



Douglas Partners
Geotechnics | Environment | Groundwater

Report on
Salinity Investigation and Management Plan

Proposed Industrial Development
Stage 3, Sydney Business Park, Marsden Park, NSW

Prepared for
Marsden Park Developments Pty Ltd

Project 94616.01
July 2020

Integrated Practical Solutions



Document History

Document details

Project No.	94616.01	Document No.	R.002.Rev1
Document title	Report on Salinity Investigation and Management Plan Proposed Industrial Development		
Site address	Stage 3, Sydney Business Park, Marsden Park, NSW		
Report prepared for	Marsden Park Developments Pty Ltd		
File name	94616.01.R.002.Rev1		



Document status and review

Status	Prepared by	Reviewed by	Date issued
Revision 0	Rod Gray	Bradley Harris	23 July 2020
Revision 1	Rod Gray	Bradley Harris	27 July 2020

Distribution of copies

Status	Electronic	Paper	Issued to
Revision 0	1	0	Marsden Park Developments Pty Ltd, Mr Michael Gray
Revision 1	1	0	Marsden Park Developments Pty Ltd, Mr Michael Gray

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 	27 July 2020
Reviewer 	27 July 2020



Douglas Partners Pty Ltd
 ABN 75 053 980 117
www.douglaspartners.com.au
 18 Waler Crescent
 Smeaton Grange NSW 2567
 Phone (02) 4647 0075

Table of Contents

	Page
1. Introduction.....	1
3. Scope of Works.....	2
4. Previous Investigations and Results	3
5. Site Description	4
6. Topography, Soils and Geology and Salinity Potential	4
7. Field Work Methods	6
8. Results	7
9. Laboratory Testing	8
9.1 Aggressivity.....	9
9.2 Salinity	11
9.3 Sodidity and Dispersibility	12
10. Impact of the Site Materials on the Proposed Development.....	12
11. Salinity Management Plan	12
12. Additional Recommendations and Conclusion	14
13. Limitations	15
 Appendix A: About this Report	
 Appendix B: Drawings 1- 4 and Figure 5 of GHD (2009)	
 Appendix C: Test Pit and Borehole Logs	
 Appendix D: Summary Table: Laboratory Tests and Assessments	
 Appendix E: NATA Reports and Chain of Custody sheets	

Report on Salinity Investigation and Management Plan

Proposed Industrial Development

Stage 3, Sydney Business Park, Marsden Park, NSW

1. Introduction

This report presents the results of a salinity investigation and management plan (SMP) undertaken for a proposed industrial development at Stage 3, Sydney Business Park, Marsden Park, NSW (the site, as shown on Drawing 1, Appendix B). The investigation was commissioned by Mr Michael Gray of Marsden Park Developments Pty Ltd (MPD) and was undertaken in accordance with Douglas Partners Pty Ltd (DP) proposal NWS200092 dated 18 June 2020.

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, breakdown of bricks and mortar, corrosion of steel (including reinforcement), break up of roads, attack on buried infrastructure, reduced ability to grow vegetation and increased erosion potential.

It is understood that a commercial subdivision is proposed and that an assessment of soil salinity is required to support a State Significant Development Application SSD 10477 submitted to NSW Planning, Industry and Environment.

The investigation comprised excavation of test pits, followed by laboratory testing of selected samples, engineering analysis and reporting. Details of the work undertaken and the results obtained are given within this report, together with comments relating to design and construction practice.

The assessment includes the results of an SMP completed for Stage 3.02 (Project 76669.02.R.001.Rev0 dated March 2017) which incorporates the northern part of the site, as well as intrusive investigations, and soil sampling and analysis for the southern part of the site. Intrusive investigations undertaken as part of this and the Stage 3.02 SMP targeted material to a depth of 3 m below ground level (bgl).

The proposed development includes the construction of a basement to depths of approximately 5 m in the south-eastern portion of the site. The investigation was completed in conjunction with a geotechnical investigation of the site (as reported in DP report 94616.00.R.001) which included boreholes in the vicinity of the basement (BH106, BH108, BH109 and BH110) to depths of up to approximately 10 m. Selected samples from below 3 m in these boreholes were also incorporated into the salinity assessment.

