Douglas Partners
Geotechnics / Environment / Groundwater

Integrated Practical Solutions

Report on
Salinity Assessment and Management Plan

Proposed Sports and Health Centre of Excellence
Goldsmith Avenue, Campbelltown

Prepared for
Campbelltown City Council

Project 34255.27
February 2018

Douglas Partners
Geotechnics / Environment / Groundwater

Document History

Document details

Project No.	34255.27	Document No.	R.001 Rev0.docx
Document title	Report on Salinity Assessment and Management Plan Proposed Sports and Health Centre of Excellence		
Site address	Goldsmith Avenue, Campbelltown		
Report prepared for	Campbelltown City Council		
File name	34255.27.R.001 Rev0		

Document status and review

Status	Prepared by	Reviewed by	Date issued
Revision 0	Emily McGinty	Christopher C. Kline	13 February 2018

Distribution of copies

Status	Electronic	Paper	Issued to
Revision 0	1	Ø	Ares Liu, Campbelltown City Council

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		13 February 2018
Reviewer	FOR CCK.	13 February 2018

bsi. ISO 9001 Quality Management

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Report on Salinity Assessment and Management Plan
Proposed Sports and Health Centre of Excellence
Goldsmith Avenue, Campbelltown

1. Introduction

Douglas Partners Pty Ltd (DP) has been engaged by Campbelltown City Council (Council) to undertake a Salinity Assessment and Management Plan (SMP) for the site of a proposed sports and health centre of excellence ('the proposed development') on land located off Goldsmith Avenue, Macarthur Heights, Campbelltown, NSW ('the site'). The site comprises an approximate area of 3.2 hectares; the site location is presented in Drawing 1, Appendix A.

Saline soils affect much of the Western Sydney Region. Buildings and infrastructure located on shales of the Wianamatta Group are particularly at risk. Salinity can affect urban structures in a number of ways, including corrosion of concrete, break-down of bricks and mortar, corrosion of steel (including reinforcement), break-up of roads, attach on buried infrastructure, reduced ability to grow vegetation and increased erosion potential.

DP understands the proposed development includes sports facilities, a sports hall, as well as support facilities and offices. The current investigation comprised a review of desk top information including regional salinity mapping, the excavation of test pits, followed by laboratory testing of selected samples, the assessment of analytical results and reporting. Details of the work undertaken and the results obtained are given within this report.

This investigation was completed in conjunction with a contamination and geotechnical investigation for the site, and as such soil samples were collected from the test pits to also inform these investigations. The findings of the contamination and geotechnical investigations shall be reported under separate cover (report references 34255.26 and 34255.25 respectively).

2. Scope of Works

The scope of works for the current investigation comprised the following:

1. Salinity assessment of the site based upon:

- Inspection of the site for signs of salinity;
- Excavation of ten test pits (TP 101, 102, 104, 106 – 108, 111, 112, 114 and 115) within the site and the general site area to a maximum depth of 3 m below ground level (bgl) or prior refusal[1];
- Collection of soil samples from test pits at regular 0.5 m depth intervals;
- Laboratory analysis of all soil samples (40 samples) for electrical conductivity (EC1:5), pH and texture by a NATA accredited laboratory for classification of salinity and aggressivity;

[1] A further six test pits (TP 103, 105, 109, 110, 113 and 116) were completed as part of the contamination and geotechnical assessments, however no salinity specific tests were conducted, therefore information from these test pits are not included in the scope of this report.

- Laboratory analysis of selected soil samples for chloride and sulphate concentrations (10 samples) for further assessment of aggressivity; and analysis for sodicity (3 samples) and dispersibilty (2 samples) as indicators of erodibility;
- Assessment of the results with respect to potential for salinity impacts on the development.

2. Preparation of a Salinity Management Plan (SMP) for the site providing guidance on development strategies to reduce the impact of saline materials (if and where found). The Plan was based upon:

- Review of the salinity investigation results;
- Review of the following documents detailing Council requirements:
  - 'Map of Salinity Potential in Western Sydney', DNR (2002);
  - 'Guidelines to Accompany Map of Salinity Potential in Western Sydney', DNR (2002);
  - 'Western Sydney Salinity Code of Practice' (amended January 2004), Rebecca Nicholson for WSROC, DNR and Natural Heritage Trust;
  - 'Guide to Residential Slabs and Footings in a Saline Environment', Cement, Concrete and Aggregates, Australia (2005);
  - 'Introduction to Urban Salinity', DNR (2003);
  - 'Building in a Saline Environment' DNR (2003);
  - 'Roads and Salinity', DNR (2003);
  - 'Indicators of Urban Salinity', DNR (2002);
  - 'Site Investigations for Urban Salinity', DNR (2002);
  - 'Urban Salinity Processes', DNR (2004);
  - 'Waterwise Parks and Gardens', DNR (2004); and
  - 'Broad Scale Resources for Urban Salinity Assessment' DNR (2002).

3. Site Description

The site is formally identified as part Lot 3099 on Deposited Plan 120509 and is currently zoned R3 Medium Density Residential. The site location and boundaries are shown on Drawing 1, Appendix A.; At the time of this investigation a disused sports centre and basketball court associated with Western Sydney University is located in the centre of the site and is surrounded by open fields and sparse bushland. The site is accessed via a paved road running from Goldsmith Avenue from the northern site boundary towards the south west. A Heras type fence is located between the sports centre running north west, preventing general access to much of the south eastern and south western portions of the site. Bow Bowing Creek which is culverted is located in the southern portion of the site, running west to east across the site. The Macarthur railway is located near parallel to the south eastern site boundary.

The site topography generally slopes gently towards the south west; the highest point at the site is located in the north west portion (approximately 84 mAHD) and the lowest elevation is located in the south east (approx. 74 mAHD). A ridgeline running north west to south east appears to be a historical access way running above Bow Bowing Creek between Goldsmith Avenue and the railway.

4. Regional Geology, Soil Landscapes and Hydrogeology

4.1 Geology

Reference to the *Geological Survey of New South Wales (1985), Wollongong-Port Hacking 1: 100 000 Geological Sheet 9029-9129* indicates that the site is underlain by Ashfield Shale comprising laminate and dark-grey siltstone and potentially Bringelly Shale comprising shale, carbonaceous claystone, laminite and minor coal of the Wianamatta Group. Localised Quaternary Alluvium deposits comprising quartz and lithic "fluvial" sand, silty and clay may also be encountered.

4.2 Soil Landscapes

Reference to the *Soil Conservation Service of NSW (1990) Soil Landscapes of the Wollongong-Port Hacking 1:100,000 Sheet* indicates that the site is underlain by Blacktown soils comprising shallow to moderately deep (<100 cm) red and brown podzolic soils on crests, upper slopes and well drained areas and deep yellow podzolic soils and soloths on lower slopes and in areas of poor drainage. Blacktown soils can be moderately reactive, highly plastic soils with characteristic low soil fertility and poor soil drainage.

4.3 Hydrogeology

McNally (2005) describes some general features of the hydrogeology of Western Sydney which are relevant to this site. The shale terrain of much of Western Sydney is known for saline groundwater, resulting either from the release of connate salt in shales of marine origin or from the accumulation of windblown sea salt. Seasonal groundwater level changes of 1 m - 2 m can occur in a shallow regolith aquifer or a deeper shale aquifer due to natural influences.

Groundwater investigations undertaken by DP in the Camden and Campbelltown area and previous studies of areas underlain by the Wianamatta Group indicate that:

- The shales have a very low intrinsic permeability, hence groundwater flow is likely to be dominated by fracture flow with resultant low yields (typically <1 L/s) in bores; and
- The groundwater in the Wianamatta Group is typically brackish to saline with total dissolved solids (TDS) in the range 4000 – 5000 mg/L (but with cases of TDS up to 31750 mg/L being reported). The dominant ions are typically sodium and chloride and the water being generally unsuitable for livestock or irrigation.

4.4 Salinity Potential

Reference to the *Map of Salinity Potential in Western Sydney*, indicates the majority of the site is located within an area of "high salinity potential", where "*soil, geology, topography and groundwater conditions predispose a site to salinity. These conditions are similar to areas of known salinity. These areas are most common in lower slopes and drainage systems where water accumulation is high…"*. A portion of the western part of the site may be located within an area of "known salinity'', where "*there is known occurrence of saline soil, or where air photo interpretation and field observations have confirmed more than one of the following: scalding, salt efflorescence, vegetation dieback, salt tolerant species, and waterlogging"*. It is anticipated that more saline conditions at the site are likely to be found near the creeks.

5. Previous Investigations

Landcom (then UrbanGrowth NSW) engaged several consultants in 2015 to undertake a Due Diligence investigation of the site and surrounding area proposed at the time to be redeveloped into a series of playing fields. The due diligence investigation included contamination, geotechnical, salinity, ecological and aboriginal studies. A copy of the reports was provided by Council to DP for review[2] including the following reports of relevance to this investigation:

- JBS & G Australia Pty Ltd (JBS & G) *Salinity Investigation, University of Western Sydney, Campbelltown Campus – Playing Fields, Goldsmith Avenue, Campbelltown, NSW.* Reference 50682 / 100173, dated 10 April 2015 (JBS & G, 2015).

The findings of the JBS & G (2015) report are summarised below:

- The development proposed by UrbanGrowth NSW includes the construction of three playing fields, re-alignment of the existing concrete lined surface water drainage (Bow Bowing Creek) and associated cut and fill works to assist with surface water management;
- The scope of works completed by JBS & G included review of previous investigation reports[3] and regional mapping, completion of a desktop study of salinity and acid sulfate soil mapping for the site, conduct a detailed site inspection, site investigation including analysis of soil samples and data assessment;
- Review of acid sulfate soil mapping indicated the site is located in an area of "no known occurrence';
- A total of 31 test pit locations were carried out by JBS & G, of which approximately six were located in the current site boundary;
- Results indicated that:
    - Surface and near surface soils were generally non to slightly saline;
    - Soils at depth (>0.7 m) indicated more moderately saline conditions in places, including in the northern portion of the current site;
    - Soils were characterised as being dispersive and sodic to highly sodic; and

[2] Provided to DP on 30 January 2018.
[3] Reports not made available to DP for review for this report.

- Soil pH, sulfate and chloride indicated non-aggressive conditions. It is noted that the conductivity of the soil did not appear to have been considered by JBS & G.

6. Methods

6.1 Field Work Method

Field investigations were undertaken on 8 and 9 January 2018 by a DP environmental engineer. The fieldwork comprised the excavation of ten test pits using a Hyundai 60CR-9 6 ton excavator with a 450 mm bucket. Test pits were excavated to a maximum depth of 3 m bgl or to prior refusal. Test pit locations are shown on Drawing 1, Appendix A. Representative samples were collected at 0.5 m depth intervals for laboratory testing and to assist in strata identification.

All field measurements and mapping for this project have been carried out using the Geodetic Datum of Australia 1994 (GDA94) and the Map Grid of Australia (MGA94), Zone 56. All reduced levels are given in relation to the Australian Height Datum (AHD).

7. Results

7.1 Field Work Results

The test pit logs are included in Appendix B, together with notes defining classification methods and descriptive terms.

Relatively uniform conditions were encountered across most of the site, with filling observed at all test pit locations. The general strata across the site are summarised as follows (in general order):

- FILLING – filling material generally comprised medium to dark brown clayey silts were encountered in TP 101, 102, 104, 105 – 112, 115 and 116. Trace rootlets and grass cover (topsoil) was encountered in the top approximately 0.2 m of the fill soil profile at TP 101, 103, 107 – 109 and 111 to 116;
- CLAYEY SILT - brown clayey silt was encountered in shallow stratum in test pits located in the central / southern portion of the site (TP 103, 107, 108, 111 and 114);
- SILTY CLAY – light to dark brown and orange in places silty clay mottled grey in places was encountered in most test pits, typically below clayey silt where present (TP 101, 104 and 107 – 115);
- CLAY – light brown / orange /grey mottled grey clays were encountered at depth in TP 101,107, 112 and 116. Typically, clay was ancountered 2 m bgl and below, however in TP 116 located in the north west portion of the site, clay was present in shallower depths above shale (0.5 – 1.5 m bgl); and

- SHALE – grey, occasionally brown shale was encountered in TP 102, 104 – 106, 109 and 116. Depth to shale was typically shallow (0.1 – 0.8 m bgl) with the exception of TP 116 (1.5 m bgl).

No free groundwater was observed in the pits during excavation for the short time that they were left open. No signs of efflorescence were noted at the time of the inspection.

7.2 Spatial Mapping

A "worst case" scenario was used to classify the extent of salinity and aggressivity within the site, by utilising a maxima / minima analysis within the full investigated depth zone of 0 - 3 m. The Summary Table (Table C1 of Appendix C) presents aggressivities and salinities for each pit location. Minimum pH, minimum electrical resistivity and maximum ECe values for each test pit were used for spatial mapping of aggressivities and salinities throughout the investigation area (refer Drawings 2 to 4, Appendix A).

7.3 Laboratory Results

The laboratory test results and assessments of aggressivity, salinity, sodicity and dispersibility are summarised in Table C1 of Appendix C. Aggressivity to concrete was determined using pH values and sulphate concentrations and aggressivity to steel was determined using pH values, chloride concentration and resistivities. The salinity class was inferred from ECe values using the method of Richards (1954) and sodicity was determined using the cation-exchange-capacity (CEC) and exchangeable sodium concentrations. Dispersion potentials were derived from Emerson Crumb Tests. The detailed laboratory test reports and chain of custody documents are provided in Appendix D.

Table 1 summaries total test sample numbers and the range of test results obtained.

Table 1: Summary of Test Results

Parameter		Units	Samples	Minimum	Maximum
pH		pH units	40	5.3	9.9
Chlorides		(mg/kg)	10	<10	790
Sulphates		(mg/kg)	10	<10	100
Aggressivity	to Concrete	[AS2159]	40	Non-aggressive	Mild
	to Steel	[AS2159]	40	Non-aggressive	Mild
Exchangeable Sodium (Na)		(meq/100g)	3	0.31	2.2
CEC (cation exchange capacity)		(meq/100g)	3	11	16
Sodicity [Na/CEC]		(ESP%)	3	3	16
Sodicity Class		[after DLWC]	3	Non-sodic	Highly sodic

EC1:5 [Lab.]	(mS/cm)	40	34	800
Resistivity	Ω.cm	40	1250	29412
ECe [M x EC1:5] [1]	(dS/m)	40	0.2	5.6
Salinity Class	[after Richards 1954]	40	Non-saline	Moderately saline

1 M is soil textural factor

7.4 Aggressivity

Figure 1 presents variations of aggressivity with depth, based on pH profiles at all sampling locations, together with class ranges indicated in the Australian Standard AS2159 (2009). The absence of free groundwater in all locations (excluding TP13 at 3.0 m) and the permeability of the sampled clay-rich soils at all sampling locations indicate that soils are in Condition “B” as defined by AS2159.

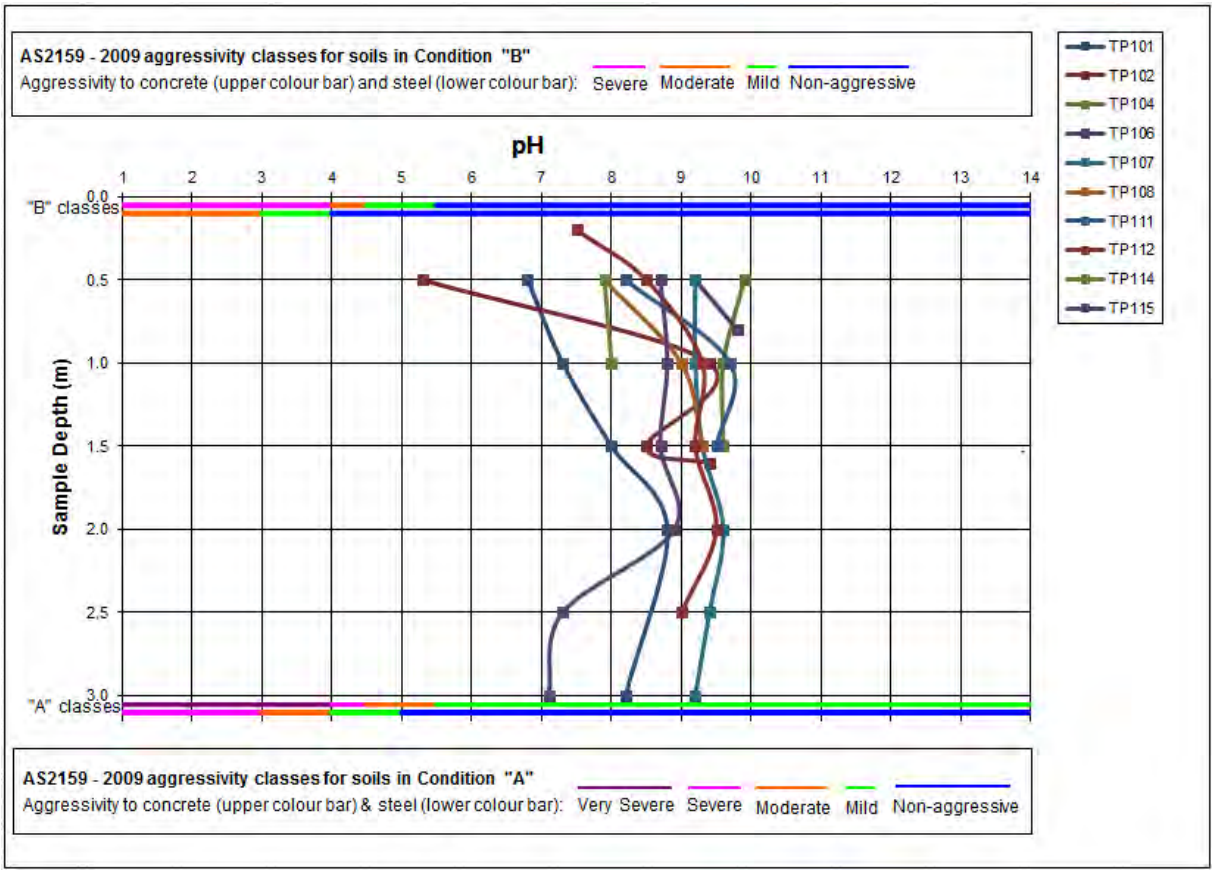

Figure 1: Vertical pH Profiles and Aggressivity Classes

Figure 1 shows non-aggressive to mildly aggressive classifications of soils based on pH values. The summary Table C1 indicates that 97% (39 of 40 samples) of all tested samples were non-aggressive to concrete and 3% (one sample) were mildly aggressive to concrete. The worst case results for each test pit were used to define approximate areas of mild (pH 4.5 - 5.5) aggressivity to concrete

foundations and piles below current ground surface (Drawing 2, Appendix A), represented by a colour zone.

The pH profiles of Figure 1 indicate that the materials throughout the site, at all investigated depths are non-aggressive to steel. The chloride concentration guidelines of AS2159 generally support this non-aggressive classification. However, based on resistivity criteria (refer Table C1, Appendix C), samples were classified as non-aggressive to mildly aggressive to steel.

The worst case resistivity results for each test pit were used to define approximate areas of mild aggressivity to steel piles, represented by colour zones on Drawing 3 (Appendix A).

7.5 Salinity

Figure 2 presents the variations of salinity with depth, based on salinity (ECe) profiles at all sampling locations, together with the salinity classifications of Richards (1954).

