. A detailed asbestos assessment was not undertaken as part of these works. Therefore the presence or absence of asbestos at a limit of reporting of 0.1 g/kg has been adopted for this assessment as an initial screen.

1.3 Water Leach Criteria

Water leach testing was conducted on selected soil samples to assess the propensity of chemical contaminants to leach from soils into water. As a conservative screen, the results of water leach testing was compared to ANZECC & ARMCANZ (2000), *National water quality management strategy. Australian and New Zealand guidelines for fresh and marine water quality*, Australian and New Zealand Conservation Council & Agriculture, and Resource Management Council of Australia and New Zealand.

Appendix D

Drawing 1 – Test Location Plan
Proposed Development Plan

Locality Plan

NOTE: Base drawing from Nearmap Image dated 20 November 2015

0 5 10 20 30 40 50 75 100 150m

1:1500 @ A3

LEGEND

- Approximate Borehole Location
- X Approximate Surface Fibro Sample Location
- 20 Approximate Figure Location & Orientation
- Approximate Site Boundary
- Approximate Location of Observed Fibro Fragments (PSI, 81598, October 2014)

Douglas Partners
Geotechnics / Environment / Groundwater

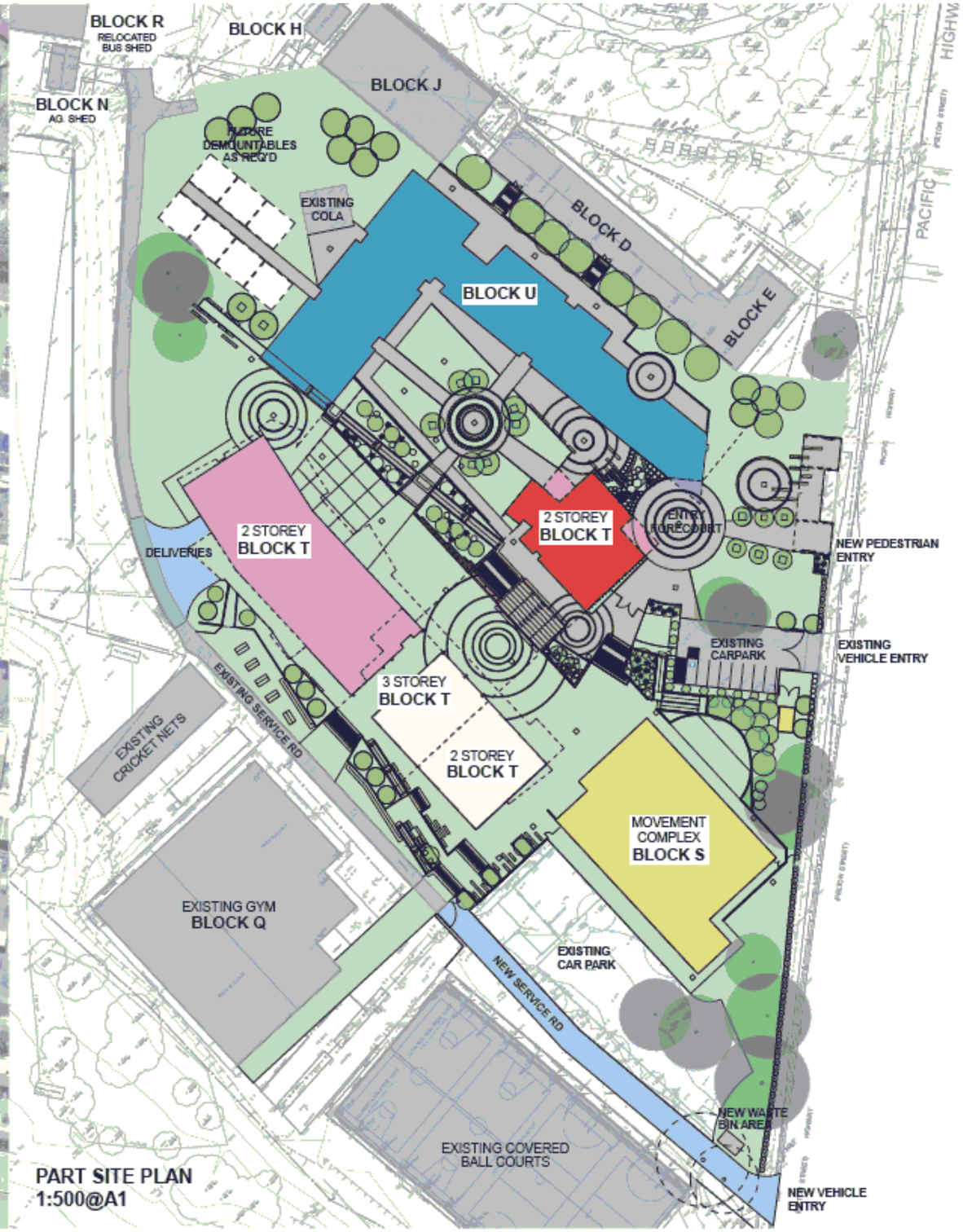
TITLE: **Test Location Plan**
Targeted Site Investigation (Contamination)
Hunter Sports High School, Pacific Highway, Gateshead

N

OFFICE: Newcastle
DRAWN BY: PLH
DATE: 13.05.2016

CLIENT: NSW Department of Public Works-Government Architects Office	PROJECT No: 81961.00	DRAWING No: 1	REVISION: 0	SCALE: 1:1500@A3

OVERALL SITE PLAN
1:1000@A1



PART SITE PLAN
1:500@A1

EJE ARCHITECTURE
ACN 002 612 645 | ABN 82 944 846 849
Nominated Architect: Bernard Collins
NSW Architects Registration No. 4438
A 412/880 STEWART, NEWCASTLE, NSW 2300
P +61 2 4929 2855 | F +61 2 4929 2866 | E mail@eje.com.au | W www.eje.com.au

N

REV	DATE	COMMENTS	DRN	CHKD	WPD
A	15.02.2016	ISSUE FOR CONSULTANT CO-ORDINATION	JJM	JPC	
B	19.02.2016	ISSUE FOR 90% COORDINATION REVIEW	JJM	JPC	
C	02.03.2016	REVISED ISSUE FOR 90% COORDINATION REVIEW	JJM	JPC	

PROJECT: HUNTER SPORTS HIGH SCHOOL
MAJOR CAPITAL WORKS UPGRADE

CLIENT: NSW Public Works / NSW Education

SITE: PACIFIC HIGHWAY
GATESHEAD 2290

DRAWING: OVERALL AND PART SITE PLANS

WORK IN FIGURED DIMENSIONS IN PREFERENCE TO SCALE. CHECK DIMENSIONS AND LEVELS ON SITE PRIOR TO THE ORDERING OF MATERIALS OR THE COMPLETION OF WORKSHOP DRAWINGS. IF IN DOUBT ASK. REPORT ALL ERRORS AND OMISSIONS.

FILENAME: 11029_Site Proposed_v17 (working).pln DATE PRINTED: 30/03/2016

DRAWN:	DATE:	SCALES:
JJM	FEB 2016	1:1000 1:500

PROJECT No:	PHASE:	DRAWING No:	REV:
11029	WD	A005	C

EJE architecture