2. Scope of Works

The current report includes two parts:

1. Salinity assessment of the site based upon:
 - Excavation of 17 test pits within the site to 3 m (or prior refusal - the investigation depth zone) and inspection of test pits for signs of salinity;
 - Collection of soil samples at regular depth intervals from the test pits and boreholes from depths of 4 m to 6 m;
 - Inspection of the site for signs of salinity;
 - Analysis of electrical conductivity (EC1:5), pH and soil texture test results for 108 soil and weathered rock samples determined at a NATA accredited analytical laboratory, for classification of salinity and aggressivity;
 - Laboratory analysis of additional salinity, aggressivity and erodibility indicators, including chloride and sulphate concentrations (22 samples), sodicities (nine samples) and dispersibility testing (four samples) at a NATA accredited analytical laboratory; and
 - 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. The Plan was based upon:
 - Review of the salinity investigation results;
 - Review of the following documents detailing Council requirements:
 - o 'Map of Salinity Potential in Western Sydney', DNR (2002);
 - o 'Guidelines to Accompany Map of Salinity Potential in Western Sydney', DNR (2002);
 - o 'Western Sydney Salinity Code of Practice' (amended January 2004), Rebecca Nicholson for WSROC, DNR and Natural Heritage Trust;
 - o 'Guide to Residential Slabs and Footings in a Saline Environment', Cement, Concrete and Aggregates, Australia (2005);
 - o 'Introduction to Urban Salinity', DNR (2003);
 - o 'Building in a Saline Environment' DNR (2003);
 - o 'Roads and Salinity', DNR (2003);
 - o 'Indicators of Urban Salinity', DNR (2002);
 - o 'Site Investigations for Urban Salinity', DNR (2002);
 - o 'Urban Salinity Processes', DNR (2004);
 - o 'Waterwise Parks and Gardens', DNR (2004); and
 - o 'Broad Scale Resources for Urban Salinity Assessment' DNR (2002).

3. Previous Investigations and Results

GHD Pty Ltd previously prepared *Preliminary Report for Marsden Park Industrial Precinct – Salinity Assessment* for MPD dated 31 June 2009 (GHD, 2009). GHD (2009) is a planning level salinity assessment which was undertaken for the entire 570 ha Sydney Business Park (SBP) site which incorporates the current site boundary. The scope of investigation by GHD included the following:

- A desktop study;
- A site walkover and surface soil / water sampling program;
- An intrusive investigation for soil and groundwater sampling;
- Salinity testing of soil and groundwater samples from the intrusive investigation; and
- Preparation of a preliminary (planning level) salinity report.

The results of the assessment were used to classify Sydney Busyness Park into three 'Salinity Domains' (SD1, SD2 and SD3) as detailed below. Figure 5 of GHD 2009 showing the mapped distribution of salinity domains is included in Appendix B.

SD1 – Higher Landscape

SD1 is expected to have a significantly large separation between the groundwater and the ground surface (greater than say 2.5 m), and thus is expected to have a corresponding lower risk of salinity issues than areas lower in the landscape. This higher landscape domain still classifies as 'Moderate Salinity Potential' as described in the DIPNR Salinity Potential in Western Sydney Map - 2002.

SD2 – Lower Landscape

SD2 lies in closer proximity to the (saline) groundwater table (inferred within about 2.5 m depth) and is subject to concentration of seepage waters near creek lines and in the alluvium adjacent to creek lines. The salt comes both from the underlying (saline) groundwater (whether by seepage or through capillary action - evaporation) and from within the residual/alluvial soils.

Salinity in the landscape only affects the built environment/vegetation when in close proximity to the ground surface, thus actions which promote near-surface seepage, waterlogging or close proximity to the underlying groundwater table should be either avoided if possible or properly managed. The lower landscape salinity domain SD2 has a higher salinity risk (described as moderate to high in the DIPNR Salinity Potential in Western Sydney Map - 2002) than the higher landscape salinity domain SD1, due to its closer proximity to the groundwater table and to the historical concentration of salt in this lower area through drainage and seepage migration.

SD3 – Disturbed Landscape

SD3 comprises zones covering both the higher and lower landscapes that have been significantly disturbed by quarrying, filling and changed drainage conditions. In particular, the current quarry / landfill area, which also has a different geology over part of this (quarry) area, has been subject to significant excavation and disturbance, likely encountering the (saline) groundwater table, and removing/stockpiling soils and bedrock that contain salts.

Review of the mapped Salinity Domains (Appendix B) indicates that the northern portion of the site was classified as SD1 and the southern portion of the site was classified as SD3.

4. Site Description

The Site is located within SBP, Marsden Park in the local government area of Blacktown City Council. The Site has an area of approximately 38 ha and incorporates the following property identifiers:

- Part Lot 36 Deposited Plan (D.P.) 262886; and
- Part Lots 4 and 5 D.P. 1210172.

5. Topography, Soils and Geology and Salinity Potential

Site topography (Figure 1) generally slopes down from southeast to west from approximately 50 m AHD to 36 m AHD.



Figure 1: 2 m Topographic Contours at the site

Reference to the Penrith 1:100 000 Soil Landscapes Sheet (Figure 2) indicates that most of the site is mapped as alluvial soil of the Berkshire Park soil landscape (mapping unit bp). This soil landscape associated with the Hawkesbury and Nepean River Systems is characterised by orange heavy clays and clayey sands, often mottled and with ironstone nodules common. The south eastern portion of the Site is mapped as the Blacktown soil landscape (mapping unit bt) of the Wianamatta Group of Triassic age which is characterised by red and brown podzolic soils on Wianamatta and Hawkesbury Shales.