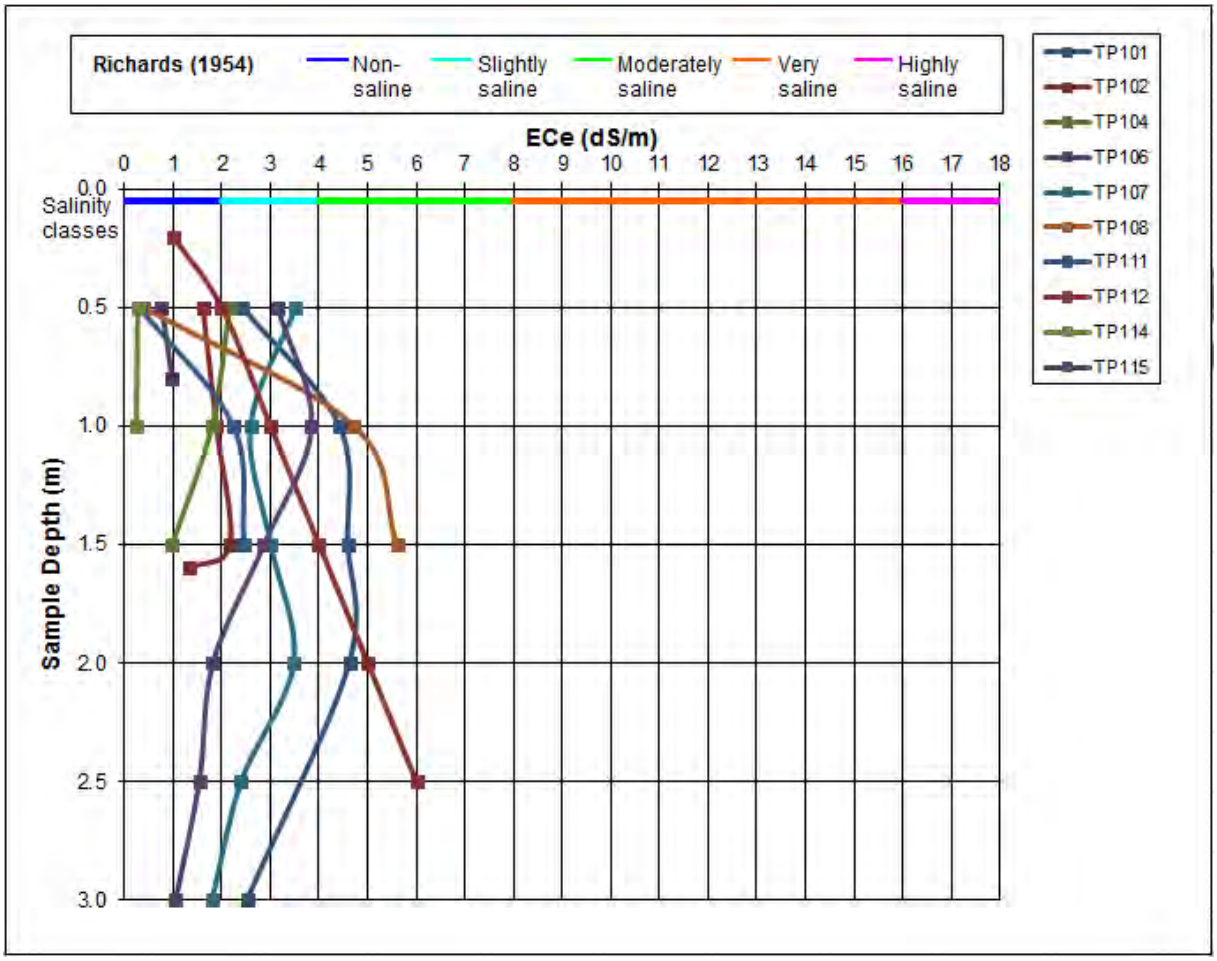

Figure 2: Vertical Salinity Profiles and Salinity Classes

Table C1, indicates that 38 % of soil samples were non-saline, 44 % were slightly saline and 18 % were moderately saline.

As for soil aggressivity, worst case ECe values were interpolated and contoured to define areas of slightly saline (ECe 2 - 4 dS/m), moderately saline (ECe 4 - 8 dS/m) and very saline soil (ECe 8 - 16 dS/m) (see Drawing 4, Appendix A).

7.6 Sodicity and Dispersibilty

The sodicity tests reported in Table C1, Appendix C, show non to highly sodic soils, indicating some potential from erodibility of soils left exposed.

The dispersion potential of the soils, as measured by the Emerson Crumb Test (refer Table C1, Appendix C), were determined in two samples. Results indicate no dispersion potential (in clay loam at 0.5 m bgl; TP 108) and some dispersion potential (in medium clay at 3 m bgl; TP 101).

7.7 Previous Investigations in Macarthur Heights

It is noted that DP has also prepared preliminary salinity investigations for the Macarthur Heights development located to the north of the site, on the other side of Goldsmith Avenue. The salinity conditions observed by DP were generally consistent with those observed during this investigation.

8. Impacts of the Proposed Development

The non to mild aggressivity to concrete and non to mild aggressivity to steel, the presence of non to moderately saline materials and the highly sodic soils are naturally occurring features of the local landscape and are not considered significant impediments to the proposed development, provided appropriate remediation or management techniques are employed.

Salinity and aggressivity affects the durability of concrete and steel by causing premature breakdown of concrete and corrosion of steel. This has impacts on the longevity of structures in contact with these materials. As a result management will be required (refer Section 8).

Sodic soils have low permeability due to infilling of interstices with fine clay particles during the weathering process, restricting infiltration of surface water and potentially creating perched water tables, seepage in cut faces or ponding of water in flat open areas. In addition, sodic soils tend to erode when exposed. Management of sodic soils is therefore required to prevent these adverse effects.

9. Salinity Management Plan

The current salinity investigation indicates that soils within the site are classified as non-saline to moderately saline. Testing of other parameters associated with salinity indicates that soils are non-aggressive to mildly aggressive to concrete (by the pH and sulphate criteria of AS2159) and non-aggressive to mildly aggressive to steel (by the resistivity and chloride criteria of AS2159). In addition, soils are shown to be highly sodic.

The following management strategies are confined to the management of the factors mentioned above, with a potential to impact on the development.

A. Management should focus on capping of the upper surface of the sodic soils, both exposed by excavation and placed as filling, with a more permeable material to prevent ponding, to reduce capillary rise, to act as a drainage layer and to reduce the potential for erosion.

B. When possible placement of excavated soils in fill areas with similar salinity characteristics (i.e. place excavated material onto in-situ soils with a similar or higher aggressivity or salinity classification). With respect to imported fill material, testing should be undertaken prior to importation, to determine the salinity characteristics of the material, which should be non-aggressive and non-saline to slightly saline where possible but in any case not more aggressive or more saline than the material on which it is to be placed.

C. Sodic soils can also be managed by maintaining vegetation where possible and planting new salt tolerant species. The addition of organic matter, gypsum and lime can also be considered where appropriate. After gypsum addition, reduction of sodicity levels may require some time for sufficient infiltration and leaching of sodium into the subsoils, however capping of exposed sodic material should remain the primary management method. Topsoil added at the completion of bulk earthworks is, in effect, also adding organic matter which may help infiltration and leaching of sodium.

D. Avoiding water collecting in low lying areas, in depressions, or behind fill. This can lead to water logging of the soils, evaporative concentration of salts, and eventual breakdown in soil structure resulting in accelerated erosion.

E. Any pavements should be designed to be well drained of surface water. There should not be excessive concentrations of runoff or ponding that would lead to waterlogging of the pavement or additional recharge to the groundwater through any more permeable zones in the underlying filling material.

F. Surface drains should generally be provided along the top of batter slopes to reduce the potential for concentrated flows of water down slopes possibly causing scour.

G. Salt tolerant grasses and trees should be considered for landscaping, to reduce soil erosion as in Strategy A above and to maintain the existing evapo-transpiration and groundwater levels. Reference should be made to an experienced landscape planner or agronomist.

The following additional strategies are recommended for completion of service installation and for building construction. These strategies should be complementary to standard good building practices recommended within the Building Code of Australia, including cover to reinforcement within concrete and correct installation of a brick damp course, so that it cannot be bridged to allow moisture to move into brick work and up the wall.

H. Where soils are classified as non-aggressive to concrete, piles should nevertheless have a minimum strength of 32 MPa and a minimum cover to reinforcement of 45 mm (as per AS2159).

I. Where soils are classified as mildly aggressive to concrete, piles should have a minimum strength of 32 MPa and a minimum cover to reinforcement of 60 mm (as per AS2159) to limit the corrosive effects of the surrounding soils (in accordance with AS2159).

J. With regard to concrete structures, for non-saline and slightly saline soils as encountered at the site (with salinities less than 4 dS/m):

- Where soils are classified as non-aggressive to concrete (AS3600 - A1) (Drawing 2), slabs and foundations should have a minimum strength of 20 MPa, and should be allowed to cure for a minimum of three days (as per AS3600) to limit the corrosive effects of the surrounding soils; and
- Where soils are classified as mildly aggressive to concrete (AS3600 - A2) (Drawing 2), slabs and foundations should have a minimum strength of 25 MPa, and should be allowed to cure for a minimum of three days (as per AS3600) to limit the corrosive effects of the surrounding soils; and

K. With regard to concrete structures, for moderately saline soils with salinities of 4 - 8 dS/m (refer Drawing 2):

- Where soils are classified as non-aggressive to mildly aggressive to concrete (AS 3600 - A1 and A2), slabs and foundations should have a minimum strength of 25 MPa, a minimum cover to reinforcement of 45 mm from unprotected ground and should be allowed to cure for a minimum of three days (as per AS3600) to limit the corrosive effects of the surrounding soils.

L. Wet cast concrete pipes and currently manufactured spun concrete pipes are understood to have estimated compressive strengths of 50 MPa and 60 - 70 MPa, respectively, in excess of the requirements for mass concrete in J and K above. Reference to the maximum and minimum test results of Table 1 (Section 6 of this report) and to Tables C1 and 3.1 of AS 4058 - 2007 “Precast concrete pipes” indicates that the site falls within the AS 4058 Clay/Stagnant (low sulphate) soil type (chlorides <=20,000 ppm, pH>=4.5 and sulphates <=1,000 ppm) and (in the absence of tidal water flow) falls within the AS 4058 Normal durability environment. AS 4058 - compliant reinforced concrete pipes of general purpose Portland cement, with a minimum cover to reinforcement of 10 mm, are expected to have a design life in excess of 100 years. Any concrete pipes installed within the site should employ AS 4058 - compliant steel reinforced pipes of general purpose Portland cement, with minimum cover to reinforcement of 10 mm, or should be fibre reinforced.

M. Resistivity results indicate soils that are non to mildly (1000 – 2000 Ohm-cm) aggressive to steel (Drawing 3, Appendix A). For these areas of soil identified as mildly aggressive to steel, a uniform corrosion allowances 0.01 - 0.02 mm/year (as per AS 2159 - 2009) should be taken into account by the designer. In instances where a coating is applied to the pile, if the design life of the pile is greater than the design life for the coating, consideration must be given to corrosion of the pile.

10. Additional Recommendations and Conclusions

Additional investigation should be undertaken in development areas which are to be excavated deeper than 3 m, where direct sampling and testing of salinity has not been carried out. Salinity management strategies herein may need to be modified or extended following additional investigations by deep test pitting and / or drilling, sampling and testing for soil and water pH, electrical conductivity, TDS, sodicity, sulphates and chlorides. Such works, if required, could be conducted when final cut and fill requirements have been determined.

It is considered that the management strategies described herein, when incorporated into the design and construction works, are appropriate to mitigate the levels of salinity, aggressivity and sodicity identified at the Site.

11. Limitations

Douglas Partners (DP) has prepared this report (or services) for this project at Goldsmith Avenue, Campbelltown in accordance with DP's proposal MAC170409 Rev1 dated 7 December 2017 and acceptance received from Ares Liu dated 15 December 2017. The work was carried out under DP's Conditions of Engagement. This report is provided for the exclusive use of 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.

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 (geotechnical /

environmental / groundwater) 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
Drawings

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 Methods

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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

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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.

Rock Strength

Rock strength is defined by the Point Load Strength Index ($Is_{(50)}$) and refers to the strength of the rock substance and not the strength of the overall rock mass, which may be considerably weaker due to defects. The test procedure is described by Australian Standard 4133.4.1 - 1993. The terms used to describe rock strength are as follows:

Term	Abbreviation	Point Load Index $Is_{(50)}$ MPa	Approx Unconfined Compressive Strength MPa*
Extremely low	EL	<0.03	<0.6
Very low	VL	0.03 - 0.1	0.6 - 2
Low	L	0.1 - 0.3	2 - 6
Medium	M	0.3 - 1.0	6 - 20
High	H	1 - 3	20 - 60
Very high	VH	3 - 10	60 - 200
Extremely high	EH	>10	>200

* Assumes a ratio of 20:1 for UCS to $Is_{(50)}$

Degree of Weathering

The degree of weathering of rock is classified as follows:

Term	Abbreviation	Description
Extremely weathered	EW	Rock substance has soil properties, i.e. it can be remoulded and classified as a soil but the texture of the original rock is still evident.
Highly weathered	HW	Limonite staining or bleaching affects whole of rock substance and other signs of decomposition are evident. Porosity and strength may be altered as a result of iron leaching or deposition. Colour and strength of original fresh rock is not recognisable
Moderately weathered	MW	Staining and discolouration of rock substance has taken place
Slightly weathered	SW	Rock substance is slightly discoloured but shows little or no change of strength from fresh rock
Fresh stained	Fs	Rock substance unaffected by weathering but staining visible along defects
Fresh	Fr	No signs of decomposition or staining

Degree of Fracturing

The following classification applies to the spacing of natural fractures in diamond drill cores. It includes bedding plane partings, joints and other defects, but excludes drilling breaks.

Term	Description
Fragmented	Fragments of <20 mm
Highly Fractured	Core lengths of 20-40 mm with some fragments
Fractured	Core lengths of 40-200 mm with some shorter and longer sections
Slightly Fractured	Core lengths of 200-1000 mm with some shorter and loner sections
Unbroken	Core lengths mostly > 1000 mm

Rock Descriptions

Rock Quality Designation

The quality of the cored rock can be measured using the Rock Quality Designation (RQD) index, defined as:

$$\text{RQD \%} = \frac{\text{cumulative length of 'sound' core sections} \geq \text{100 mm long}}{\text{total drilled length of section being assessed}}$$

where 'sound' rock is assessed to be rock of low strength or better. The RQD applies only to natural fractures. If the core is broken by drilling or handling (i.e. drilling breaks) then the broken pieces are fitted back together and are not included in the calculation of RQD.

Stratification Spacing

For sedimentary rocks the following terms may be used to describe the spacing of bedding partings:

Term	Separation of Stratification Planes
Thinly laminated	< 6 mm
Laminated	6 mm to 20 mm
Very thinly bedded	20 mm to 60 mm
Thinly bedded	60 mm to 0.2 m
Medium bedded	0.2 m to 0.6 m
Thickly bedded	0.6 m to 2 m
Very thickly bedded	> 2 m

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

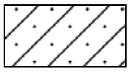
Soils


Topsoil

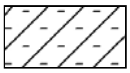

Peat


Clay

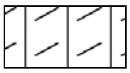

Silty clay

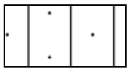

Sandy clay

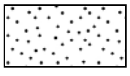

Gravelly clay

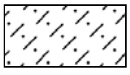

Shaly clay

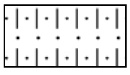

Silt


Clayey silt


Sandy silt

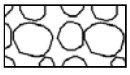

Sand

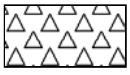

Clayey sand


Silty sand


Gravel


Sandy gravel


Cobbles, boulders

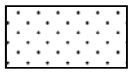

Talus

Sedimentary Rocks

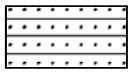

Boulder conglomerate

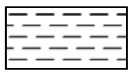

Conglomerate


Conglomeratic sandstone

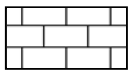

Sandstone


Siltstone


Laminite

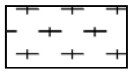

Mudstone, claystone, shale

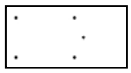

Coal


Limestone

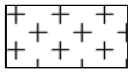
Metamorphic Rocks

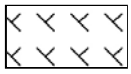

Slate, phyllite, schist

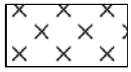

Gneiss

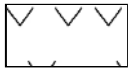

Quartzite

Igneous Rocks


Granite


Dolerite, basalt, andesite


Dacite, epidote


Tuff, breccia


Porphyry

Cone Penetration Tests

Douglas Partners

Introduction

The Cone Penetration Test (CPT) is a sophisticated soil profiling test carried out in-situ. A special cone shaped probe is used which is connected to a digital data acquisition system. The cone and adjoining sleeve section contain a series of strain gauges and other transducers which continuously monitor and record various soil parameters as the cone penetrates the soils.

The soil parameters measured depend on the type of cone being used, however they always include the following basic measurements

- Cone tip resistance q_c
- Sleeve friction f_s
- Inclination (from vertical) i
- Depth below ground z

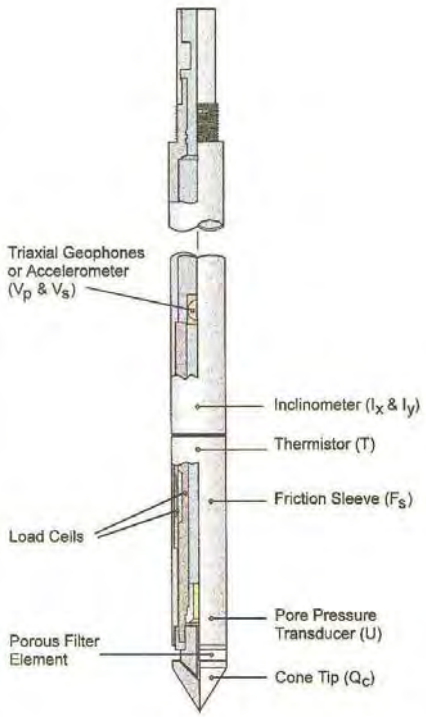


Figure 1: Cone Diagram

The inclinometer in the cone enables the verticality of the test to be confirmed and, if required, the vertical depth can be corrected.

The cone is thrust into the ground at a steady rate of about 20 mm/sec, usually using the hydraulic rams of a purpose built CPT rig, or a drilling rig. The testing is carried out in accordance with the Australian Standard AS1289 Test 6.5.1.

Figure 2: Purpose built CPT rig

The CPT can penetrate most soil types and is particularly suited to alluvial soils, being able to detect fine layering and strength variations. With sufficient thrust the cone can often penetrate a short distance into weathered rock. The cone will usually reach refusal in coarse filling, medium to coarse gravel and on very low strength or better rock. Tests have been successfully completed to more than 60 m.

Types of CPTs

Douglas Partners (and its subsidiary GroundTest) owns and operates the following types of CPT cones:

Type	Measures
Standard	Basic parameters (q_c, f_s, i & z)
Piezocone	Dynamic pore pressure (u) plus basic parameters. Dissipation tests estimate consolidation parameters
Conductivity	Bulk soil electrical conductivity (σ) plus basic parameters
Seismic	Shear wave velocity (V_s), compression wave velocity (V_p), plus basic parameters

Strata Interpretation

The CPT parameters can be used to infer the Soil Behaviour Type (SBT), based on normalised values of cone resistance (Qt) and friction ratio (Fr). These are used in conjunction with soil classification charts, such as the one below (after Robertson 1990)

Cone Penetration Tests

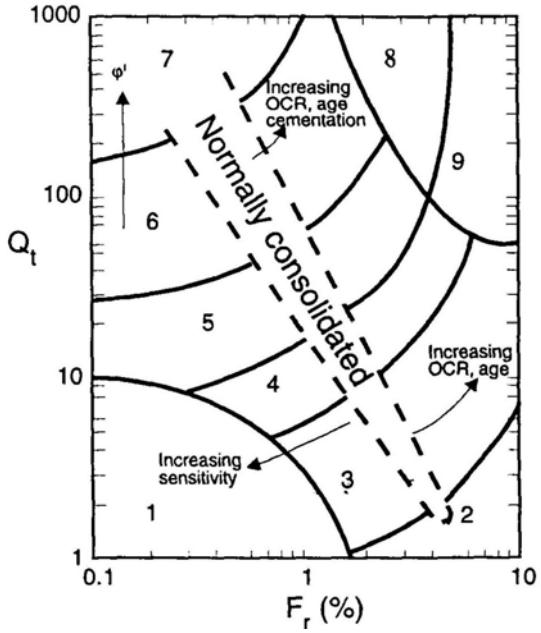


Figure 3: Soil Classification Chart

DP's in-house CPT software provides computer aided interpretation of soil strata, generating soil descriptions and strengths for each layer. The software can also produce plots of estimated soil parameters, including modulus, friction angle, relative density, shear strength and over consolidation ratio.

DP's CPT software helps our engineers quickly evaluate the critical soil layers and then focus on developing practical solutions for the client's project.

Engineering Applications

There are many uses for CPT data. The main applications are briefly introduced below:

Settlement

CPT provides a continuous profile of soil type and strength, providing an excellent basis for settlement analysis. Soil compressibility can be estimated from cone derived moduli, or known consolidation parameters for the critical layers (eg. from laboratory testing). Further, if pore pressure dissipation tests are undertaken using a piezocone, in-situ consolidation coefficients can be estimated to aid analysis.

Pile Capacity

The cone is, in effect, a small scale pile and, therefore, ideal for direct estimation of pile capacity. DP's in-house program ConePile can analyse most pile types and produces pile capacity versus depth plots. The analysis methods are based on proven static theory and empirical studies, taking account of scale effects, pile materials and method of installation. The results are expressed in limit state format, consistent with the Piling Code AS2159.

Dynamic or Earthquake Analysis

CPT and, in particular, Seismic CPT are suitable for dynamic foundation studies and earthquake response analyses, by profiling the low strain shear modulus G_0. Techniques have also been developed relating CPT results to the risk of soil liquefaction.

Other Applications

Other applications of CPT include ground improvement monitoring (testing before and after works), salinity and contaminant plume mapping (conductivity cone), preloading studies and verification of strength gain.

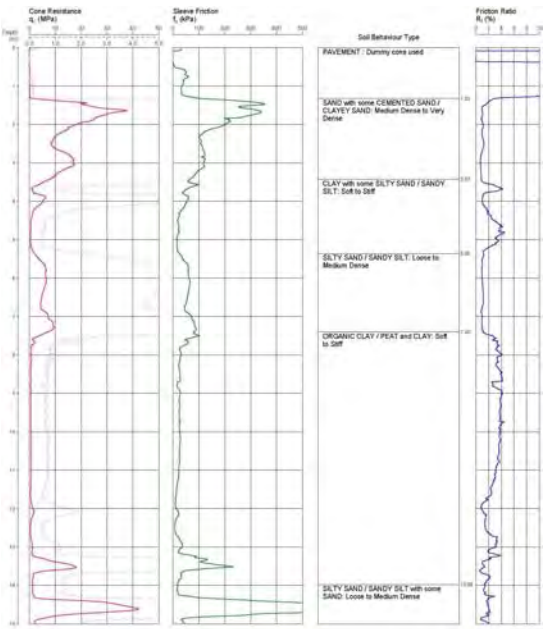


Figure 4: Sample Cone Plot

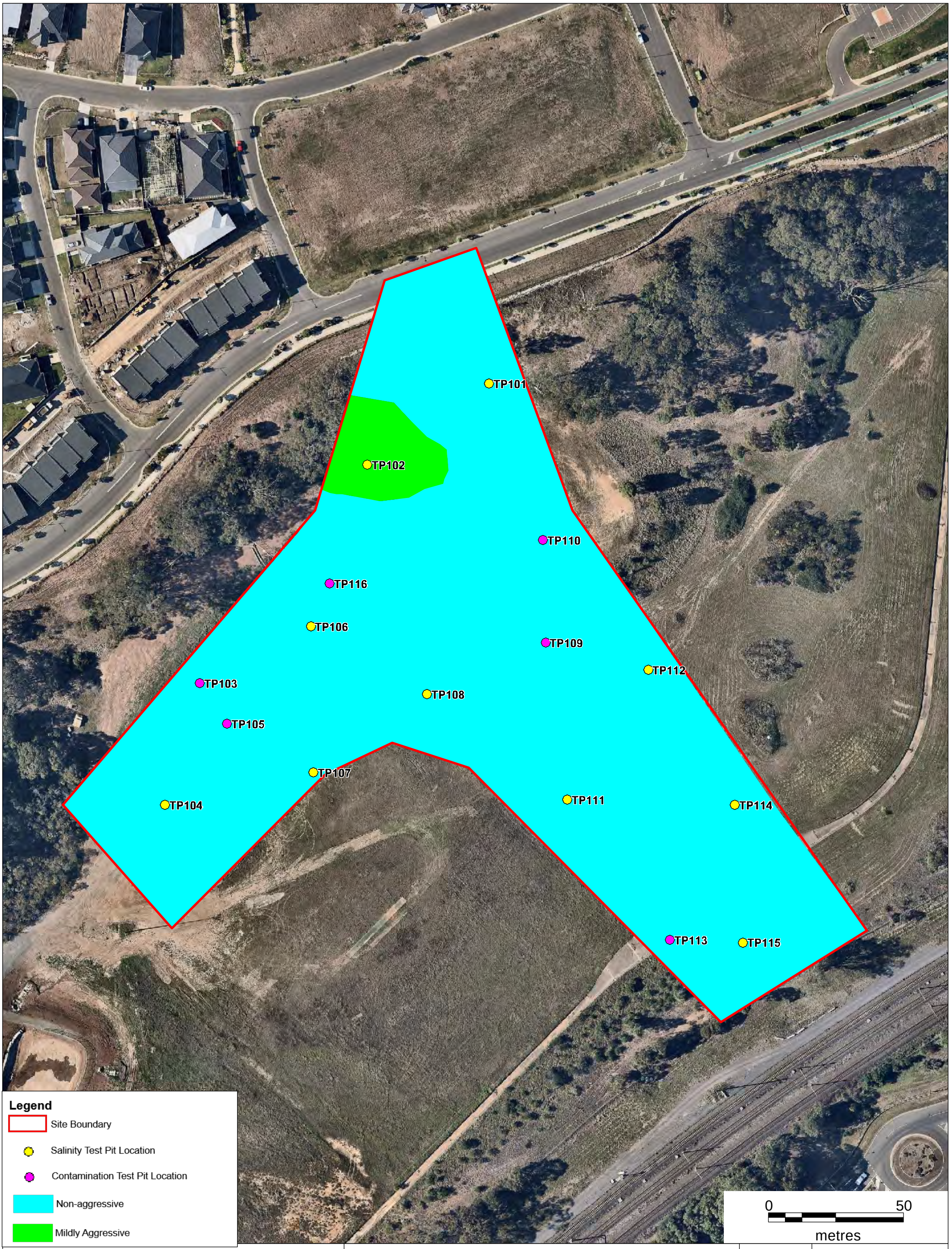
Douglas Partners
Geotechnics / Environment / Groundwater

TITLE: Site Locality and Test Pit Locations
Proposed Sports and Heath Centre of Excellence
Goldsmith Avenue, Campbelltown NSW

N
MGA

OFFICE: Macarthur
DRAWN BY: CLN
DATE: 22.01.2018

CLIENT: Campbelltown City Council
PROJECT No: 34255.27
DRAWING No: 1
REVISION: A
SCALE: As shown

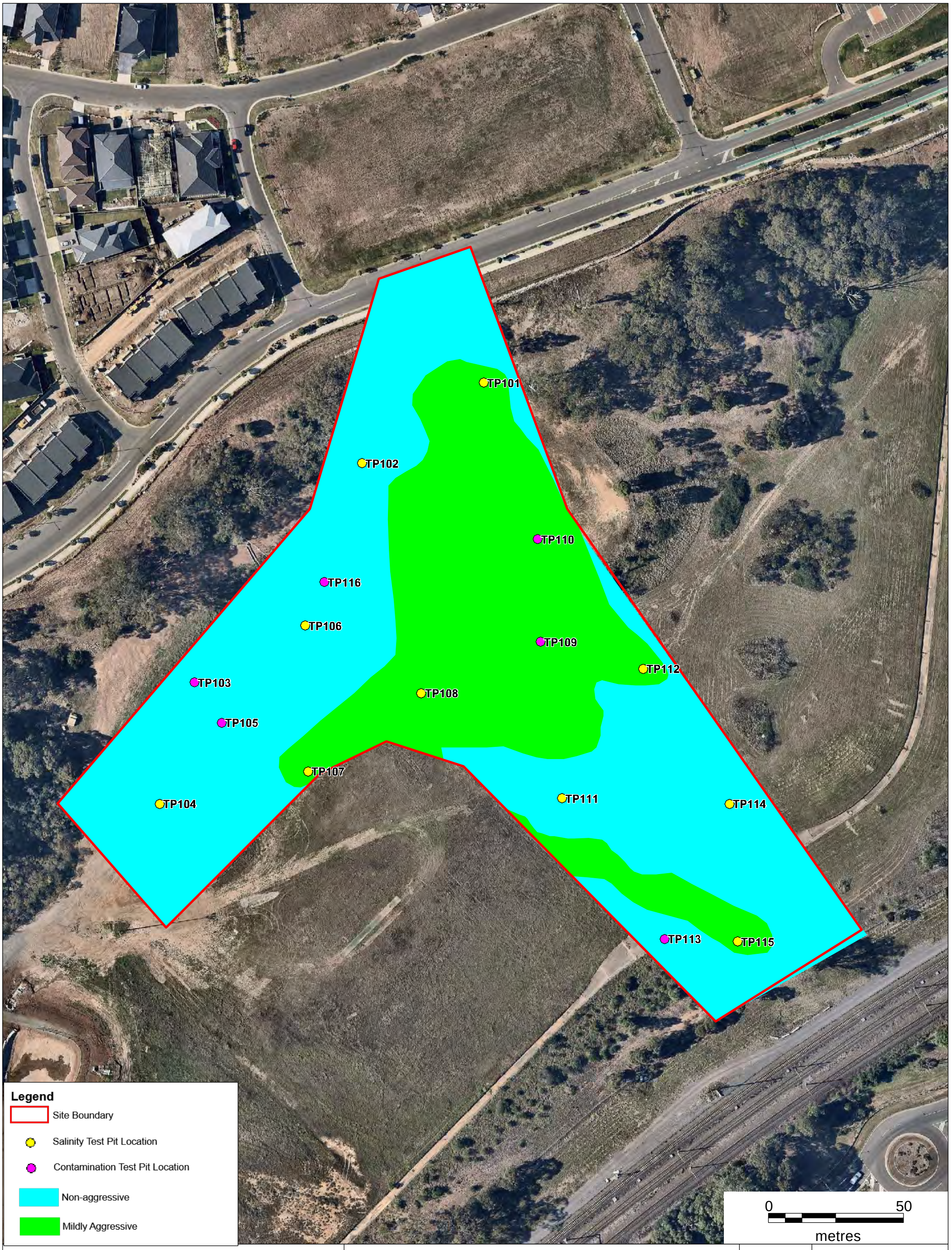


Douglas Partners
Geotechnics / Environment / Groundwater

TITLE: Aggressivity to Concrete within Investigated Depth Zone
Proposed Sports and Health Centre of Excellence
Goldsmith Avenue, Campbelltown, NSW

OFFICE: Macarthur
DRAWN BY: CLN
DATE: 22.01.2018

CLIENT: Campbelltown City Council
PROJECT No: 34255.27
DRAWING No: 2
REVISION: A
SCALE: As shown

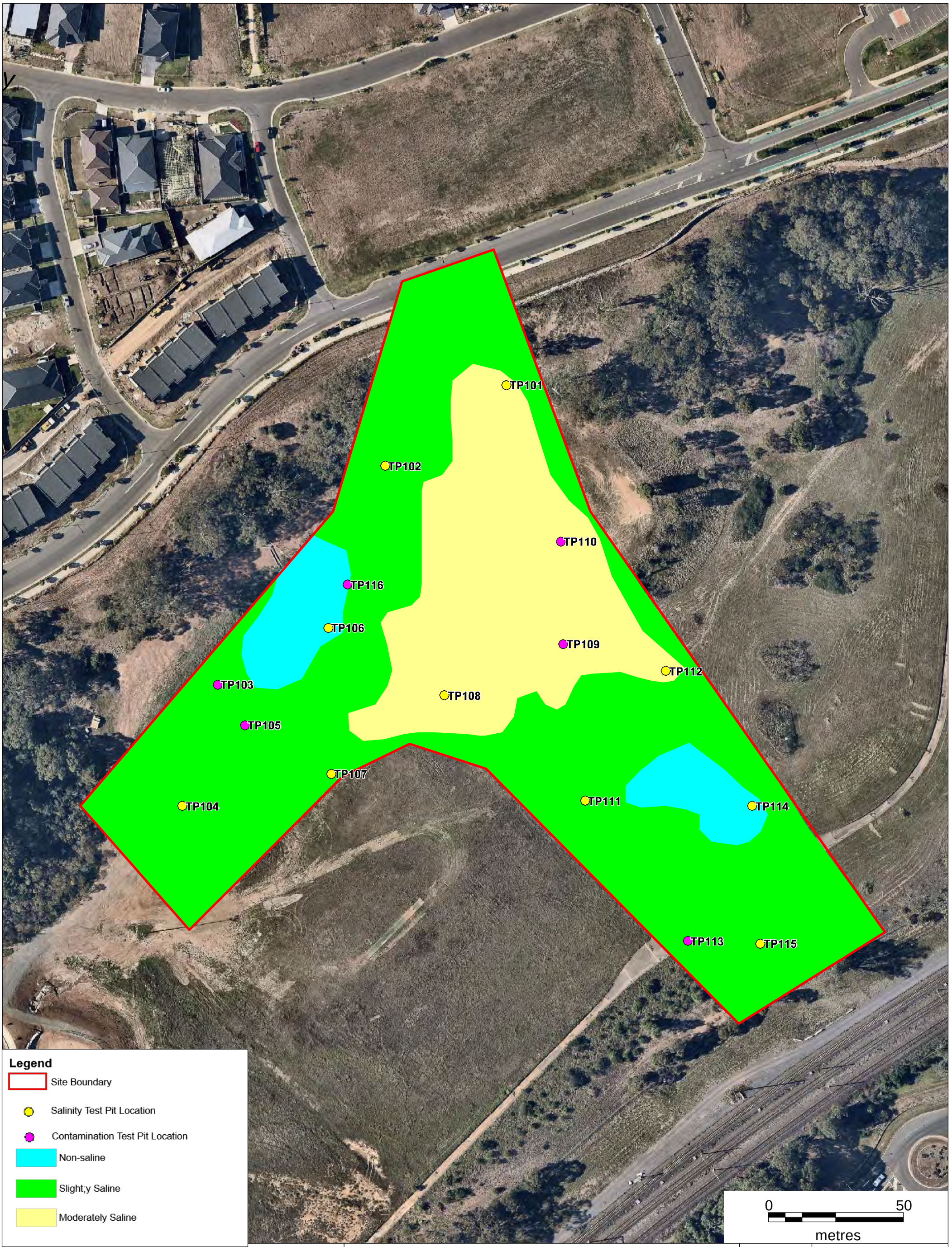


Douglas Partners
Geotechnics / Environment / Groundwater

TITLE: Aggressivity to Steel within Investigated Depth Zone
Proposed Sports and Health Centre of Excellence
Goldsmith Avenue, Campbelltown, NSW

OFFICE: Macarthur
DRAWN BY: CLN
DATE: 22.01.2018

CLIENT: Campbelltown City Council
PROJECT No: 34255.27
DRAWING No: 3
REVISION: A
SCALE: As shown



Douglas Partners
Geotechnics / Environment / Groundwater

TITLE: Salinities within Investigated Depth Zone
Proposed Sports and Health Centre of Excellence
Goldsmith Avenue, Campbelltown, NSW

OFFICE: Macarthur
DRAWN BY: CLN
DATE: 22.01.2018

CLIENT: Campbelltown City Council
PROJECT No: 34255.27
DRAWING No: 4
REVISION: A
SCALE: As shown

Appendix B

Test Pit Logs

TEST PIT LOG

CLIENT: Campbelltown City Council
PROJECT: Sports & Health Centre of Excellence
LOCATION: Goldsmith Avenue, Campbelltown

SURFACE LEVEL: 80 AHD
EASTING: 295784
NORTHING: 6227645

PIT No: 101
PROJECT No: 34255.26
DATE: 8/1/2018
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per mm)
80	0.1	TOPSOIL - dry brown clayey silt with trace rootlets		D	0.0				
		SILTY CLAY - dry light brown silty clay			0.2				
	0.5			D	0.4				
		SILTY CLAY - brown/dark brown silty clay with trace rootlets			0.5				
				D	0.9				
79	1				1.0				1
				D	1.4				
					1.5				
				D	1.9				
78	2 2.0	CLAY - grey mottled grey clay, mc<pl			2.0				2
				D	2.4				
					2.5				
				D	2.9				
77	3 3.0	Pit discontinued at 3.0m - limit of investigation			3.0				3
76	4								4

RIG: Hyundai 60 CR-96 excavator - 450mm bucket

LOGGED: LOC

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS: No odour, no staining.

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

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

TEST PIT LOG

CLIENT: Campbelltown City Council
PROJECT: Sports & Health Centre of Excellence
LOCATION: Goldsmith Avenue, Campbelltown

SURFACE LEVEL: 91 AHD
EASTING: 295739
NORTHING: 6227615

PIT No: 102
PROJECT No: 34255.26
DATE: 8/1/2018
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 150mm)
91	0.0	FILLING - light brown and red dry silty clay with trace dark grey gravels with trace brown shale gravels, mc<pl		D	0.0				
					0.2				
				B	0.4				
					0.5				
	0.6	SHALE - light grey shale, low strength, extremely weathered.							
90	1			D	0.9				1
					1.0				
	1.2	SHALE - light brown shale, low strength, extremely weathered.							
				D	1.4				
					1.5				
				D	1.6				
	1.7	Pit discontinued at 1.7m - refusal at 1.7m on low strength shale			1.7				
89	2								2
88	3								3
87	4								4

RIG: Hyundai 60 CR-96 excavator - 450mm bucket

LOGGED: LOC

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS: * Replicate sample BD2/080118 collected. No odour, no staining.

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

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

TEST PIT LOG

CLIENT: Campbelltown City Council
PROJECT: Sports & Health Centre of Excellence
LOCATION: Goldsmith Avenue, Campbelltown

SURFACE LEVEL: 86 AHD
EASTING: 295677
NORTHING: 6227534

PIT No: 103
PROJECT No: 34255.26
DATE: 8/1/2018
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per mm) 5 10 15 20
86		CLAYEY SILT - brown clayey silt with trace rootlets		D	0.0				
					0.2				
				D	0.4				
					0.5				
		- becoming brown clayey silt with trace gravels							
85	1			D	0.9				1
	1.0	Pit discontinued at 1.0m - limit of investigation			1.0				
84	2								2
83	3								3
82	4								4

RIG: Hyundai 60 CR-96 excavator - 450mm bucket

LOGGED: LOC

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS: No odour, no staining.