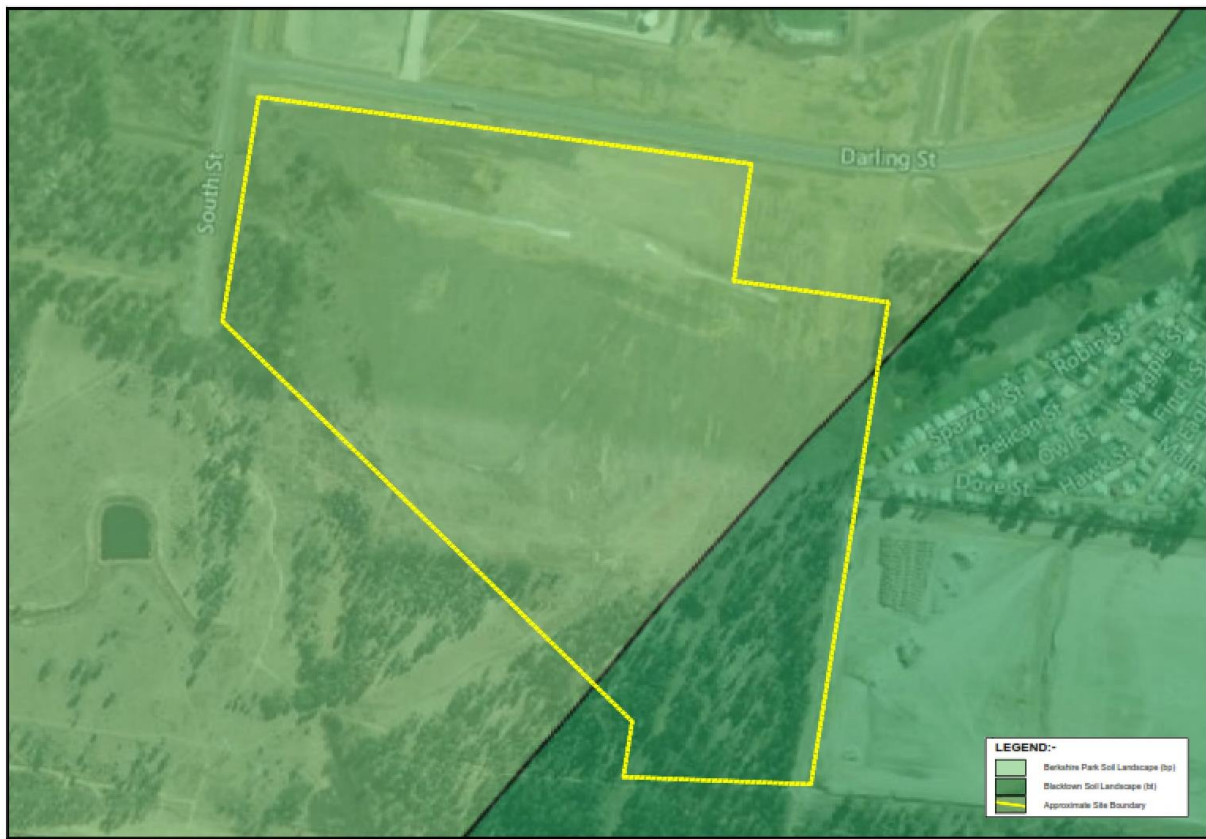


Figure 2: Soil Landscape at the site

Reference to the Penrith 1:100 000 Geological Series Sheets indicates that the Site is underlain by Bringelly Shale (mapping unit Rwb) of the Wianamatta Group of Triassic age. This formation typically comprises shale, carbonaceous claystone, claystone, laminite and some minor coaly bands which weather to form clays of high plasticity.

Reference to the Map of Salinity Potential in Western Sydney (Figure 3), indicates that most of the site is located within an area of “moderate salinity potential” where “saline areas may occur which have not yet been identified or may occur if risk factors change adversely”. The western and north western areas of the site are mapped as “high salinity potential” where “conditions are similar to areas of known salinity”.

The Investigation of urban salinity – case studies from Western Sydney, Urban Salt 2005 Conference Paper, Parramatta (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 to 2 m can occur in a shallow regolith aquifer or a deeper shale aquifer due to natural influences.