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

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

TEST PIT LOG

CLIENT: Campbelltown City Council
PROJECT: Sports & Health Centre of Excellence
LOCATION: Goldsmith Avenue, Campbelltown

SURFACE LEVEL: 82 AHD
EASTING: 295664
NORTHING: 6227489

PIT No: 104
PROJECT No: 34255.26
DATE: 8/1/2018
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per mm)
82	0.1	FILLING - road base, light brown clayey silt with some gravels with trace very light gray sandstone gravels		D	0.0				
		SILTY CLAY - orange mottled grey sandy silty clay, mc<pl			0.2				
				D	0.4				
	0.75				0.5				
		SHALE - low strength slightly weathered dark grey shale with some orange mottled grey silty sandy clay							
81	1 1.0			D	0.9				1
		SHALE - medium strength, slightly weathered, dark grey shale.			1.0				
				D	1.4				
	1.5	Pit discontinued at 1.5m - limit of investigation			1.5				
80	2								2
79	3								3
78	4								4

RIG: Hyundai 60 CR-96 excavator - 450mm bucket

LOGGED: LOC

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS: No odour, no staining.

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

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

TEST PIT LOG

CLIENT: Campbelltown City Council
PROJECT: Sports & Health Centre of Excellence
LOCATION: Goldsmith Avenue, Campbelltown

SURFACE LEVEL: 82 AHD
EASTING: 295687
NORTHING: 6227519

PIT No: 105
PROJECT No: 34255.26
DATE: 8/1/2018
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 50mm)
82	0.1	FILLING - (roadbase) light brown silty clay with basaltic gravels		D	0.0 0.05				
		SHALE - slightly weathered brown grey medium strength shale		B	0.2 0.3				
81	1								1
80	2								2
79	3.0	Pit discontinued at 3.0m - refusal at 0.25m on shale							3
78	4								4

Dynamic Penetrometer Test (blows per 50mm): 5, 10, 15, 20

RIG: Hyundai 60 CR-96 excavator - 450mm bucket

LOGGED: LOC

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS: No odour, no staining.

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

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

TEST PIT LOG

CLIENT: Campbelltown City Council
PROJECT: Sports & Health Centre of Excellence
LOCATION: Goldsmith Avenue, Campbelltown

SURFACE LEVEL: 80 AHD
EASTING: 295718
NORTHING: 6227555

PIT No: 106
PROJECT No: 34255.26
DATE: 8/1/2018
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per mm)
80	0.01	FILLING - very dark grey basaltic gravels (roadbase - loose)		D	0.0				
				D	0.05				
		FILLING - light grey and light brown sandy silty with light grey/brown gravels and trace light grey sandstone gravels			0.1				
	0.3	FILLING - medium orange mottled grey silty clay with trace light grey gravels		D	0.2				
					0.4				
	0.6	SHALE - highly weathered low strength dark grey shale		D	0.5				
					0.7				
	0.8	Pit discontinued at 0.8m - refusal at 0.8m on shale			0.8				
79	1								1
78	2								2
77	3								3
76	4								4

Dynamic Penetrometer Test (blows per mm): 5, 10, 15, 20

RIG: Hyundai 60 CR-96 excavator - 450mm bucket

LOGGED: LOC

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS: No odour, no staining.

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

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

TEST PIT LOG

CLIENT: Campbelltown City Council
PROJECT: Sports & Health Centre of Excellence
LOCATION: Goldsmith Avenue, Campbelltown

SURFACE LEVEL: 85 AHD
EASTING: 295719
NORTHING: 6227501

PIT No: 107
PROJECT No: 34255.26
DATE: 8/1/2018
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per mm)
85	0.1	TOPSOIL - light red brown clayey silty with trace rootlets and trace gravels		D	0.0				
		SILTY CLAY - red mottled orange and grey silty clay with trace rootlets, mc<pl			0.2				
				D	0.4				
	0.75	SILTY CLAY - red mottled grey silty clay, mc<pl			0.8				
				D	0.9				
84	1				1.0				1
					1.1				
				D					
					1.5				
					1.9				
				D					
83	2				2.0				2
					2.4				
	2.5			D					
		CLAY - light brown light orange mottled light grey clay, mc<pl			2.5				
					2.9				
82	3			D					3
	3.0	Pit discontinued at 3.0m - limit of investigation			3.0				
81	4								4

RIG: Hyundai 60 CR-96 excavator - 450mm bucket

LOGGED: LOC

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS: * Replicate sample BD1/080118 collected. No odour, no staining.

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

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

TEST PIT LOG

CLIENT: Campbelltown City Council
PROJECT: Sports & Health Centre of Excellence
LOCATION: Goldsmith Avenue, Campbelltown

SURFACE LEVEL: 78 AHD
EASTING: 295761
NORTHING: 6227530

PIT No: 108
PROJECT No: 34255.26
DATE: 9/1/2018
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per mm)
78	0.0			D	0.0				
	0.1	TOPSOIL - brown clayey silt with trace rootlets and trace gravels			0.1				
		CLAYEY SILT - brown clayey silt with trace rootlets		D	0.4				
					0.5				
	0.7	SILTY CLAY - grey mottled brown silty clay with trace rootlets							
77	1			D	0.9				1
					1.0				
	1.3	SILTY CLAY - light grey mottled light orange silty clay with trace rootlets		D	1.4				
	1.5	Pit discontinued at 1.5m - limit of investigation			1.5				
76	2								2
75	3								3
74	4								4

RIG: Hyundai 60 CR-96 excavator - 450mm bucket

LOGGED: LOC

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS: No odour, no staining.

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

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

TEST PIT LOG

CLIENT: Campbelltown City Council
PROJECT: Sports & Health Centre of Excellence
LOCATION: Goldsmith Avenue, Campbelltown

SURFACE LEVEL: 84 AHD
EASTING: 295803
NORTHING: 6227549

PIT No: 109
PROJECT No: 34255.26
DATE: 9/1/2018
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per mm)
84	0.0	TOPSOIL - brown clayey silt with trace rootlets		D	0.0				
	0.1	FILLING - light brown mottled orange and dark grey silty clay with trace rootlets		D	0.1				
	0.2				0.2				
	0.4	FILLING - dry brown silty clay with some dry grey silty clay with trace grey shale gravels		D	0.4				
	0.5				0.5				
	0.6	SILTY CLAY - brown mottled orange and light grey silty clay							
	0.8	Pit discontinued at 0.8m - refusal at 0.8m on grey shale							
83	1								1
82	2								2
81	3								3
80	4								4

Dynamic Penetrometer Test (blows per mm): 5, 10, 15, 20

RIG: Hyundai 60 CR-96 excavator - 450mm bucket

LOGGED: LOC

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS: * Replicate sample BD4/090118 collected. No odour, no staining.

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

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

TEST PIT LOG

CLIENT: Campbelltown City Council
PROJECT: Sports & Health Centre of Excellence
LOCATION: Goldsmith Avenue, Campbelltown

SURFACE LEVEL: 92 AHD
EASTING: 295804
NORTHING: 6227587

PIT No: 110
PROJECT No: 34255.26
DATE: 9/1/2018
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per mm)
92	0.1	ASPHALT CONCRETE			0.1				
		FILLING - brown silty sand with some gravels		D	0.2				
	0.3	FILLING - orange red brown silty clay with trace gravels			0.4				
	0.5	SILTY CLAY - orange mottled grey silty clay with trace gravels, mc<pl		D	0.5				
91	1 1.0	Pit discontinued at 1.0m - limit of investigation							1
90	2								2
89	3								3
88	4								4

5 10 15 20

RIG: Hyundai 60 CR-96 excavator - 450mm bucket

LOGGED: LOC

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS: No odour, no staining.

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

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

TEST PIT LOG

CLIENT: Campbelltown City Council
PROJECT: Sports & Health Centre of Excellence
LOCATION: Goldsmith Avenue, Campbelltown

SURFACE LEVEL: 80 AHD
EASTING: 295813
NORTHING: 6227491

PIT No: 111
PROJECT No: 34255.26
DATE: 9/1/2018
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per mm)
80	0.0	TOPSOIL - dark brown clayey silt with some dark grey shale gravels and trace rootlets.		D	0.0				
	0.2	CLAYEY SILT - dry, light brown clayey silt with trace rootlets		D	0.2 0.4 0.5				
	0.6	SILTY CLAY - light brown/orange/grey silty clay, mc<pl		D	0.9 1.0				
79	1			D	1.4				1
	1.5	Pit discontinued at 1.5m - limit of investigation			1.5				
78	2								2
77	3								3
76	4								4

RIG: Hyundai 60 CR-96 excavator - 450mm bucket

LOGGED: LOC

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS: No odour, no staining.

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

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

TEST PIT LOG

CLIENT: Campbelltown City Council
PROJECT: Sports & Health Centre of Excellence
LOCATION: Goldsmith Avenue, Campbelltown

SURFACE LEVEL: 79 AHD
EASTING: 295843
NORTHING: 6222539

PIT No: 112
PROJECT No: 34255.26
DATE: 8/1/2018
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per mm)
79	0.0	TOPSOIL - dry, brown silty clay with trace rootlets.		D	0.0				
					0.2				
	0.3	SILTY CLAY - dry, light brown mottled dark grey silty clay with trace rootlets, mc<pl		D	0.4				
					0.5				
				D	0.9				
78	1				1.0				1
				D	1.4				
					1.5				
				D	1.9				
77	2				2.0				2
	2.2	CLAY - grey mottled brown clay, mc<pl		D	2.4				
					2.5				
				D	2.9				
76	3				3.0				3
	3.0	Pit discontinued at 3.0m - limit of investigation							
75	4								4

RIG: Hyundai 60 CR-96 excavator - 450mm bucket

LOGGED: LOC

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS: * Replicate sample BD3/080118 collected. No odour, no staining.

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

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

TEST PIT LOG

CLIENT: Campbelltown City Council
PROJECT: Sports & Health Centre of Excellence
LOCATION: Goldsmith Avenue, Campbelltown

SURFACE LEVEL: 81 AHD
EASTING: 295851
NORTHING: 6277439

PIT No: 113
PROJECT No: 34255.26
DATE: 9/1/2018
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per mm)
81		SILTY CLAY - light brown/orange mottled light/dark grey and red silty clay with trace rootlets - potentially reworked.		D	0.0				
					0.2				
				D	0.4				
					0.5				
		- becoming light orange mottled light grey silty clay at 0.7m							
80	1 1.0	Pit discontinued at 1.0m - limit of investigation							1
79	2								2
78	3								3
77	4								4

RIG: Hyundai 60 CR-96 excavator - 450mm bucket

LOGGED: LOC

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS: * Replicate sample BD5/090118 collected. No odour, no staining.

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

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

TEST PIT LOG

CLIENT: Campbelltown City Council
PROJECT: Sports & Health Centre of Excellence
LOCATION: Goldsmith Avenue, Campbelltown

SURFACE LEVEL: 80 AHD
EASTING: 295875
NORTHING: 6227489

PIT No: 114
PROJECT No: 34255.26
DATE: 9/1/2018
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per mm)
80	0.0	CLAYEY SILT - brown clayey silt with trace rootlets		D	0.0				
					0.2				
	0.3	SILTY CLAY - dark grey brown silty clay with trace rootlets, mc<pl		D	0.4				
					0.5				
	0.6	SILTY CLAY - orange-brown silty clay, mc<pl							
79	1			D	0.9				1
					1.0				
	1.4	SILTY CLAY - light orange mottled light grey silty clay, mc<pl		D	1.34				
	1.5	Pit discontinued at 1.5m - limit of investigation			1.5				
78	2								2
77	3								3
76	4								4

RIG: Hyundai 60 CR-96 excavator - 450mm bucket

LOGGED: LOC

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS: No odour, no staining.

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

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

TEST PIT LOG

CLIENT: Campbelltown City Council
PROJECT: Sports & Health Centre of Excellence
LOCATION: Goldsmith Avenue, Campbelltown

SURFACE LEVEL: 84 AHD
EASTING: 295878
NORTHING: 6227438

PIT No: 115
PROJECT No: 34255.26
DATE: 9/1/2018
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per mm)
84	0.0			D	0.0				
	0.1	FILLING - brown clayey silt with some large very dark grey basaltic gravels and trace rootlets		D	0.1				
		FILLING - orange to light brown silty clay with mottled light grey/red/dark grey with trace rootlets and trace gravels, mc<pl			0.2				
				D	0.4				
	0.6				0.5				
		FILLING - brown/orange silty clay with trace light grey silty clay and gravels, mc<pl							
83	1			D	0.9				1
					1.0				
				D	1.4				
					1.5				
				D	1.9				
82	2				2.0				2
				D	2.4				
					2.5				
	2.8	SILTY CLAY - dark grey/orange silty clay, mc<pl		D	2.9				
81	3				3.0				3
	3.0	Pit discontinued at 3.0m - limit of investigation							
80	4								4

RIG: Hyundai 60 CR-96 excavator - 450mm bucket

LOGGED: LOC

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS: No odour, no staining.

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

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

TEST PIT LOG

CLIENT: Campbelltown City Council
PROJECT: Sports & Health Centre of Excellence
LOCATION: Goldsmith Avenue, Campbelltown

SURFACE LEVEL: 82 AHD
EASTING: 295725
NORTHING: 6227571

PIT No: 116
PROJECT No: 34255.26
DATE: 9/1/2018
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 150mm)
82	0	FILLING - dry brown clayey silt with trace rootlets							
	0.2	FILLING - dry brown silty clay with trace rootlets and gravels							
	0.5	CLAY - red clay mottled orange, dry with trace rootlets, mc<pl		B	0.5 0.7				
81	1								1
	1.5	SHALE - light grey, low strength, extremely weathered shale							
80	2								2
	2.0	Pit discontinued at 2.0m - limit of investigation							
79	3								3
78	4								4

Dynamic Penetrometer Test (blows per 150mm): 5, 10, 15, 20

RIG: Hyundai 60 CR-96 excavator - 450mm bucket

LOGGED: LOC

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS: No odour, no staining.

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

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 C

Summary Table

Test Bore or Pit	Test Location			Sample Depth	pH	Chloride Concentration	Sulphate Concentration	Resistivity	Soil Condition	Sample Aggressivity Class				
	East	North	RL					By inversion of EC1:5		Aggr. to Concrete - from sample pH	Aggr. to Concrete - from Sulphate conc.	Aggr. to Steel - from sample pH	Aggr. to Steel - from Chloride conc.	Aggr. to Steel - from sample Resistivity
	(m MGA56)	(m MGA56)	(m AHD)	(m bgl)	(pH units)	(mg/kg)	(mg/kg)	Ω.cm	[AS2159-2009]	[AS2159-2009]				
TP101	295784.0	6227645.0	80.0	0.5	6.8			3704	B	Non-Aggressive		Non-Aggressive		Non-Aggressive
				1.0	7.3			1923	B	Non-Aggressive		Non-Aggressive		Mild
				1.5	8.0			1852	B	Non-Aggressive		Non-Aggressive		Mild
				2.0	8.8			1515	B	Non-Aggressive		Non-Aggressive		Mild
.				3.0	8.2	280	10	2778	B	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive
TP102	295739.0	6227615.0	91.0	0.5	5.3			4348	B	Mild		Non-Aggressive		Non-Aggressive
				1.0	9.4			3704	B	Non-Aggressive		Non-Aggressive		Non-Aggressive
				1.5	8.5			3226	B	Non-Aggressive		Non-Aggressive		Non-Aggressive
.				1.6	9.4	200	10	4545	B	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive
TP104	295664.0	6227489.0	82.0	0.5	9.9	130	10	4167	B	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive
				1.0	9.6			5000	B	Non-Aggressive		Non-Aggressive		Non-Aggressive
.				1.5	9.6			7143	B	Non-Aggressive		Non-Aggressive		Non-Aggressive
TP106	295718.0	6227555.0	80.0	0.5	9.2	10	28	9091	B	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive
.				0.8	9.8			7143	B	Non-Aggressive		Non-Aggressive		Non-Aggressive
TP107	295719.0	6227501.0	85.0	0.5	9.2			2273	B	Non-Aggressive		Non-Aggressive		Non-Aggressive
				1.0	9.2			2703	B	Non-Aggressive		Non-Aggressive		Non-Aggressive
				1.5	9.3			2326	B	Non-Aggressive		Non-Aggressive		Non-Aggressive
				2.0	9.6			1724	B	Non-Aggressive		Non-Aggressive		Mild
				2.5	9.4	510	66	2500	B	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive
.				3.0	9.2			3333	B	Non-Aggressive		Non-Aggressive		Non-Aggressive
TP108	295761.0	6227530.0	76.0	0.5	7.9	10	10	22727	B	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive
				1.0	9.0			1695	B	Non-Aggressive		Non-Aggressive		Mild
.				1.5	9.3			1250	B	Non-Aggressive		Non-Aggressive		Mild
TP111	295813.0	6227491.0	80.0	0.5	8.2			27778	B	Non-Aggressive		Non-Aggressive		Non-Aggressive
				1.0	9.7			3125	B	Non-Aggressive		Non-Aggressive		Non-Aggressive
.				1.5	9.5	420	100	2439	B	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive
TP112	295843.0	6222539.0	79.0	0.2	7.5			11494	B	Non-Aggressive		Non-Aggressive		Non-Aggressive
				0.5	8.5			3226	B	Non-Aggressive		Non-Aggressive		Non-Aggressive
				1.0	9.3			1923	B	Non-Aggressive		Non-Aggressive		Mild
				1.5	9.2	790	69	1818	B	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive	Mild
				2.0	9.5			1493	B	Non-Aggressive		Non-Aggressive		Mild
.				2.5	9.0			1449	B	Non-Aggressive		Non-Aggressive		Mild
TP114	295875.0	6227489.0	80.0	0.5	7.9			29412	B	Non-Aggressive		Non-Aggressive		Non-Aggressive
.				1.0	8.0	10	20	28571	B	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive
TP115	295878.0	6227438.0	84.0	0.5	8.7			2703	B	Non-Aggressive		Non-Aggressive		Non-Aggressive
				1.0	8.8			1818	B	Non-Aggressive		Non-Aggressive		Mild
				1.5	8.7			2439	B	Non-Aggressive		Non-Aggressive		Non-Aggressive
				2.0	8.9	230	80	3846	B	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive
				2.5	7.3			4545	B	Non-Aggressive		Non-Aggressive		Non-Aggressive
.				3.0	7.1			6667	B	Non-Aggressive		Non-Aggressive		Non-Aggressive

Test Bore or Pit	Test Location			Sample Depth	Exchangeable Sodium (Na) Concentration	Cation Exchange Capacity	Sodicity	Sodicity Class	Emerson Crumb Class Number	Dispersion?	Soil Texture Group	Textural Factor (M)	$EC_{1:5}$	EC_e	Sample Salinity Class
	East	North	RL				[Na/CEC]			(from Emerson Class)	(for detailed soil logs see Report Appendix)		[Lab.]	[M x $EC_{1:5}$]	(Based on sample ECe)
	(m MGA56)	(m MGA56)	(m AHD)	(m bgl)	(meq/100g)	(meq/100g)	(%)	[after DLWC]		[AS1289.3.8.1]	[after DLWC]	[after DLWC]	(microS/cm)	(deciS/m)	[Richards 1954]
TP101	295784.0	6227645.0	80.0	0.5							Clay loam	9	270	2.4	Slightly Saline
				1.0							Light clay	9	520	4.4	Moderately Saline
				1.5							Light clay	9	540	4.6	Moderately Saline
				2.0							Medium clay	7	660	4.6	Moderately Saline
.				3.0	2.20	14.00	16	Highly Sodic	2	Some	Medium clay	7	360	2.5	Slightly Saline
TP102	295739.0	6227615.0	91.0	0.5							Medium clay	7	230	1.6	Non-Saline
				1.0							Medium clay	7	270	1.9	Non-Saline
				1.5							Medium clay	7	310	2.2	Slightly Saline
.				1.6							Heavy clay	6	220	1.3	Non-Saline
TP104	295664.0	6227489.0	82.0	0.5							Clay loam	9	240	2.2	Slightly Saline
				1.0							Clay loam	9	200	1.8	Non-Saline
.				1.5							Medium clay	7	140	1.0	Non-Saline
TP106	295718.0	6227555.0	80.0	0.5							Medium clay	7	110	0.8	Non-Saline
.				0.8							Medium clay	7	140	1.0	Non-Saline
TP107	295719.0	6227501.0	85.0	0.5							Light medium clay	8	440	3.5	Slightly Saline
				1.0							Medium clay	7	370	2.6	Slightly Saline
				1.5							Medium clay	7	430	3.0	Slightly Saline
				2.0							Heavy clay	6	580	3.5	Slightly Saline
				2.5							Heavy clay	6	400	2.4	Slightly Saline
.				3.0							Heavy clay	6	300	1.8	Non-Saline
TP108	295761.0	6227530.0	76.0	0.5	0.31	11.00	3	Non-Sodic	5	No	Clay loam	9	44	0.4	Non-Saline
				1.0							Light medium clay	8	590	4.7	Moderately Saline
.				1.5							Medium clay	7	800	5.6	Moderately Saline
TP111	295813.0	6227491.0	80.0	0.5							Light clay	9	36	0.3	Non-Saline
				1.0							Medium clay	7	320	2.2	Slightly Saline
.				1.5							Heavy clay	6	410	2.5	Slightly Saline
TP112	295843.0	6222539.0	79.0	0.2									87		
				0.5							Medium clay	7	310	2.2	Slightly Saline
				1.0							Medium clay	7	520	3.6	Slightly Saline
				1.5							Heavy clay	6	550	3.3	Slightly Saline
				2.0							Heavy clay	6	670	4.0	Moderately Saline
.				2.5							Heavy clay	6	690	4.1	Moderately Saline
TP114	295875.0	6227489.0	80.0	0.5							Light medium clay	8	34	0.3	Non-Saline
.				1.0							Medium clay	7	35	0.2	Non-Saline
TP115	295878.0	6227438.0	84.0	0.5							Light clay	9	370	3.1	Slightly Saline
				1.0							Medium clay	7	550	3.9	Slightly Saline
				1.5							Medium clay	7	410	2.9	Slightly Saline
				2.0	1.60	16.00	10	Sodic			Medium clay	7	260	1.8	Non-Saline
				2.5							Medium clay	7	220	1.5	Non-Saline
.				3.0							Medium clay	7	150	1.1	Non-Saline

Appendix D

Laboratory Analytical Reports

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

SAMPLE RECEIPT ADVICE

Client Details

Client	Douglas Partners Pty Ltd Smeaton Grange
Attention	Lachlan Clement, Emily McGinty

Sample Login Details

Your reference	34255.26, Campbelltown
Envirolab Reference	183054
Date Sample Received	10/01/2018
Date Instructions Received	10/01/2018
Date Results Expected to be Reported	17/01/2018

Sample Condition

Samples received in appropriate condition for analysis	YES
No. of Samples Provided	74 soil
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	3.0
Cooling Method	Ice
Sampling Date Provided	YES

Comments

Nil

Please direct any queries to:

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

Analysis Underway, details on the following page:

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
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www.envirolab.com.au

Sample ID	VOCs in soil	vTRH(C6-C10)/BTEXN in Soil	svTRH (C10-C40) in Soil	PAHs in Soil	Organochlorine Pesticidesin soil	PCBsin Soil	Acid Extractable metalsin soil	Asbestos ID - soils	pH1:5 soil:water	Electrical Conductivity1:5 soil:water	Chloride, Cl1:5 soil:water	Sulphate, SO41:5 soil:water	ESP/CEC	On Hold
TP101-0.0-0.2		✓	✓	✓	✓	✓	✓	✓						
TP101-0.4-0.5									✓	✓				
TP101-0.9-1.0									✓	✓				
TP101-1.4-1.5									✓	✓				
TP101-1.9-2.0									✓	✓				
TP101-2.4-25														✓
TP101-2.9-3.0									✓	✓	✓	✓	✓	
TP102-0.0-0.2														✓
TP102-0.4-0.5		✓	✓	✓			✓		✓	✓				
TP102-0.9-1.0									✓	✓				
TP102-1.4-1.5									✓	✓				
TP102-1.6-1.47									✓	✓	✓	✓		
TP103-0.0-0.2														✓
TP103-0.4-0.5		✓	✓	✓			✓							
TP103-0.9-1.0														✓
TP104-0.0-0.2		✓	✓	✓			✓							
TP104-0.4-0.5									✓	✓	✓	✓		
TP104-0.9-1.0									✓	✓				
TP104-1.4-1.5									✓	✓				
TP105-0.0-0.05		✓	✓	✓			✓							
TP105-0.1-0.2														✓
TP106-0.0-0.05														✓
TP106-0.1-0.2		✓	✓	✓	✓	✓	✓	✓						
TP106-0.4-0.5									✓	✓	✓	✓		
TP106-0.7-0.8									✓	✓				
TP107-0.0-0.2		✓	✓	✓			✓							
TP107-0.4-0.5									✓	✓				
TP107-0.9-1.0									✓	✓				
TP107-1.4-1.5									✓	✓				
TP107-1.9-2.0									✓	✓				
TP107-2.4-2.5									✓	✓	✓	✓		
TP107-2.9-3.0									✓	✓				

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Sample ID	VOCs in soil	vTRH(C6-C10)/BTEXN in Soil	svTRH (C10-C40) in Soil	PAHs in Soil	Organochlorine Pesticidesin soil	PCBsin Soil	Acid Extractable metalsin soil	Asbestos ID - soils	pH1:5 soil:water	Electrical Conductivity1:5 soil:water	Chloride, Cl1:5 soil:water	Sulphate, SO41:5 soil:water	ESP/CEC	On Hold
TP108-0.0-0.2														✓
TP108-0.4-0.5		✓	✓	✓			✓		✓	✓	✓	✓	✓	
TP108-0.9-1.0									✓	✓				
TP108-1.4-1.5									✓	✓				
TP109-0.0-0.1														✓
TP109-0.1-0.2		✓	✓	✓			✓	✓						
TP109-0.4-0.5														✓
TP110-0.1-0.2	✓	✓	✓	✓			✓							
TP110-0.4-0.5														✓
TP111-0.0-0.2		✓	✓	✓			✓	✓						
TP111-0.4-0.5									✓	✓				
TP111-0.9-1.0									✓	✓				
TP111-1.4-1.5									✓	✓	✓	✓		
TP112-0.0-0.2									✓	✓				
TP112-0.4-0.5		✓	✓	✓			✓		✓	✓				
TP112-0.9-1.0									✓	✓				
TP112-1.4-1.5									✓	✓	✓	✓		
TP112-1.9-2.0									✓	✓				
TP112-2.4-2.5									✓	✓				
TP112-2.9-3.0														✓
TP113-0.0-0.2														✓
TP113-0.4-0.5		✓	✓	✓			✓							
TP114-0.0-0.2														✓
TP114-0.4-0.5		✓	✓	✓			✓		✓	✓				
TP114-0.9-1.0									✓	✓	✓	✓		
TP114-1.4-1.5														✓
TP115-0.0-0.1														✓
TP115-0.1-0.2		✓	✓	✓			✓	✓						
TP115-0.4-0.5									✓	✓				
TP115-0.9-1.0									✓	✓				
TP115-1.4-1.5									✓	✓				
TP115-1.9-2.0									✓	✓	✓	✓	✓	

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
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Sample ID	VOCs in soil	vTRH(C6-C10)/BTEXN in Soil	svTRH (C10-C40) in Soil	PAHs in Soil	Organochlorine Pesticidesin soil	PCBsin Soil	Acid Extractable metalsin soil	Asbestos ID - soils	pH1:5 soil:water	Electrical Conductivity1:5 soil:water	Chloride, Cl1:5 soil:water	Sulphate, SO41:5 soil:water	ESP/CEC	On Hold
TP115-2.4-2.5		✓	✓	✓			✓		✓	✓				
TP115-2.9-3.0									✓	✓				
BD1-080118														✓
BD2-080118		✓	✓				✓							
BD3-080118														✓
BD4-090118														✓
BD5-090118														✓
SP1														✓
TB		✓												
TS		✓												

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

Additional Info

Sample storage - Waters are routinely disposed of approximately 1 month and soils approximately 2 months from receipt.
Requests for longer term sample storage must be received in writing.

Douglas Partners
Geotechnics / Environment / Groundwater

CHAIN OF CUSTODY

Project Name:	CAMPBELLTOWN, Sports Health Center, PSI			**To:**	Envirolab Services
Project No:	34255.26	**Sampler:**	Lachlan Clement		12 Ashley Street, Chatswood NSW 2067
Project Mgr:	Emily McGinty	**Mob. Phone:**	0427 102 041	**Attn:**	Tania Notaras
Email:	lachlan.clement@douglaspartners.com.au; Emily.McGinty@douglaspartners.com.au			**Phone:**	(02) 9910 6200 **Fax:** (02) 9910 6201
Date Required:	Standard			**Email:**	tnotaras@envirolabservices.com.au

Sample ID	Lab ID	Date Sampled	Sample Type (S - Soil, W - Water)	Container Type (G - Glass, P - Plastic)	Analytes: Metals	PAH	TRH	BTEX	OCP	PCB	Asbestos	Volatiles	pH	EC	Chloride	Sulphate	Sodicity	HOLD	Notes/preservation
TP101/0.0-0.2	1	08/01/18	S	G	x		x		x		x								Job No: 183054.
TP101/0.4-0.5	2	08/01/18	S	G									x						Date Received: 100118.
TP101/0.9-1.0	3	08/01/18	S	G									x						Time Received: 1425
TP101/1.4-1.5	4	08/01/18	S	G									x						Received by: EWS.
TP101/1.9-2.0	5	08/01/18	S	G									x						Temp: Cool/Ambient
TP101/2.4-2.5	6	08/01/18	S	G														x	Cooling: ~~Ice/Icepack~~
TP101/2.9-3.0	7	08/01/18	S	G									x		x		x		Security: Intact/~~Broken/None~~
TP102/0.0-0.2	8	08/01/18	S	G														x	
TP102/0.4-0.5	9	08/01/18	S	G	x		x						x						
TP102/0.9-1.0	10	08/01/18	S	G									x						
TP102/1.4-1.5	11	08/01/18	S	G									x						
TP102/1.6-1.7	12	08/01/18	S	G									x		x				
TP103/0.0-0.2	13	08/01/18	S	G														x	

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

Lab Report No:			
Send Results to:	Douglas Partners Pty Ltd	**Address** 18 Waler Crescent, Smeaton Grange 2567	**Phone:** (02) 4647 0075 **Fax:** (02) 4646 1886
Relinquished by:	LOC	**Transported to laboratory by:**	
Signed:	**Date & Time:** 10/01/2018	**Received by:**	EWS. 100118 14:25.

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CHAIN OF CUSTODY

Project Name:	CAMPBELLTOWN, Sports Health Center, PSI			**To:**	Envirolab Services
Project No:	34255.26	**Sampler:**	Lachlan Clement		12 Ashley Street, Chatswood NSW 2067
Project Mgr:	Emily McGinty	**Mob. Phone:**	0427 102 041	**Attn:**	Tania Notaras
Email:	lachlan.clement@douglaspartners.com.au; Emily.McGinty@douglaspartners.com.au			**Phone:**	(02) 9910 6200 **Fax:** (02) 9910 6201
Date Required:	Standard			**Email:**	tnotaras@envirolabservices.com.au

Sample ID	Lab ID	Date Sampled	Sample Type (S - Soil, W - Water)	Container Type (G - Glass, P - Plastic)	Analytes														Notes/preservation
					Metals	PAH	TRH	BTEX	OCP	PCB	Asbestos	Volatiles	pH	EC	Chloride	Sulphate	Sodicity	HOLD	
TP103/0.4-0.5	14	08/01/18	S	G	x		x												
TP103/0.9-1.0	15	08/01/18	S	G														x	
TP104/0.0-0.2	16	08/01/18	S	G	x		x												
TP104/0.4-0.5	17	08/01/18	S	G									x		x				
TP104/0.9-1.0	18	08/01/18	S	G									x						
TP104/1.4-1.5	19	08/01/18	S	G									x						
TP105/0.0-0.05	20	08/01/18	S	G	x		x												
TP105/0.1-0.2	21	08/01/18	S	G														x	
TP106/0.0-0.05	22	08/01/18	S	G														x	
TP106/0.1-0.2	23	08/01/18	S	G	x		x		x		x								
TP106/0.4-0.5	24	08/01/18	S	G									x		x				
TP106/0.7-0.8	25	08/01/18	S	G									x						

Lab Report No:					
Send Results to:	Douglas Partners Pty Ltd	**Address** 18 Waler Crescent, Smeaton Grange 2567		**Phone:** (02) 4647 0075	**Fax:** (02) 4646 1886
Relinquished by:	LOC		**Transported to laboratory by:**		
Signed:		**Date & Time:** 10/01/2018	**Received by:** Ellen Wh. ES. 100118. 1425.		

183054

Douglas Partners
Geotechnics / Environment / Groundwater

CHAIN OF CUSTODY

Project Name:	CAMPBELLTOWN, Sports Health Center, PSI			**To:**	Envirolab Services
Project No:	34255.26	**Sampler:**	Lachlan Clement		12 Ashley Street, Chatswood NSW 2067
Project Mgr:	Emily McGinty	**Mob. Phone:**	0427 102 041	**Attn:**	Tania Notaras
Email:	lachlan.clement@douglaspartners.com.au; Emily.McGinty@douglaspartners.com.au			**Phone:**	(02) 9910 6200 **Fax:** (02) 9910 6201
Date Required:	Standard			**Email:**	tnotaras@envirolabservices.com.au

Sample ID	Lab ID	Date Sampled	Sample Type (S - Soil, W - Water)	Container Type (G - Glass, P - Plastic)	Analytes														Notes/preservation
					Metals	PAH	TRH	BTEX	OCP	PCB	Asbestos	Volatiles	pH	EC	Chloride	Sulphate	Sodicity	HOLD	
TP107/0.0-0.2	26	08/01/18	S	G	x		x												
TP107/0.4-0.5	27	08/01/18	S	G									x						
TP107/0.9-1.0	28	08/01/18	S	G									x						
TP107/1.4-1.5	29	08/01/18	S	G									x						
TP107/1.9-2.0	30	08/01/18	S	G									x						
TP107/2.4-2.5	31	08/01/18	S	G									x		x				
TP107/2.9-3.0	32	08/01/18	S	G									x						
TP108/0.0-0.2	33	09/01/18	S	G														x	
TP108/0.4-0.5	34	09/01/18	S	G	x		x						x		x		x		
TP108/0.9-1.0	35	09/01/18	S	G									x						
TP108/1.4-1.5	36	09/01/18	S	G									x						
TP109/0.0-0.1	37	09/01/18	S	G														x	
TP109/0.1-0.2	38	09/01/18	S	G	x		x				x								

Lab Report No:					
Send Results to:	Douglas Partners Pty Ltd	**Address** 18 Waler Crescent, Smeaton Grange 2567		**Phone:** (02) 4647 0075	**Fax:** (02) 4646 1886
Relinquished by:	LOC		**Transported to laboratory by:**		
Signed:		**Date & Time:** 10/01/2018	**Received by:**	Ellen W ELS 100118 1420.	

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CHAIN OF CUSTODY

Project Name:	CAMPBELLTOWN, Sports Health Center, PSI			**To:**	Envirolab Services
Project No:	34255.26	**Sampler:**	Lachlan Clement		12 Ashley Street, Chatswood NSW 2067
Project Mgr:	Emily McGinty	**Mob. Phone:**	0427 102 041	**Attn:**	Tania Notaras
Email:	lachlan.clement@douglaspartners.com.au; Emily.McGinty@douglaspartners.com.au			**Phone:**	(02) 9910 6200 **Fax:** (02) 9910 6201
Date Required:	Standard			**Email:**	tnotaras@envirolabservices.com.au

Sample ID	Lab ID	Date Sampled	Sample Type (S - Soil, W - Water)	Container Type (G - Glass, P - Plastic)	Analytes														Notes/preservation
					Metals	PAH	TRH	BTEX	OCP	PCB	Asbestos	Volatiles	pH	EC	Chloride	Sulphate	Sodicity	HOLD	
TP109/0.4-0.5	39	09/01/18	S	G														x	
TP110/0.1-0.2	40	08/01/18	S	G	x		x					x							
TP110/0.4-0.5	41	08/01/18	S	G														x	
TP111/0.0-0.2	42	09/01/18	S	G	x		x				x								
TP111/0.4-0.5	43	09/01/18	S	G									x						
TP111/0.9-1.0	44	09/01/18	S	G									x						
TP111/1.4-1.5	45	09/01/18	S	G									x		x				
TP112/0.0-0.2	46	08/01/18	S	G									x						
TP112/0.4-0.5	47	08/01/18	S	G	x		x						x						
TP112/0.9-1.0	48	08/01/18	S	G									x						
TP112/1.4-1.5	49	08/01/18	S	G									x		x				
TP112/1.9-2.0	50	08/01/18	S	G									x						
TP112/2.4-2.5	51	08/01/18	S	G									x						

Lab Report No:					
Send Results to:	Douglas Partners Pty Ltd	**Address** 18 Waler Crescent, Smeaton Grange 2567		**Phone:** (02) 4647 0075	**Fax:** (02) 4646 1886
Relinquished by:	LOC		**Transported to laboratory by:**		
Signed:		**Date & Time:** 10/01/2018	**Received by:**	Ellen Wh. ES. 100118. 1425.	

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Douglas Partners
Geotechnics / Environment / Groundwater

CHAIN OF CUSTODY

Project Name:	CAMPBELLTOWN, Sports Health Center, PSI			**To:**	Envirolab Services
Project No:	34255.26	**Sampler:**	Lachlan Clement		12 Ashley Street, Chatswood NSW 2067
Project Mgr:	Emily McGinty	**Mob. Phone:**	0427 102 041	**Attn:**	Tania Notaras
Email:	lachlan.clement@douglaspartners.com.au; Emily.McGinty@douglaspartners.com.au			**Phone:**	(02) 9910 6200 **Fax:** (02) 9910 6201
Date Required:	Standard			**Email:**	tnotaras@envirolabservices.com.au

Sample ID	Lab ID	Date Sampled	Sample Type (S - Soil, W - Water)	Container Type (G - Glass, P - Plastic)	Analytes														Notes/preservation
					Metals	PAH	TRH	BTEX	OCP	PCB	Asbestos	Volatiles	pH	EC	Chloride	Sulphate	Sodicity	HOLD	
TP112/2.9-3.0	52	08/01/18	S	G														x	
TP113/0.0-0.2	53	09/01/18	S	G														x	
TP113/0.4-0.5	54	09/01/18	S	G	x		x												
TP114/0.0-0.2	55	09/01/18	S	G														x	
TP114/0.4-0.5	56	09/01/18	S	G	x		x						x						
TP114/0.9-1.0	57	09/01/18	S	G									x		x				
TP114/1.4-1.5	58	09/01/18	S	G														x	
TP115/0.0-0.1	59	09/01/18	S	G														x	
TP115/0.1-0.2	60	09/01/18	S	G	x		x				x								
TP115/0.4-0.5	61	09/01/18	S	G									x						
TP115/0.9-1.0	62	09/01/18	S	G									x						
TP115/1.4-1.5	63	09/01/18	S	G									x						
TP115/1.9-2.0	64	09/01/18	S	G									x		x		x		

Lab Report No:					
Send Results to:	Douglas Partners Pty Ltd	**Address** 18 Waler Crescent, Smeaton Grange 2567		**Phone:** (02) 4647 0075	**Fax:** (02) 4646 1886
Relinquished by:	LOC		**Transported to laboratory by:**		
Signed:		**Date & Time:** 10/01/2018	**Received by:**	Ellen W. ES. 100118. 1425.	