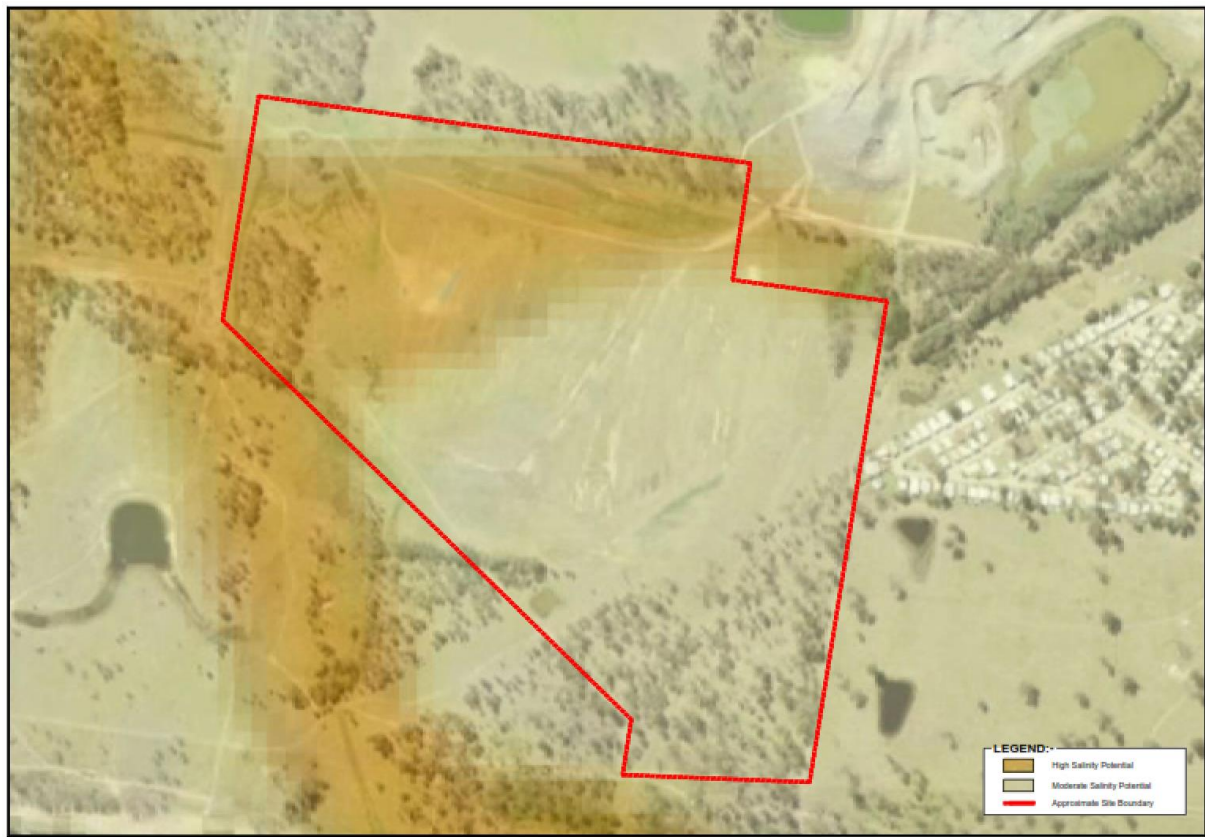


Figure 3: Salinity Potential at the Site

A north westerly flowing ephemeral creek is present in the south western portion of the Site. The creek meanders in a generally northerly direction prior to joining South Creek approximately 4 km north of the site.

6. Field Work Methods

The current field work for this salinity investigation comprised the excavation of 17 test pits with a backhoe fitted with a 450 mm bucket. Test pits were sample to a maximum depth of 3.0 m. The fieldwork was logged on - site by a geo-environmental engineer, who collected representative disturbed samples to assist in strata identification and for laboratory testing. After carefully backfilling each test pit, the surface was reinstated to its previous level.

The test locations were nominated by DP and located on-site by DP prior to the investigation. Soil samples collected from the below tested for salinity parameters:

- Nine test pits (TP14, TP19, TP26, TP29, TP30, TP33, TP35, TP36 and TP38) from the Stage 3.02 SMP;
- Eight test pits (TP138 – TP140, TP150 – TP152, TP155 and TP156) from test pits excavated during June and July 2020 (ie: the current investigation); and

- Four boreholes (BH106, BH108, BH109 and BH110) excavated as part of the geotechnical investigation.

7. Results

The test pit logs are included in AppendixC and should be read in conjunction with the accompanying standard notes that define classification methods and descriptive terms. Relatively inconsistent conditions were encountered in the test pits, with the general succession of strata is broadly summarised as follows:

- Topsoil
 - silty clay topsoil at most locations (except Pit 115) to depths ranging between 0.1 m and 0.3 m. Inclusions of rootlets and gravel were encountered within the topsoil; overlying
- Fill
 - Bores 101 to 105 and 157 and TP112 to TP143 encountered fill to depths of up to 3.9 m was encountered. The fill typically comprised a gravelly clay with siltstone gravel, cobbles and boulders (estimated to be up to high strength);
 - Bores 106 to 111 and TP144 to TP156 encountered fill ranged from 0.2 m to 0.9 m, with most of the fill being present along an elevated access road extending from near the end of Hollinsworth Road;
- Natural Soil
 - typically stiff to very stiff silty clay with some hard layers; overlying,
- Bedrock
 - Either sandstone, siltstone or laminite (interbedded siltstone and sandstone) bedrock, ranging in strength from very low to high strength at depths of 2.5 m to 5.5 m.