183054

Douglas Partners
Geotechnics / Environment / Groundwater

CHAIN OF CUSTODY

Project Name:	CAMPBELLTOWN, Sports Health Center, PSI			**To:**	Envirolab Services
Project No:	34255.26	**Sampler:**	Lachlan Clement		12 Ashley Street, Chatswood NSW 2067
Project Mgr:	Emily McGinty	**Mob. Phone:**	0427 102 041	**Attn:**	Tania Notaras
Email:	lachlan.clement@douglaspartners.com.au; Emily.McGinty@douglaspartners.com.au			**Phone:**	(02) 9910 6200 **Fax:** (02) 9910 6201
Date Required:	Standard			**Email:**	tnotaras@envirolabservices.com.au

Sample ID	Lab ID	Date Sampled	Sample Type (S - Soil, W - Water)	Container Type (G - Glass, P - Plastic)	Analytes														Notes/preservation
					Metals	PAH	TRH	BTEX	OCP	PCB	Asbestos	Volatiles	pH	EC	Chloride	Sulphate	Sodicity	HOLD	
TP115/2.4-2.5	65	09/01/18	S	G	x		x						x						
TP115/2.9-3.0	66	09/01/18	S	G									x						
BD1-080118	67	08/01/18	S	G														x	
BD2-080118	68	08/01/18	S	G	x		x												
BD3-080118	69	08/01/18	S	G														x	
BD4-090118	70	09/01/18	S	G														x	
BD5-090118	71	09/01/18	S	G														x	
SP1	72	09/01/18	S	G														x	
TB	73											x							
TS	74											x							

Lab Report No:

Send Results to: Douglas Partners Pty Ltd **Address** 19 Waler Crescent, Smeaton Grange 2567 **Phone:** (02) 4647 0076 **Fax:** (02) 4646 1887

Relinquished by: LOC **Transported to laboratory by:**

Signed: **Date & Time:** 10/01/2018 **Received by:** Ellen Wr. ELS. 100118 1425.

183054

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

CERTIFICATE OF ANALYSIS 183054

Client Details

Client	Douglas Partners Pty Ltd Smeaton Grange
Attention	Lachlan Clement, Emily McGinty
Address	18 Waler Crescent, Smeaton Grange, NSW, 2567

Sample Details

Your Reference	**34255.26, Campbelltown**
Number of Samples	74 soil
Date samples received	10/01/2018
Date completed instructions received	10/01/2018

Analysis Details

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

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

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

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

Report Details

Date results requested by	17/01/2018
Date of Issue	15/01/2018

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Asbestos Approved By
Analysed by Asbestos Approved Identifier: Matt Tang
Authorised by Asbestos Approved Signatory: Lulu Scott

Results Approved By
Dragana Tomas, Senior Chemist
Leon Ow, Chemist
Long Pham, Team Leader, Metals
Lulu Scott, Asbestos Supervisor
Priya Samarawickrama, Senior Chemist
Steven Luong, Senior Chemist

Authorised By

David Springer, General Manager

VOCs in soil		
Our Reference		183054-40
Your Reference	UNITS	TP110
Depth		0.1-0.2
Date Sampled		08/01/2018
Type of sample		soil
Date extracted	-	11/01/2018
Date analysed	-	12/01/2018
Dichlorodifluoromethane	mg/kg	<1
Chloromethane	mg/kg	<1
Vinyl Chloride	mg/kg	<1
Bromomethane	mg/kg	<1
Chloroethane	mg/kg	<1
Trichlorofluoromethane	mg/kg	<1
1,1-Dichloroethene	mg/kg	<1
trans-1,2-dichloroethene	mg/kg	<1
1,1-dichloroethane	mg/kg	<1
cis-1,2-dichloroethene	mg/kg	<1
bromochloromethane	mg/kg	<1
chloroform	mg/kg	<1
2,2-dichloropropane	mg/kg	<1
1,2-dichloroethane	mg/kg	<1
1,1,1-trichloroethane	mg/kg	<1
1,1-dichloropropene	mg/kg	<1
Cyclohexane	mg/kg	<1
carbon tetrachloride	mg/kg	<1
Benzene	mg/kg	<0.2
dibromomethane	mg/kg	<1
1,2-dichloropropane	mg/kg	<1
trichloroethene	mg/kg	<1
bromodichloromethane	mg/kg	<1
trans-1,3-dichloropropene	mg/kg	<1
cis-1,3-dichloropropene	mg/kg	<1
1,1,2-trichloroethane	mg/kg	<1
Toluene	mg/kg	<0.5
1,3-dichloropropane	mg/kg	<1
dibromochloromethane	mg/kg	<1
1,2-dibromoethane	mg/kg	<1
tetrachloroethene	mg/kg	<1
1,1,1,2-tetrachloroethane	mg/kg	<1
chlorobenzene	mg/kg	<1
Ethylbenzene	mg/kg	<1

VOCs in soil		
Our Reference		183054-40
Your Reference	UNITS	TP110
Depth		0.1-0.2
Date Sampled		08/01/2018
Type of sample		soil
bromoform	mg/kg	<1
m+p-xylene	mg/kg	<2
styrene	mg/kg	<1
1,1,2,2-tetrachloroethane	mg/kg	<1
o-Xylene	mg/kg	<1
1,2,3-trichloropropane	mg/kg	<1
isopropylbenzene	mg/kg	<1
bromobenzene	mg/kg	<1
n-propyl benzene	mg/kg	<1
2-chlorotoluene	mg/kg	<1
4-chlorotoluene	mg/kg	<1
1,3,5-trimethyl benzene	mg/kg	<1
tert-butyl benzene	mg/kg	<1
1,2,4-trimethyl benzene	mg/kg	<1
1,3-dichlorobenzene	mg/kg	<1
sec-butyl benzene	mg/kg	<1
1,4-dichlorobenzene	mg/kg	<1
4-isopropyl toluene	mg/kg	<1
1,2-dichlorobenzene	mg/kg	<1
n-butyl benzene	mg/kg	<1
1,2-dibromo-3-chloropropane	mg/kg	<1
1,2,4-trichlorobenzene	mg/kg	<1
hexachlorobutadiene	mg/kg	<1
1,2,3-trichlorobenzene	mg/kg	<1
Surrogate Dibromofluorometha	%	98
Surrogate aaa-Trifluorotoluene	%	83
Surrogate Toluene-d_8	%	97
Surrogate 4-Bromofluorobenzene	%	95

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		183054-1	183054-9	183054-14	183054-16	183054-20
Your Reference	UNITS	TP101	TP102	TP103	TP104	TP105
Depth		0.0-0.2	0.4-0.5	0.4-0.5	0.0-0.2	0.0-0.05
Date Sampled		08/01/2018	08/01/2018	08/01/2018	08/01/2018	08/01/2018
Type of sample		soil	soil	soil	soil	soil
Date extracted	-	11/01/2018	11/01/2018	11/01/2018	11/01/2018	11/01/2018
Date analysed	-	12/01/2018	12/01/2018	12/01/2018	12/01/2018	12/01/2018
TRH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25	<25	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
naphthalene	mg/kg	<1	<1	<1	<1	<1
Total +ve Xylenes	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	113	122	117	118	117

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		183054-23	183054-26	183054-34	183054-38	183054-40
Your Reference	UNITS	TP106	TP107	TP108	TP109	TP110
Depth		0.1-0.2	0.0-0.2	0.4-0.5	0.1-0.2	0.1-0.2
Date Sampled		08/01/2018	08/01/2018	08/01/2018	08/01/2018	08/01/2018
Type of sample		soil	soil	soil	soil	soil
Date extracted	-	11/01/2018	11/01/2018	11/01/2018	11/01/2018	11/01/2018
Date analysed	-	12/01/2018	12/01/2018	12/01/2018	12/01/2018	12/01/2018
TRH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25	<25	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
naphthalene	mg/kg	<1	<1	<1	<1	<1
Total +ve Xylenes	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	117	122	121	118	83

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		183054-42	183054-47	183054-54	183054-56	183054-60
Your Reference	UNITS	TP111	TP112	TP113	TP114	TP115
Depth		0.0-0.2	0.4-0.5	0.4-0.5	0.4-0.5	0.1-0.2
Date Sampled		08/01/2018	08/01/2018	09/01/2018	09/01/2018	09/01/2018
Type of sample		soil	soil	soil	soil	soil
Date extracted	-	11/01/2018	11/01/2018	11/01/2018	11/01/2018	11/01/2018
Date analysed	-	12/01/2018	12/01/2018	12/01/2018	12/01/2018	12/01/2018
TRH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25	<25	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
naphthalene	mg/kg	<1	<1	<1	<1	<1
Total +ve Xylenes	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	119	124	129	128	126

vTRH(C6-C10)/BTEXN in Soil					
Our Reference		183054-65	183054-68	183054-73	183054-74
Your Reference	UNITS	TP115	BD2-080118	TB	TS
Depth		2.4-2.5	-	-	-
Date Sampled		09/01/2018	08/01/2018	09/01/2018	09/01/2018
Type of sample		soil	soil	soil	soil
Date extracted	-	11/01/2018	11/01/2018	11/01/2018	11/01/2018
Date analysed	-	12/01/2018	12/01/2018	12/01/2018	12/01/2018
TRH C_6 - C_9	mg/kg	<25	<25	<25	[NA]
TRH C_6 - C_{10}	mg/kg	<25	<25	<25	[NA]
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25	[NA]
Benzene	mg/kg	<0.2	<0.2	<0.2	93%
Toluene	mg/kg	<0.5	<0.5	<0.5	92%
Ethylbenzene	mg/kg	<1	<1	<1	89%
m+p-xylene	mg/kg	<2	<2	<2	90%
o-Xylene	mg/kg	<1	<1	<1	90%
naphthalene	mg/kg	<1	<1	<1	[NA]
Total +ve Xylenes	mg/kg	<1	<1	<1	[NA]
Surrogate aaa-Trifluorotoluene	%	123	137	132	100

svTRH (C10-C40) in Soil						
Our Reference		183054-1	183054-9	183054-14	183054-16	183054-20
Your Reference	UNITS	TP101	TP102	TP103	TP104	TP105
Depth		0.0-0.2	0.4-0.5	0.4-0.5	0.0-0.2	0.0-0.05
Date Sampled		08/01/2018	08/01/2018	08/01/2018	08/01/2018	08/01/2018
Type of sample		soil	soil	soil	soil	soil
Date extracted	-	11/01/2018	11/01/2018	11/01/2018	11/01/2018	11/01/2018
Date analysed	-	12/01/2018	12/01/2018	12/01/2018	12/01/2018	12/01/2018
TRH C_{10} - C_{14}	mg/kg	<50	<50	<50	<50	<50
TRH C_{15} - C_{28}	mg/kg	<100	<100	<100	700	<100
TRH C_{29} - C_{36}	mg/kg	<100	<100	<100	360	<100
TRH >C_{10} -C_{16}	mg/kg	<50	<50	<50	140	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50	<50	<50	140	<50
TRH >C_{16} -C_{34}	mg/kg	<100	<100	<100	870	<100
TRH >C_{34} -C_{40}	mg/kg	<100	<100	<100	240	<100
Total +ve TRH (>C10-C40)	mg/kg	<50	<50	<50	1,200	<50
Surrogate o-Terphenyl	%	104	110	102	138	105

svTRH (C10-C40) in Soil						
Our Reference		183054-23	183054-26	183054-34	183054-38	183054-40
Your Reference	UNITS	TP106	TP107	TP108	TP109	TP110
Depth		0.1-0.2	0.0-0.2	0.4-0.5	0.1-0.2	0.1-0.2
Date Sampled		08/01/2018	08/01/2018	08/01/2018	08/01/2018	08/01/2018
Type of sample		soil	soil	soil	soil	soil
Date extracted	-	11/01/2018	11/01/2018	11/01/2018	11/01/2018	11/01/2018
Date analysed	-	12/01/2018	12/01/2018	12/01/2018	12/01/2018	12/01/2018
TRH C_{10} - C_{14}	mg/kg	<50	<50	<50	<50	<50
TRH C_{15} - C_{28}	mg/kg	<100	<100	<100	<100	<100
TRH C_{29} - C_{36}	mg/kg	<100	<100	<100	<100	210
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	220
TRH >C_{34} -C_{40}	mg/kg	<100	<100	<100	<100	250
Total +ve TRH (>C10-C40)	mg/kg	<50	<50	<50	<50	470
Surrogate o-Terphenyl	%	104	92	85	85	87

svTRH (C10-C40) in Soil						
Our Reference		183054-42	183054-47	183054-54	183054-56	183054-60
Your Reference	UNITS	TP111	TP112	TP113	TP114	TP115
Depth		0.0-0.2	0.4-0.5	0.4-0.5	0.4-0.5	0.1-0.2
Date Sampled		08/01/2018	08/01/2018	09/01/2018	09/01/2018	09/01/2018
Type of sample		soil	soil	soil	soil	soil
Date extracted	-	11/01/2018	11/01/2018	11/01/2018	11/01/2018	11/01/2018
Date analysed	-	12/01/2018	12/01/2018	12/01/2018	12/01/2018	12/01/2018
TRH C_{10} - C_{14}	mg/kg	<50	<50	<50	<50	<50
TRH C_{15} - C_{28}	mg/kg	<100	<100	<100	<100	<100
TRH C_{29} - C_{36}	mg/kg	<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
Total +ve TRH (>C10-C40)	mg/kg	<50	<50	<50	<50	<50
Surrogate o-Terphenyl	%	84	89	87	87	90

svTRH (C10-C40) in Soil			
Our Reference		183054-65	183054-68
Your Reference	UNITS	TP115	BD2-080118
Depth		2.4-2.5	-
Date Sampled		09/01/2018	08/01/2018
Type of sample		soil	soil
Date extracted	-	11/01/2018	11/01/2018
Date analysed	-	12/01/2018	12/01/2018
TRH C_{10} - C_{14}	mg/kg	<50	<50
TRH C_{15} - C_{28}	mg/kg	<100	<100
TRH C_{29} - C_{36}	mg/kg	<100	<100
TRH >C_{10} -C_{16}	mg/kg	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50	<50
TRH >C_{16} -C_{34}	mg/kg	<100	<100
TRH >C_{34} -C_{40}	mg/kg	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	<50	<50
Surrogate o-Terphenyl	%	87	89

PAHs in Soil						
Our Reference		183054-1	183054-9	183054-14	183054-16	183054-20
Your Reference	UNITS	TP101	TP102	TP103	TP104	TP105
Depth		0.0-0.2	0.4-0.5	0.4-0.5	0.0-0.2	0.0-0.05
Date Sampled		08/01/2018	08/01/2018	08/01/2018	08/01/2018	08/01/2018
Type of sample		soil	soil	soil	soil	soil
Date extracted	-	11/01/2018	11/01/2018	11/01/2018	11/01/2018	11/01/2018
Date analysed	-	11/01/2018	11/01/2018	11/01/2018	11/01/2018	11/01/2018
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<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	0.2	<0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	<0.1	<0.1	<0.1	0.2	<0.1
Pyrene	mg/kg	<0.1	<0.1	<0.1	0.2	<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	0.09	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve PAH's	mg/kg	<0.05	<0.05	<0.05	0.61	<0.05
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Surrogate p-Terphenyl-d14	%	110	103	105	103	108

PAHs in Soil						
Our Reference		183054-23	183054-26	183054-34	183054-38	183054-40
Your Reference	UNITS	TP106	TP107	TP108	TP109	TP110
Depth		0.1-0.2	0.0-0.2	0.4-0.5	0.1-0.2	0.1-0.2
Date Sampled		08/01/2018	08/01/2018	08/01/2018	08/01/2018	08/01/2018
Type of sample		soil	soil	soil	soil	soil
Date extracted	-	11/01/2018	11/01/2018	11/01/2018	11/01/2018	11/01/2018
Date analysed	-	11/01/2018	11/01/2018	11/01/2018	11/01/2018	11/01/2018
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	<0.1	0.1
Acenaphthene	mg/kg	<0.1	<0.1	<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	0.2
Anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	0.2
Fluoranthene	mg/kg	<0.1	<0.1	<0.1	<0.1	0.9
Pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	1.0
Benzo(a)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	0.6
Chrysene	mg/kg	<0.1	<0.1	<0.1	<0.1	0.5
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	<0.2	<0.2	<0.2	1
Benzo(a)pyrene	mg/kg	<0.05	<0.05	<0.05	<0.05	0.68
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	0.4
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	0.8
Total +ve PAH's	mg/kg	<0.05	<0.05	<0.05	<0.05	6.6
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	<0.5	<0.5	1.0
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	<0.5	<0.5	1.0
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	<0.5	<0.5	1.0
Surrogate p-Terphenyl-d14	%	108	106	107	105	105

PAHs in Soil						
Our Reference		183054-42	183054-47	183054-54	183054-56	183054-60
Your Reference	UNITS	TP111	TP112	TP113	TP114	TP115
Depth		0.0-0.2	0.4-0.5	0.4-0.5	0.4-0.5	0.1-0.2
Date Sampled		08/01/2018	08/01/2018	09/01/2018	09/01/2018	09/01/2018
Type of sample		soil	soil	soil	soil	soil
Date extracted	-	11/01/2018	11/01/2018	11/01/2018	11/01/2018	11/01/2018
Date analysed	-	11/01/2018	11/01/2018	11/01/2018	11/01/2018	11/01/2018
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<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
Total +ve PAH's	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Surrogate p-Terphenyl-d14	%	106	108	109	109	107

PAHs in Soil		
Our Reference		183054-65
Your Reference	UNITS	TP115
Depth		2.4-2.5
Date Sampled		09/01/2018
Type of sample		soil
Date extracted	-	11/01/2018
Date analysed	-	11/01/2018
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
Total +ve PAH's	mg/kg	<0.05
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
Surrogate p-Terphenyl-d14	%	110

Organochlorine Pesticides in soil			
Our Reference		183054-1	183054-23
Your Reference	UNITS	TP101	TP106
Depth		0.0-0.2	0.1-0.2
Date Sampled		08/01/2018	08/01/2018
Type of sample		soil	soil
Date extracted	-	11/01/2018	11/01/2018
Date analysed	-	12/01/2018	12/01/2018
HCB	mg/kg	<0.1	<0.1
alpha-BHC	mg/kg	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1
Total +ve DDT+DDD+DDE	mg/kg	<0.1	<0.1
Surrogate TCMX	%	100	106