No free groundwater was observed in any test pits during excavation or for the short time that they were left open prior to backfilling. The immediate backfilling of all test pits after excavation precluded any further monitoring of groundwater levels.

No signs of efflorescence were noted during the inspection.

8. Laboratory Testing

A Summary Table (Appendix D) presents the results of laboratory tests, assessments of aggressivity to concrete and steel, sodicity class, textural classification, calculated salinity ECe and salinity class inferred from ECe values using the method of Richards (1954). The Summary Table also includes results of Emerson Crumb tests and derived Dispersion Potentials. The detailed laboratory test reports and chain-of-custody information are provided in Appendix E.

In the absence of cut to fill information available for the site, a “worst case” scenario was used to classify the extent of salinity and aggressivity of the site materials below the current ground surface. The “worst case” classification was carried out by utilising a maxima/minima analysis within the investigated depth zone of 0 – 6.0 m at individual locations. The Summary Table presents aggressivities and salinities for each pit location, based on minimum pH, minimum electrical resistivity and maximum ECe values within the investigated depth zone.

These values were used for spatial mapping of aggressivities and salinities throughout the investigation area (refer Drawings 2 to 4, Appendix B).

The test sample numbers and the range of test results obtained from the test pits and boreholes are summarised in Table 1.

Table1: Summary of Test Results

Parameter		Units	Samples	Minimum	Maximum
pH		pH units	108	4.6	9.6
Chlorides		(mg/kg)	22	10	1200
Sulphates		(mg/kg)	22	29	570
Aggressivity	to Concrete	[AS 2159]	108	non-aggressive	mild
	to Steel	[AS 2159]	108	non-aggressive	moderate
Exchangeable Sodium (Na)		(meq/100g)	9	0.6	4.5
CEC (cation exchange capacity)		(meq/100g)	9	6.8	54
Sodicity [Na/CEC]		(ESP%)	9	1	31
Sodicity Class		[after DLWC]	9	Non-sodic	highly sodic
EC1:5 [Lab.]		(mS/cm)	108	38	1040
Resistivity		Ω .cm	108	962	26316
ECe [M x EC1:5] ¹		(dS/m)	108	0.2	9.7
Salinity Class		[after Richards 1954]	108	Non-saline	Very saline

¹ M is soil textural factor

8.1 Aggressivity

Figure 4 (following page) presents variations of aggressivity with depth, based on pH profiles at salinity test pit and borehole locations, together with the aggressivity class ranges indicated in Australian Standard AS 2159 (2009). The absence of free groundwater from all test locations and the impermeability of the sampled clay-rich soils indicate that soils at all test locations are in Condition “B” as defined by AS 2159.

The pH profiles of Figure 4 indicate that the materials throughout the site, at all investigated depths, are non-aggressive to steel. The chloride concentration guidelines of AS 2159 support this non-aggressive classification. However, based on resistivity criteria (Appendix D), samples were classified as non-aggressive to moderately aggressive to steel.

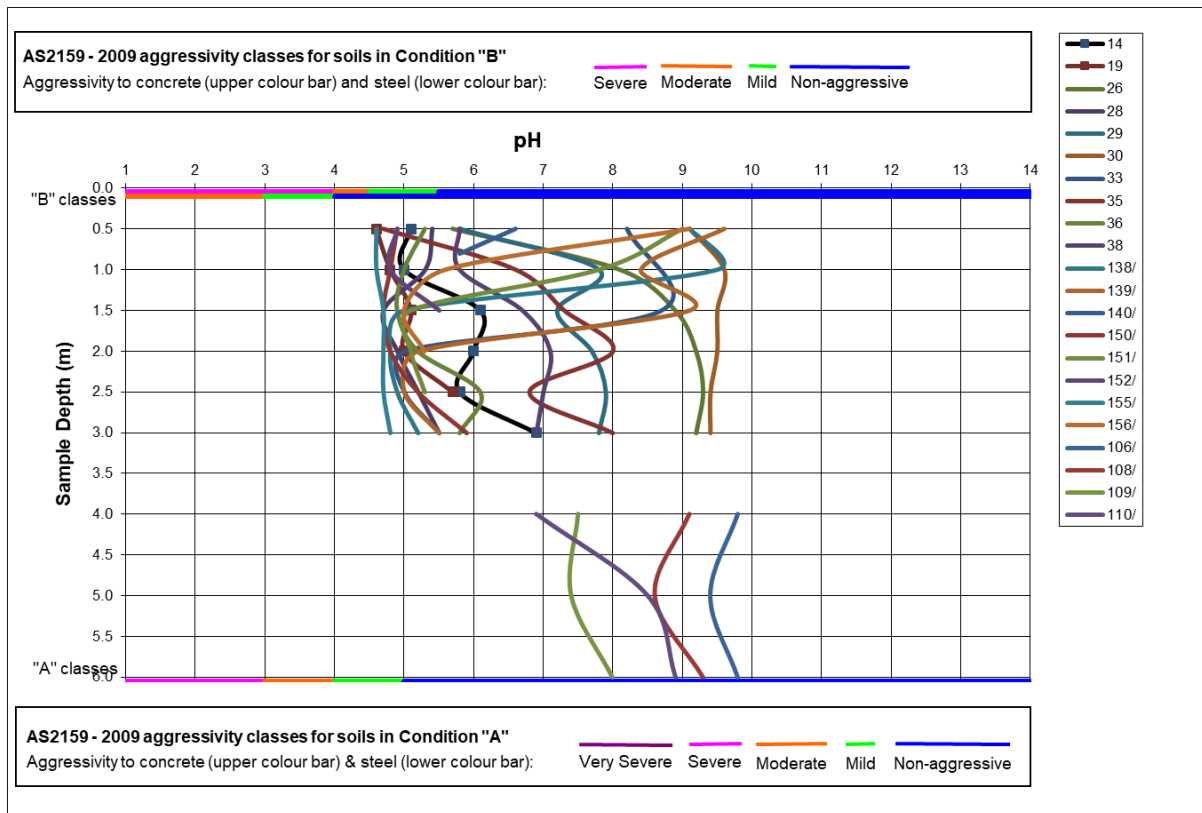


Figure 4: Vertical pH Profiles and Aggressivity Classes

The Summary Table also indicates that 57% of all samples were non-aggressive to concrete and 43% were mildly aggressive to concrete.

The worst case results for each location were interpolated and contoured to define areas which are non-aggressive (pH >5.5) and mildly aggressive (pH 4.5 – 5.5) to concrete structures and services, represented by colour zones on Drawing 2 (Appendix B).

Calculated soil resistivities indicated higher aggressivities to steel than were indicated by pH measurements. The worst case results for each test pit were interpolated and contoured to define areas of mild aggressivity and moderate aggressivity to steel structures and services, represented by colour zones on Drawing 3 (Appendix A).

Test pit refusal was encountered at 0.8 m at TP140. Material in the shallow soil profile was classified as non-aggressive to concrete and steel, however, in the absence of analysis of deeper samples, the worst case results from adjacent test pits were used to interpolate and contour soil conditions within this area.

8.2 Salinity

Figure 5 (below) presents the variations of salinity with depth, based on salinity (ECe) profiles at test pit and borehole locations, together with the salinity classifications of Richards (1954).