PCBs in Soil			
Our Reference		183054-1	183054-23
Your Reference	UNITS	TP101	TP106
Depth		0.0-0.2	0.1-0.2
Date Sampled		08/01/2018	08/01/2018
Type of sample		soil	soil
Date extracted	-	11/01/2018	11/01/2018
Date analysed	-	12/01/2018	12/01/2018
Aroclor 1016	mg/kg	<0.1	<0.1
Aroclor 1221	mg/kg	<0.1	<0.1
Aroclor 1232	mg/kg	<0.1	<0.1
Aroclor 1242	mg/kg	<0.1	<0.1
Aroclor 1248	mg/kg	<0.1	<0.1
Aroclor 1254	mg/kg	<0.1	<0.1
Aroclor 1260	mg/kg	<0.1	<0.1
Total +ve PCBs (1016-1260)	mg/kg	<0.1	<0.1
Surrogate TCLMX	%	100	106

Acid Extractable metals in soil						
Our Reference		183054-1	183054-9	183054-14	183054-16	183054-20
Your Reference	UNITS	TP101	TP102	TP103	TP104	TP105
Depth		0.0-0.2	0.4-0.5	0.4-0.5	0.0-0.2	0.0-0.05
Date Sampled		08/01/2018	08/01/2018	08/01/2018	08/01/2018	08/01/2018
Type of sample		soil	soil	soil	soil	soil
Date prepared	-	11/01/2018	11/01/2018	11/01/2018	11/01/2018	11/01/2018
Date analysed	-	11/01/2018	11/01/2018	11/01/2018	11/01/2018	11/01/2018
Arsenic	mg/kg	7	14	9	6	<4
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	12	6	14	8	8
Copper	mg/kg	26	38	25	24	23
Lead	mg/kg	14	15	22	19	9
Mercury	mg/kg	<0.1	0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	13	21	17	12	7
Zinc	mg/kg	39	87	60	49	31

Acid Extractable metals in soil						
Our Reference		183054-23	183054-26	183054-34	183054-38	183054-40
Your Reference	UNITS	TP106	TP107	TP108	TP109	TP110
Depth		0.1-0.2	0.0-0.2	0.4-0.5	0.1-0.2	0.1-0.2
Date Sampled		08/01/2018	08/01/2018	08/01/2018	08/01/2018	08/01/2018
Type of sample		soil	soil	soil	soil	soil
Date prepared	-	11/01/2018	11/01/2018	11/01/2018	11/01/2018	11/01/2018
Date analysed	-	11/01/2018	11/01/2018	11/01/2018	11/01/2018	11/01/2018
Arsenic	mg/kg	<4	8	7	10	4
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	5	14	14	16	13
Copper	mg/kg	32	24	22	31	36
Lead	mg/kg	10	21	17	21	28
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	7	12	13	18	17
Zinc	mg/kg	26	45	39	57	54

Acid Extractable metals in soil						
Our Reference		183054-42	183054-47	183054-54	183054-56	183054-60
Your Reference	UNITS	TP111	TP112	TP113	TP114	TP115
Depth		0.0-0.2	0.4-0.5	0.4-0.5	0.4-0.5	0.1-0.2
Date Sampled		08/01/2018	08/01/2018	09/01/2018	09/01/2018	09/01/2018
Type of sample		soil	soil	soil	soil	soil
Date prepared	-	11/01/2018	11/01/2018	11/01/2018	11/01/2018	11/01/2018
Date analysed	-	11/01/2018	11/01/2018	11/01/2018	11/01/2018	11/01/2018
Arsenic	mg/kg	11	7	7	5	8
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	14	14	15	11	14
Copper	mg/kg	38	27	24	22	29
Lead	mg/kg	30	16	15	17	18
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	13	16	14	15	17
Zinc	mg/kg	55	44	41	42	51

Acid Extractable metals in soil			
Our Reference		183054-65	183054-68
Your Reference	UNITS	TP115	BD2-080118
Depth		2.4-2.5	-
Date Sampled		09/01/2018	08/01/2018
Type of sample		soil	soil
Date prepared	-	11/01/2018	11/01/2018
Date analysed	-	11/01/2018	11/01/2018
Arsenic	mg/kg	7	12
Cadmium	mg/kg	<0.4	<0.4
Chromium	mg/kg	15	6
Copper	mg/kg	21	39
Lead	mg/kg	17	14
Mercury	mg/kg	<0.1	<0.1
Nickel	mg/kg	10	29
Zinc	mg/kg	29	120

Moisture						
Our Reference		183054-1	183054-9	183054-14	183054-16	183054-20
Your Reference	UNITS	TP101	TP102	TP103	TP104	TP105
Depth		0.0-0.2	0.4-0.5	0.4-0.5	0.0-0.2	0.0-0.05
Date Sampled		08/01/2018	08/01/2018	08/01/2018	08/01/2018	08/01/2018
Type of sample		soil	soil	soil	soil	soil
Date prepared	-	11/01/2018	11/01/2018	11/01/2018	11/01/2018	11/01/2018
Date analysed	-	12/01/2018	12/01/2018	12/01/2018	12/01/2018	12/01/2018
Moisture	%	9.1	8.8	10	8.9	0.9

Moisture						
Our Reference		183054-23	183054-26	183054-34	183054-38	183054-40
Your Reference	UNITS	TP106	TP107	TP108	TP109	TP110
Depth		0.1-0.2	0.0-0.2	0.4-0.5	0.1-0.2	0.1-0.2
Date Sampled		08/01/2018	08/01/2018	08/01/2018	08/01/2018	08/01/2018
Type of sample		soil	soil	soil	soil	soil
Date prepared	-	11/01/2018	11/01/2018	11/01/2018	11/01/2018	11/01/2018
Date analysed	-	12/01/2018	12/01/2018	12/01/2018	12/01/2018	12/01/2018
Moisture	%	2.8	6.0	13	9.4	10

Moisture						
Our Reference		183054-42	183054-47	183054-54	183054-56	183054-60
Your Reference	UNITS	TP111	TP112	TP113	TP114	TP115
Depth		0.0-0.2	0.4-0.5	0.4-0.5	0.4-0.5	0.1-0.2
Date Sampled		08/01/2018	08/01/2018	09/01/2018	09/01/2018	09/01/2018
Type of sample		soil	soil	soil	soil	soil
Date prepared	-	11/01/2018	11/01/2018	11/01/2018	11/01/2018	11/01/2018
Date analysed	-	12/01/2018	12/01/2018	12/01/2018	12/01/2018	12/01/2018
Moisture	%	12	10	10	10	11

Moisture			
Our Reference		183054-65	183054-68
Your Reference	UNITS	TP115	BD2-080118
Depth		2.4-2.5	-
Date Sampled		09/01/2018	08/01/2018
Type of sample		soil	soil
Date prepared	-	11/01/2018	11/01/2018
Date analysed	-	12/01/2018	12/01/2018
Moisture	%	14	8.4

Asbestos ID - soils						
Our Reference		183054-1	183054-23	183054-38	183054-42	183054-60
Your Reference	UNITS	TP101	TP106	TP109	TP111	TP115
Depth		0.0-0.2	0.1-0.2	0.1-0.2	0.0-0.2	0.1-0.2
Date Sampled		08/01/2018	08/01/2018	08/01/2018	08/01/2018	09/01/2018
Type of sample		soil	soil	soil	soil	soil
Date analysed	-	11/01/2018	11/01/2018	11/01/2018	11/01/2018	11/01/2018
Sample mass tested	g	Approx. 25g	Approx. 35g	Approx. 15g	Approx. 20g	Approx. 25g
Sample Description	-	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Trace Analysis	-	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected

Misc Inorg - Soil						
Our Reference		183054-2	183054-3	183054-4	183054-5	183054-7
Your Reference	UNITS	TP101	TP101	TP101	TP101	TP101
Depth		0.4-0.5	0.9-1.0	1.4-1.5	1.9-2.0	2.9-3.0
Date Sampled		08/01/2018	08/01/2018	08/01/2018	08/01/2018	08/01/2018
Type of sample		soil	soil	soil	soil	soil
Date prepared	-	12/01/2018	12/01/2018	12/01/2018	12/01/2018	12/01/2018
Date analysed	-	12/01/2018	12/01/2018	12/01/2018	12/01/2018	12/01/2018
pH 1:5 soil:water	pH Units	6.8	7.3	8.0	8.8	8.2
Electrical Conductivity 1:5 soil:water	µS/cm	270	520	540	660	360
Chloride, Cl 1:5 soil:water	mg/kg	[NA]	[NA]	[NA]	[NA]	280
Sulphate, SO4 1:5 soil:water	mg/kg	[NA]	[NA]	[NA]	[NA]	10

Misc Inorg - Soil						
Our Reference		183054-9	183054-10	183054-11	183054-12	183054-17
Your Reference	UNITS	TP102	TP102	TP102	TP102	TP104
Depth		0.4-0.5	0.9-1.0	1.4-1.5	1.6-1.47	0.4-0.5
Date Sampled		08/01/2018	08/01/2018	08/01/2018	08/01/2018	08/01/2018
Type of sample		soil	soil	soil	soil	soil
Date prepared	-	12/01/2018	12/01/2018	12/01/2018	12/01/2018	12/01/2018
Date analysed	-	12/01/2018	12/01/2018	12/01/2018	12/01/2018	12/01/2018
pH 1:5 soil:water	pH Units	5.3	9.4	8.5	9.4	9.9
Electrical Conductivity 1:5 soil:water	µS/cm	230	270	310	220	240
Chloride, Cl 1:5 soil:water	mg/kg	[NA]	[NA]	[NA]	200	130
Sulphate, SO4 1:5 soil:water	mg/kg	[NA]	[NA]	[NA]	<10	<10

Misc Inorg - Soil						
Our Reference		183054-18	183054-19	183054-24	183054-25	183054-27
Your Reference	UNITS	TP104	TP104	TP106	TP106	TP107
Depth		0.9-1.0	1.4-1.5	0.4-0.5	0.7-0.8	0.4-0.5
Date Sampled		08/01/2018	08/01/2018	08/01/2018	08/01/2018	08/01/2018
Type of sample		soil	soil	soil	soil	soil
Date prepared	-	12/01/2018	12/01/2018	12/01/2018	12/01/2018	12/01/2018
Date analysed	-	12/01/2018	12/01/2018	12/01/2018	12/01/2018	12/01/2018
pH 1:5 soil:water	pH Units	9.6	9.6	9.2	9.8	9.2
Electrical Conductivity 1:5 soil:water	µS/cm	200	140	110	140	440
Chloride, Cl 1:5 soil:water	mg/kg	[NA]	[NA]	<10	[NA]	[NA]
Sulphate, SO4 1:5 soil:water	mg/kg	[NA]	[NA]	28	[NA]	[NA]

Misc Inorg - Soil						
Our Reference		183054-28	183054-29	183054-30	183054-31	183054-32
Your Reference	UNITS	TP107	TP107	TP107	TP107	TP107
Depth		0.9-1.0	1.4-1.5	1.9-2.0	2.4-2.5	2.9-3.0
Date Sampled		08/01/2018	08/01/2018	08/01/2018	08/01/2018	08/01/2018
Type of sample		soil	soil	soil	soil	soil
Date prepared	-	12/01/2018	12/01/2018	12/01/2018	12/01/2018	12/01/2018
Date analysed	-	12/01/2018	12/01/2018	12/01/2018	12/01/2018	12/01/2018
pH 1:5 soil:water	pH Units	9.2	9.3	9.6	9.4	9.2
Electrical Conductivity 1:5 soil:water	µS/cm	370	430	580	400	300
Chloride, Cl 1:5 soil:water	mg/kg	[NA]	[NA]	[NA]	510	[NA]
Sulphate, SO4 1:5 soil:water	mg/kg	[NA]	[NA]	[NA]	66	[NA]

Misc Inorg - Soil						
Our Reference		183054-34	183054-35	183054-36	183054-43	183054-44
Your Reference	UNITS	TP108	TP108	TP108	TP111	TP111
Depth		0.4-0.5	0.9-1.0	1.4-1.5	0.4-0.5	0.9-1.0
Date Sampled		08/01/2018	08/01/2018	08/01/2018	08/01/2018	08/01/2018
Type of sample		soil	soil	soil	soil	soil
Date prepared	-	12/01/2018	12/01/2018	12/01/2018	12/01/2018	12/01/2018
Date analysed	-	12/01/2018	12/01/2018	12/01/2018	12/01/2018	12/01/2018
pH 1:5 soil:water	pH Units	7.9	9.0	9.3	8.2	9.7
Electrical Conductivity 1:5 soil:water	µS/cm	44	590	800	36	320
Chloride, Cl 1:5 soil:water	mg/kg	<10	[NA]	[NA]	[NA]	[NA]
Sulphate, SO4 1:5 soil:water	mg/kg	<10	[NA]	[NA]	[NA]	[NA]

Misc Inorg - Soil						
Our Reference		183054-45	183054-46	183054-47	183054-48	183054-49
Your Reference	UNITS	TP111	TP112	TP112	TP112	TP112
Depth		1.4-1.5	0.0-0.2	0.4-0.5	0.9-1.0	1.4-1.5
Date Sampled		08/01/2018	08/01/2018	08/01/2018	08/01/2018	08/01/2018
Type of sample		soil	soil	soil	soil	soil
Date prepared	-	12/01/2018	12/01/2018	12/01/2018	12/01/2018	12/01/2018
Date analysed	-	12/01/2018	12/01/2018	12/01/2018	12/01/2018	12/01/2018
pH 1:5 soil:water	pH Units	9.5	7.5	8.5	9.3	9.2
Electrical Conductivity 1:5 soil:water	µS/cm	410	87	310	520	550
Chloride, Cl 1:5 soil:water	mg/kg	420	[NA]	[NA]	[NA]	790
Sulphate, SO4 1:5 soil:water	mg/kg	100	[NA]	[NA]	[NA]	69

Misc Inorg - Soil						
Our Reference		183054-50	183054-51	183054-56	183054-57	183054-61
Your Reference	UNITS	TP112	TP112	TP114	TP114	TP115
Depth		1.9-2.0	2.4-2.5	0.4-0.5	0.9-1.0	0.4-0.5
Date Sampled		08/01/2018	08/01/2018	09/01/2018	09/01/2018	09/01/2018
Type of sample		soil	soil	soil	soil	soil
Date prepared	-	12/01/2018	12/01/2018	12/01/2018	12/01/2018	12/01/2018
Date analysed	-	12/01/2018	12/01/2018	12/01/2018	12/01/2018	12/01/2018
pH 1:5 soil:water	pH Units	9.5	9.0	7.9	8.0	8.7
Electrical Conductivity 1:5 soil:water	µS/cm	670	690	34	35	370
Chloride, Cl 1:5 soil:water	mg/kg	[NA]	[NA]	[NA]	10	[NA]
Sulphate, SO4 1:5 soil:water	mg/kg	[NA]	[NA]	[NA]	20	[NA]

Misc Inorg - Soil						
Our Reference		183054-62	183054-63	183054-64	183054-65	183054-66
Your Reference	UNITS	TP115	TP115	TP115	TP115	TP115
Depth		0.9-1.0	1.4-1.5	1.9-2.0	2.4-2.5	2.9-3.0
Date Sampled		09/01/2018	09/01/2018	09/01/2018	09/01/2018	09/01/2018
Type of sample		soil	soil	soil	soil	soil
Date prepared	-	12/01/2018	12/01/2018	12/01/2018	12/01/2018	12/01/2018
Date analysed	-	12/01/2018	12/01/2018	12/01/2018	12/01/2018	12/01/2018
pH 1:5 soil:water	pH Units	8.8	8.7	8.9	7.3	7.1
Electrical Conductivity 1:5 soil:water	µS/cm	550	410	260	220	150
Chloride, Cl 1:5 soil:water	mg/kg	[NA]	[NA]	230	[NA]	[NA]
Sulphate, SO4 1:5 soil:water	mg/kg	[NA]	[NA]	80	[NA]	[NA]

ESP/CEC				
Our Reference		183054-7	183054-34	183054-64
Your Reference	UNITS	TP101	TP108	TP115
Depth		2.9-3.0	0.4-0.5	1.9-2.0
Date Sampled		08/01/2018	08/01/2018	09/01/2018
Type of sample		soil	soil	soil
Date prepared	-	12/01/2018	12/01/2018	12/01/2018
Date analysed	-	12/01/2018	12/01/2018	12/01/2018
Exchangeable Ca	meq/100g	2.8	5.9	5.3
Exchangeable K	meq/100g	0.2	0.2	0.1
Exchangeable Mg	meq/100g	8.4	4.8	8.7
Exchangeable Na	meq/100g	2.2	0.31	1.6
Cation Exchange Capacity	meq/100g	14	11	16
ESP	%	16	3	10

Method ID	Methodology Summary
ASB-001	Asbestos ID - Qualitative identification of asbestos in bulk samples using Polarised Light Microscopy and Dispersion Staining Techniques including Synthetic Mineral Fibre and Organic Fibre as per Australian Standard 4964-2004.
Inorg-001	pH - Measured using pH meter and electrode in accordance with APHA latest edition, 4500-H+. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times.
Inorg-002	Conductivity and Salinity - measured using a conductivity cell at 25°C in accordance with APHA latest edition 2510 and Rayment & Lyons.
Inorg-008	Moisture content determined by heating at 105+/-5 °C for a minimum of 12 hours.
Inorg-081	Anions - a range of Anions are determined by Ion Chromatography, in accordance with APHA latest edition, 4110-B. Alternatively determined by colourimetry/turbidity using Discrete Analyer.
Metals-009	Determination of exchangeable cations and cation exchange capacity in soils using 1M Ammonium Chloride exchange and ICP-AES analytical finish.
Metals-020	Determination of various metals by ICP-AES.
Metals-021	Determination of Mercury by Cold Vapour AAS.
Org-003	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
Org-003	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis. Note, the Total +ve TRH PQL is reflective of the lowest individual PQL and is therefore "Total +ve TRH" is simply a sum of the positive individual TRH fractions (>C10-C40).
Org-005	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC with dual ECD's.
Org-005	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC with dual ECD's. Note, the Total +ve reported DDD+DDE+DDT PQL is reflective of the lowest individual PQL and is therefore simply a sum of the positive individually report DDD+DDE+DDT.
Org-006	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD.
Org-006	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD. Note, the Total +ve PCBs PQL is reflective of the lowest individual PQL and is therefore" Total +ve PCBs" is simply a sum of the positive individual PCBs.

Method ID	Methodology Summary
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. 'EQ PQL'values are assuming all contributing PAHs reported as <PQL are actually at the PQL. This is the most conservative approach and can give false positive TEQs given that PAHs that contribute to the TEQ calculation may not be present. 2. 'EQ zero'values are assuming all contributing PAHs reported as <PQL are zero. This is the least conservative approach and is more susceptible to false negative TEQs when PAHs that contribute to the TEQ calculation are present but below PQL. 3. 'EQ half PQL'values are assuming all contributing PAHs reported as <PQL are half the stipulated PQL. Hence a mid-point between the most and least conservative approaches above. Note, the Total +ve PAHs PQL is reflective of the lowest individual PQL and is therefore "Total +ve PAHs" is simply a sum of the positive individual PAHs.
Org-014	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS.
Org-016	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.
Org-016	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater. Note, the Total +ve Xylene PQL is reflective of the lowest individual PQL and is therefore "Total +ve Xylenes" is simply a sum of the positive individual Xylenes.