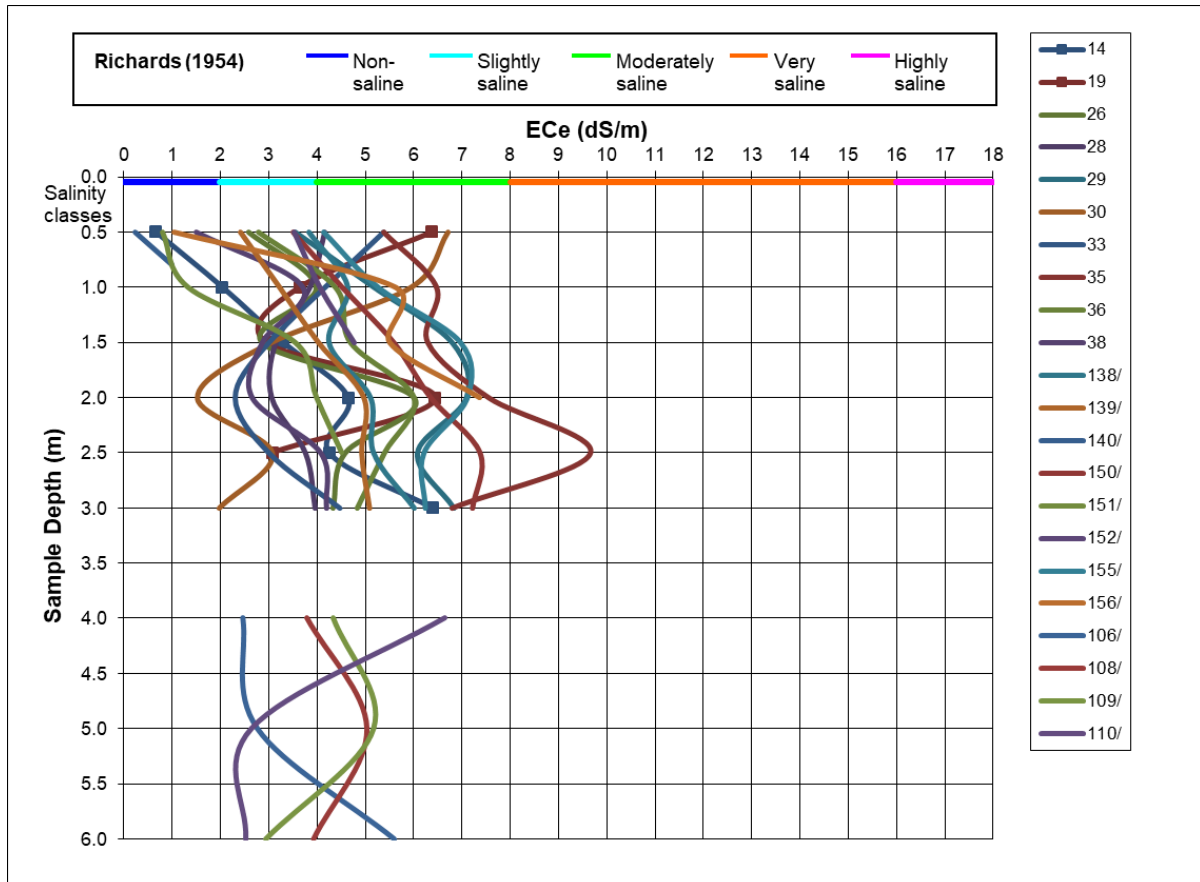


Figure 5: Vertical Salinity Profiles and Salinity Classes

The Summary Table (Appendix D) indicates that 8% of all soil samples were non-saline, 34% were slightly saline, 56% were moderately saline and 2% were very saline.

As for aggressivity, worst case ECe values were interpolated and contoured to define areas of moderately saline (ECe 4 – 8 dS/m) and very saline (ECe 8 – 16 dS/m) material (see Drawing 4, Appendix B).

As discussed in Section 7, test pit refusal was encountered at 0.8 m at TP140. Material in the shallow soil profile was classified as non-saline, however, in the absence of analysis of deeper samples, the worst case results from adjacent test pit locations were used to interpolate and contour soil conditions within this area.

8.3 Sodicty and Dispersibility

The sodicty test reported in the Summary Table shows non-sodic to highly sodic soils, indicating the potential for erodability of soils left exposed.

The dispersion potential of the soils, as measured by the Emerson Crumb Test (refer Summary Table, Appendix D), were determined to range from a Class 2 (some dispersion) to a Class 5 (no dispersion) over the four locations tested, at depths of 0.5 m – 1.5 m.

9. Impact of the Site Materials on the Proposed Development

The mild aggressivity to concrete, the mild to moderate aggressivity to steel, the presence of moderately to very 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 11).

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.

10. Salinity Management Plan

The current salinity investigation indicates that materials within the Site are moderately to very saline. Testing of other parameters associated with salinity indicates that the materials are mildly to moderately aggressive to steel (by the resistivity and chloride criteria of AS 2159) and non-aggressive to mildly aggressive to concrete within the site (by the pH and sulphate criteria of AS 2159). In addition, shallow soils were highly sodic.

The following management strategies are confined to the management of those factors 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, place excavated materials in fill areas with similar salinity characteristics (ie: place 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 moderately 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. Avoid 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 above strategies should be considered in conjunction with the erosion controls outlined in Landcom, *Soils and Construction, Managing Urban Stormwater, Volume 1, 4th Edition*, March 2004.

The following additional strategies are recommended for completion of service installation and for house / 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 (where used), so that it cannot be bridged to allow moisture to move into brick work and up the wall.