QUALITY CONTROL: VOCs in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-4	183054-40
Date extracted	-			11/01/2018	40	11/01/2018	11/01/2018		11/01/2018	11/01/2018
Date analysed	-			12/01/2018	40	12/01/2018	12/01/2018		12/01/2018	12/01/2018
Dichlorodifluoromethane	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
Chloromethane	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
Vinyl Chloride	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
Bromomethane	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
Chloroethane	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
Trichlorofluoromethane	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
1,1-Dichloroethene	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
trans-1,2-dichloroethene	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
1,1-dichloroethane	mg/kg	1	Org-014	<1	40	<1	<1	0	81	83
cis-1,2-dichloroethene	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
bromochloromethane	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
chloroform	mg/kg	1	Org-014	<1	40	<1	<1	0	94	94
2,2-dichloropropane	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
1,2-dichloroethane	mg/kg	1	Org-014	<1	40	<1	<1	0	84	85
1,1,1-trichloroethane	mg/kg	1	Org-014	<1	40	<1	<1	0	78	79
1,1-dichloropropene	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
Cyclohexane	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
carbon tetrachloride	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
Benzene	mg/kg	0.2	Org-014	<0.2	40	<0.2	<0.2	0	[NT]	[NT]
dibromomethane	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
1,2-dichloropropane	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
trichloroethene	mg/kg	1	Org-014	<1	40	<1	<1	0	85	86
bromodichloromethane	mg/kg	1	Org-014	<1	40	<1	<1	0	98	100
trans-1,3-dichloropropene	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
cis-1,3-dichloropropene	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
1,1,2-trichloroethane	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
Toluene	mg/kg	0.5	Org-014	<0.5	40	<0.5	<0.5	0	[NT]	[NT]
1,3-dichloropropane	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
dibromochloromethane	mg/kg	1	Org-014	<1	40	<1	<1	0	104	106
1,2-dibromoethane	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
tetrachloroethene	mg/kg	1	Org-014	<1	40	<1	<1	0	88	88
1,1,1,2-tetrachloroethane	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
chlorobenzene	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
Ethylbenzene	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
bromoform	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
m+p-xylene	mg/kg	2	Org-014	<2	40	<2	<2	0	[NT]	[NT]
styrene	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
1,1,2,2-tetrachloroethane	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
o-Xylene	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]

QUALITY CONTROL: VOCs in soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-4	183054-40
1,2,3-trichloropropane	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
isopropylbenzene	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
bromobenzene	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
n-propyl benzene	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
2-chlorotoluene	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
4-chlorotoluene	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
1,3,5-trimethyl benzene	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
tert-butyl benzene	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
1,2,4-trimethyl benzene	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
1,3-dichlorobenzene	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
sec-butyl benzene	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
1,4-dichlorobenzene	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
4-isopropyl toluene	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
1,2-dichlorobenzene	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
n-butyl benzene	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
1,2-dibromo-3-chloropropane	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
1,2,4-trichlorobenzene	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
hexachlorobutadiene	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
1,2,3-trichlorobenzene	mg/kg	1	Org-014	<1	40	<1	<1	0	[NT]	[NT]
Surrogate Dibromofluorometha	%		Org-014	97	40	98	99	1	97	98
Surrogate aaa-Trifluorotoluene	%		Org-014	75	40	83	81	2	85	82
Surrogate Toluene-d_8	%		Org-014	98	40	97	97	0	98	97
Surrogate 4-Bromofluorobenzene	%		Org-014	97	40	95	95	0	99	99

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-4	183054-40
Date extracted	-			11/01/2018	1	11/01/2018	11/01/2018		11/01/2018	11/01/2018
Date analysed	-			12/01/2018	1	12/01/2018	12/01/2018		12/01/2018	12/01/2018
TRH C_6 - C_9	mg/kg	25	Org-016	<25	1	<25	<25	0	106	89
TRH C_6 - C_{10}	mg/kg	25	Org-016	<25	1	<25	<25	0	106	89
Benzene	mg/kg	0.2	Org-016	<0.2	1	<0.2	<0.2	0	100	82
Toluene	mg/kg	0.5	Org-016	<0.5	1	<0.5	<0.5	0	104	86
Ethylbenzene	mg/kg	1	Org-016	<1	1	<1	<1	0	101	91
m+p-xylene	mg/kg	2	Org-016	<2	1	<2	<2	0	112	92
o-Xylene	mg/kg	1	Org-016	<1	1	<1	<1	0	100	90
naphthalene	mg/kg	1	Org-014	<1	1	<1	<1	0	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-016	114	1	113	115	2	107	82

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	40	11/01/2018	11/01/2018		[NT]	[NT]
Date analysed	-			[NT]	40	12/01/2018	12/01/2018		[NT]	[NT]
TRH C_6 - C_9	mg/kg	25	Org-016	[NT]	40	<25	<25	0	[NT]	[NT]
TRH C_6 - C_{10}	mg/kg	25	Org-016	[NT]	40	<25	<25	0	[NT]	[NT]
Benzene	mg/kg	0.2	Org-016	[NT]	40	<0.2	<0.2	0	[NT]	[NT]
Toluene	mg/kg	0.5	Org-016	[NT]	40	<0.5	<0.5	0	[NT]	[NT]
Ethylbenzene	mg/kg	1	Org-016	[NT]	40	<1	<1	0	[NT]	[NT]
m+p-xylene	mg/kg	2	Org-016	[NT]	40	<2	<2	0	[NT]	[NT]
o-Xylene	mg/kg	1	Org-016	[NT]	40	<1	<1	0	[NT]	[NT]
naphthalene	mg/kg	1	Org-014	[NT]	40	<1	<1	0	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-016	[NT]	40	83	81	2	[NT]	[NT]

QUALITY CONTROL: svTRH (C10-C40) in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-4	183054-23
Date extracted	-			11/01/2018	1	11/01/2018	11/01/2018		11/01/2018	11/01/2018
Date analysed	-			12/01/2018	1	12/01/2018	12/01/2018		12/01/2018	12/01/2018
TRH C_{10} - C_{14}	mg/kg	50	Org-003	<50	1	<50	<50	0	120	126
TRH C_{15} - C_{28}	mg/kg	100	Org-003	<100	1	<100	<100	0	130	126
TRH C_{29} - C_{36}	mg/kg	100	Org-003	<100	1	<100	<100	0	123	120
TRH >C_{10} -C_{16}	mg/kg	50	Org-003	<50	1	<50	<50	0	120	126
TRH >C_{16} -C_{34}	mg/kg	100	Org-003	<100	1	<100	<100	0	130	126
TRH >C_{34} -C_{40}	mg/kg	100	Org-003	<100	1	<100	<100	0	123	120
Surrogate o-Terphenyl	%		Org-003	104	1	104	105	1	114	104

QUALITY CONTROL: svTRH (C10-C40) in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	40	11/01/2018	11/01/2018		[NT]	[NT]
Date analysed	-			[NT]	40	12/01/2018	12/01/2018		[NT]	[NT]
TRH C_{10} - C_{14}	mg/kg	50	Org-003	[NT]	40	<50	<50	0	[NT]	[NT]
TRH C_{15} - C_{28}	mg/kg	100	Org-003	[NT]	40	<100	<100	0	[NT]	[NT]
TRH C_{29} - C_{36}	mg/kg	100	Org-003	[NT]	40	210	230	9	[NT]	[NT]
TRH >C_{10} -C_{16}	mg/kg	50	Org-003	[NT]	40	<50	<50	0	[NT]	[NT]
TRH >C_{16} -C_{34}	mg/kg	100	Org-003	[NT]	40	220	240	9	[NT]	[NT]
TRH >C_{34} -C_{40}	mg/kg	100	Org-003	[NT]	40	250	260	4	[NT]	[NT]
Surrogate o-Terphenyl	%		Org-003	[NT]	40	87	101	15	[NT]	[NT]

QUALITY CONTROL: PAHs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-4	183054-23
Date extracted	-			11/01/2018	1	11/01/2018	11/01/2018		11/01/2018	11/01/2018
Date analysed	-			11/01/2018	1	11/01/2018	11/01/2018		11/01/2018	11/01/2018
Naphthalene	mg/kg	0.1	Org-012	<0.1	1	<0.1	<0.1	0	88	82
Acenaphthylene	mg/kg	0.1	Org-012	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-012	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Fluorene	mg/kg	0.1	Org-012	<0.1	1	<0.1	<0.1	0	91	86
Phenanthrene	mg/kg	0.1	Org-012	<0.1	1	<0.1	<0.1	0	95	88
Anthracene	mg/kg	0.1	Org-012	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-012	<0.1	1	<0.1	<0.1	0	98	94
Pyrene	mg/kg	0.1	Org-012	<0.1	1	<0.1	<0.1	0	119	113
Benzo(a)anthracene	mg/kg	0.1	Org-012	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-012	<0.1	1	<0.1	<0.1	0	88	88
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-012	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-012	<0.05	1	<0.05	<0.05	0	81	83
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-012	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-012	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-012	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-012	107	1	110	104	6	105	106

QUALITY CONTROL: PAHs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	40	11/01/2018	11/01/2018		[NT]	[NT]
Date analysed	-			[NT]	40	11/01/2018	11/01/2018		[NT]	[NT]
Naphthalene	mg/kg	0.1	Org-012	[NT]	40	<0.1	<0.1	0	[NT]	[NT]
Acenaphthylene	mg/kg	0.1	Org-012	[NT]	40	0.1	<0.1	0	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-012	[NT]	40	<0.1	<0.1	0	[NT]	[NT]
Fluorene	mg/kg	0.1	Org-012	[NT]	40	<0.1	<0.1	0	[NT]	[NT]
Phenanthrene	mg/kg	0.1	Org-012	[NT]	40	0.2	0.2	0	[NT]	[NT]
Anthracene	mg/kg	0.1	Org-012	[NT]	40	0.2	0.1	67	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-012	[NT]	40	0.9	0.8	12	[NT]	[NT]
Pyrene	mg/kg	0.1	Org-012	[NT]	40	1.0	0.9	11	[NT]	[NT]
Benzo(a)anthracene	mg/kg	0.1	Org-012	[NT]	40	0.6	0.6	0	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-012	[NT]	40	0.5	0.4	22	[NT]	[NT]
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-012	[NT]	40	1	0.9	11	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-012	[NT]	40	0.68	0.63	8	[NT]	[NT]
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-012	[NT]	40	0.4	0.4	0	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-012	[NT]	40	0.1	<0.1	0	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-012	[NT]	40	0.8	0.7	13	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-012	[NT]	40	105	103	2	[NT]	[NT]

QUALITY CONTROL: Organochlorine Pesticides in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-3	[NT]
Date extracted	-			11/01/2018	1	11/01/2018	11/01/2018		11/01/2018	[NT]
Date analysed	-			12/01/2018	1	12/01/2018	12/01/2018		12/01/2018	[NT]
HCB	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
alpha-BHC	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	83	[NT]
gamma-BHC	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
beta-BHC	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	98	[NT]
Heptachlor	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	93	[NT]
delta-BHC	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aldrin	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	98	[NT]
Heptachlor Epoxide	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	99	[NT]
gamma-Chlordane	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
alpha-chlordane	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Endosulfan I	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
pp-DDE	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	98	[NT]
Dieldrin	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	100	[NT]
Endrin	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	94	[NT]
pp-DDD	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	99	[NT]
Endosulfan II	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
pp-DDT	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Endrin Aldehyde	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Endosulfan Sulphate	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	85	[NT]
Methoxychlor	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-005	112	1	100	111	10	116	[NT]

QUALITY CONTROL: PCBs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-3	[NT]
Date extracted	-			11/01/2018	1	11/01/2018	11/01/2018		11/01/2018	[NT]
Date analysed	-			12/01/2018	1	12/01/2018	12/01/2018		12/01/2018	[NT]
Aroclor 1016	mg/kg	0.1	Org-006	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1221	mg/kg	0.1	Org-006	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1232	mg/kg	0.1	Org-006	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1242	mg/kg	0.1	Org-006	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1248	mg/kg	0.1	Org-006	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1254	mg/kg	0.1	Org-006	<0.1	1	<0.1	<0.1	0	112	[NT]
Aroclor 1260	mg/kg	0.1	Org-006	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCLMX	%		Org-006	112	1	100	111	10	99	[NT]

QUALITY CONTROL: Acid Extractable metals in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-4	183054-40
Date prepared	-			11/01/2018	1	11/01/2018	11/01/2018		11/01/2018	11/01/2018
Date analysed	-			11/01/2018	1	11/01/2018	11/01/2018		11/01/2018	11/01/2018
Arsenic	mg/kg	4	Metals-020	<4	1	7	6	15	106	82
Cadmium	mg/kg	0.4	Metals-020	<0.4	1	<0.4	<0.4	0	104	80
Chromium	mg/kg	1	Metals-020	<1	1	12	12	0	107	81
Copper	mg/kg	1	Metals-020	<1	1	26	26	0	107	122
Lead	mg/kg	1	Metals-020	<1	1	14	13	7	102	85
Mercury	mg/kg	0.1	Metals-021	<0.1	1	<0.1	<0.1	0	114	126
Nickel	mg/kg	1	Metals-020	<1	1	13	12	8	103	71
Zinc	mg/kg	1	Metals-020	<1	1	39	41	5	103	76

QUALITY CONTROL: Acid Extractable metals in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	23	11/01/2018	11/01/2018		[NT]	[NT]
Date analysed	-			[NT]	23	11/01/2018	11/01/2018		[NT]	[NT]
Arsenic	mg/kg	4	Metals-020	[NT]	23	<4	<4	0	[NT]	[NT]
Cadmium	mg/kg	0.4	Metals-020	[NT]	23	<0.4	<0.4	0	[NT]	[NT]
Chromium	mg/kg	1	Metals-020	[NT]	23	5	5	0	[NT]	[NT]
Copper	mg/kg	1	Metals-020	[NT]	23	32	32	0	[NT]	[NT]
Lead	mg/kg	1	Metals-020	[NT]	23	10	8	22	[NT]	[NT]
Mercury	mg/kg	0.1	Metals-021	[NT]	23	<0.1	<0.1	0	[NT]	[NT]
Nickel	mg/kg	1	Metals-020	[NT]	23	7	6	15	[NT]	[NT]
Zinc	mg/kg	1	Metals-020	[NT]	23	26	23	12	[NT]	[NT]

QUALITY CONTROL: Misc Inorg - Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-4	183054-12
Date prepared	-			12/01/2018	9	12/01/2018	12/01/2018		12/01/2018	12/01/2018
Date analysed	-			12/01/2018	9	12/01/2018	12/01/2018		12/01/2018	12/01/2018
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	9	5.3	5.3	0	102	[NT]
Electrical Conductivity 1:5 soil:water	µS/cm	1	Inorg-002	<1	9	230	260	12	105	[NT]
Chloride, Cl 1:5 soil:water	mg/kg	10	Inorg-081	<10	64	230	260	12	118	96
Sulphate, SO4 1:5 soil:water	mg/kg	10	Inorg-081	<10	64	80	92	14	118	103

QUALITY CONTROL: Misc Inorg - Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			[NT]	19	12/01/2018	12/01/2018		12/01/2018	[NT]
Date analysed	-			[NT]	19	12/01/2018	12/01/2018		12/01/2018	[NT]
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	19	9.6	9.6	0	102	[NT]
Electrical Conductivity 1:5 soil:water	µS/cm	1	Inorg-002	[NT]	19	140	140	0	104	[NT]

QUALITY CONTROL: Misc Inorg - Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	43	12/01/2018	12/01/2018		[NT]	[NT]
Date analysed	-			[NT]	43	12/01/2018	12/01/2018		[NT]	[NT]
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	43	8.2	7.9	4	[NT]	[NT]
Electrical Conductivity 1:5 soil:water	µS/cm	1	Inorg-002	[NT]	43	36	33	9	[NT]	[NT]

QUALITY CONTROL: Misc Inorg - Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	64	12/01/2018	12/01/2018		[NT]	[NT]
Date analysed	-			[NT]	64	12/01/2018	12/01/2018		[NT]	[NT]
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	64	8.9	8.8	1	[NT]	[NT]
Electrical Conductivity 1:5 soil:water	µS/cm	1	Inorg-002	[NT]	64	260	360	32	[NT]	[NT]

QUALITY CONTROL: ESP/CEC					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-4	[NT]
Date prepared	-			12/01/2018	[NT]	[NT]	[NT]	[NT]	12/01/2018	[NT]
Date analysed	-			12/01/2018	[NT]	[NT]	[NT]	[NT]	12/01/2018	[NT]
Exchangeable Ca	meq/100g	0.1	Metals-009	<0.1	[NT]	[NT]	[NT]	[NT]	104	[NT]
Exchangeable K	meq/100g	0.1	Metals-009	<0.1	[NT]	[NT]	[NT]	[NT]	105	[NT]
Exchangeable Mg	meq/100g	0.1	Metals-009	<0.1	[NT]	[NT]	[NT]	[NT]	99	[NT]
Exchangeable Na	meq/100g	0.1	Metals-009	<0.1	[NT]	[NT]	[NT]	[NT]	97	[NT]

Result Definitions

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

Quality Control Definitions

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

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

Laboratory Acceptance Criteria

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

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

Spikes for Physical and Aggregate Tests are not applicable.

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

Duplicates: <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.

Measurement Uncertainty estimates are available for most tests upon request.

Report Comments

Asbestos: Excessive sample volumes were provided for asbestos analysis.
A portion of the supplied samples were sub-sampled according to Envirolab procedures.
We cannot guarantee that these sub-samples are indicative of the entire sample.
Envirolab recommends supplying 40-50g (50mL) of sample in its own container as per AS4964-2004.
Note: Samples 183054-1, 23, 38, 42, & 60 were sub-sampled from bags provided by the client.

Material Test Report

Douglas Partners
Geotechnics / Environment / Groundwater
Douglas Partners Pty Ltd
Macarthur Laboratory
18 Waler Crescent Smeaton Grange NSW 2567
Phone: (02) 4647 0075
Fax: (02) 4646 1886
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Accredited for compliance with ISO/IEC 17025 - Testing

NATA
WORLD RECOGNISED ACCREDITATION

J.T. Purcell

Approved Signatory: John Purcell
Lab technician

NATA Accredited Laboratory Number: 828

Report Number: **34255.27-1**
Issue Number: 1
Date Issued: 18/01/2018
Client: Campbelltown City Council
PO Box 57, Campbelltown NSW 2560
Contact: Ares Liu
Project Number: 34255.27
Project Name: Proposed Sports and Health Centre of Excellence, Geotechnic
Project Location: Goldsmith Avenue, Campbelltown
Work Request: 276
Sample Number: 18-276A
Date Sampled: 08/01/2018
Sampling Method: Sampled by Engineering Department
Sample Location: **TP101 (3.0m)**
Material: SILTY CLAY - grey silty clay

Emerson Class Number of a Soil (AS 1289 3.8.1)		Min	Max
Emerson Class	**2**		
Soil Description	SILTY CLAY - grey silty clay		
Nature of Water	Distilled		
Temperature of Water (^{o}C)	20		

Material Test Report

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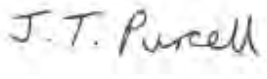

Approved Signatory: John Purcell
Lab technician
NATA Accredited Laboratory Number: 828

Report Number: **34255.27-1**
Issue Number: 1
Date Issued: 18/01/2018
Client: Campbelltown City Council
PO Box 57, Campbelltown NSW 2560
Contact: Ares Liu
Project Number: 34255.27
Project Name: Proposed Sports and Health Centre of Excellence, Geotechnic
Project Location: Goldsmith Avenue, Campbelltown
Work Request: 276
Sample Number: 18-276B
Date Sampled: 08/01/2018
Sampling Method: Sampled by Engineering Department
Sample Location: **TP108 (0.5m)**
Material: SILTY CLAY - light brown silty clay

Emerson Class Number of a Soil (AS 1289 3.8.1)		Min	Max
Emerson Class	**5**		
Soil Description	SILTY CLAY - light brown silty		
Nature of Water	Distilled		
Temperature of Water (^{o}C)	20		