- H. Where materials are classified as non-aggressive to concrete (refer Drawing 2), piles should nevertheless have a minimum strength of 32 MPa and a minimum cover to reinforcement of 45 mm (as per AS 2159).
- I. Where materials are classified as mildly aggressive to concrete (refer Drawing 2), piles should have a minimum strength of 32 MPa and a minimum cover to reinforcement of 60 mm (as per AS 2159) to limit the corrosive effects of the surrounding materials (in accordance with AS 2159).
- J. With regard to concrete structures, for moderately saline soils (soils with salinities of 4 – 8 dS/m - refer Drawing 4) that are classified as non - aggressive and mildly aggressive to concrete , 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 AS 3600) to limit the corrosive effects of the surrounding soils.
- K. With regard to concrete structures, for very saline soils (soils with salinities of 8 - 16 dS/m - refer Drawing 4) that are classified as non-aggressive and mildly aggressive to concrete, slabs and foundations should have a minimum strength of 32 MPa, a minimum cover to reinforcement of 50 mm from unprotected ground and should be allowed to cure for a minimum of seven days (as per AS 3600) 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 7 of this report) and to Tables E1 and 3.1 of AS 4058 – 2007 “Precast concrete pipes” indicates that the site falls marginally outside the AS 4058 Clay/Stagnant (low sulphate) soil type (chlorides $\leq 20,000$ ppm and sulphates $\leq 1,000$ ppm) and (in the absence of tidal water flow) falls within the AS 4058 “Other” durability environment. The minimum site pH of 4.4 indicates a slightly more acidic environment than that within the Clay/Stagnant soil type definition (minimum pH 4.5) and reference to the Concrete Pipe Association of Australasia Engineering Guideline (“Designing Durable Concrete Pipelines”) indicates an increase of cover to reinforcement (to 20 mm) or a protective (eg: epoxy) coating or sleeve, or blended concrete, should be employed to maintain a design life in excess of 100 years. It is recommended that 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 20 mm, or with an alternative durability provision as indicated above, or should be fibre reinforced.
- M. Resistivity results indicate soils that are aggressive to steel (Drawing 3, Appendix B). This drawing identifies areas of mild aggressivity (1000 – 2000 Ohm-cm) and moderate aggressivity (< 1000 Ohm – cm) to steel over the site. For these areas of soil identified as mildly and moderately aggressive to steel, the following corrosion allowances (as per AS 2159 – 2009) should be taken into account by the designer:
- Mild: uniform corrosion allowance 0.01 – 0.02 mm/year; and
 - Moderate: uniform corrosion allowance 0.02 – 0.04 mm/year.
- 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 in accordance with the above list.
- N. In all masonry buildings a brick damp course should be installed so that it cannot be bridged either internally or externally. This will prevent moisture moving into brickwork and up the wall.
- O. The use of a bedding layer of sand (100 mm thick), overlain by a membrane of thick plastic (damp proof as opposed to vapour proof), is recommended under concrete slabs to act as a moisture barrier and drainage layer and to restrict capillary rise under the slab. As an alternative method for protection of concrete slabs for non-residential construction, higher strength (32 MPa) concrete may be placed directly on a layer of crushed rock. Such rock should be sourced locally from an area classified as non - saline or slightly saline or should be imported after stockpiling, testing and classification as non-saline or slightly saline.

11. Additional Recommendations and Conclusion

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.

The assessment included assessment of salinity and aggressivity of material within the footprint of the proposed basement in the south eastern part of the site which will be excavated to a depth of approximately 5 m. Additional investigation should be undertaken in any other 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.

12. Limitations

Douglas Partners Pty Ltd (DP) has prepared this report for this project at Stage 3, Sydney Business Park, Marsden Park, NSW in accordance with DP's proposal NWS200092, dated 18 June 2020. The work was carried out under DP's Conditions of Engagement. This report is provided for the exclusive use of Marsden Park Developments Pty Ltd 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 subsurface 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. Subsurface 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 salinity 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

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

This report is the property of Douglas Partners Pty Ltd. The report may only be used for the purpose for which it was commissioned and in accordance with the Conditions of Engagement for the commission supplied at the time of proposal. Unauthorised use of this report in any form whatsoever is prohibited.

Borehole and Test Pit Logs

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

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

Groundwater

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

- In low permeability soils groundwater may enter the hole very slowly or perhaps not at all during the time the hole is left open;

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

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

Reports

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

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

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

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

About this Report

Site Anomalies

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

Information for Contractual Purposes

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

Site Inspection

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



Sampling

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

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

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

Test Pits

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

Large Diameter Augers

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

Continuous Spiral Flight Augers

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

reliability, due to the remoulding, possible mixing or softening of samples by groundwater.

Non-core Rotary Drilling

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

Continuous Core Drilling

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

Standard Penetration Tests

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

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

The test results are reported in the following form.

- In the case where full penetration is obtained with successive blow counts for each 150 mm of, say, 4, 6 and 7 as:
4,6,7
N=13
- In the case where the test is discontinued before the full penetration depth, say after 15 blows for the first 150 mm and 30 blows for the next 40 mm as:
15, 30/40 mm

Sampling Methods

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.

Symbols & Abbreviations

Douglas Partners



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

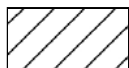
Soils



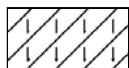
Topsoil



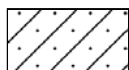
Peat



Clay



Silty clay



Sandy clay



Gravelly clay



Shaly clay



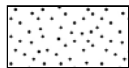
Silt



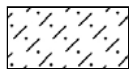
Clayey silt



Sandy silt



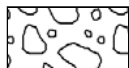
Sand



Clayey sand



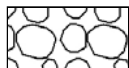
Silty sand



Gravel



Sandy gravel

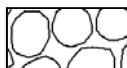


Cobbles, boulders



Talus

Sedimentary Rocks



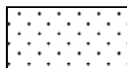
Boulder conglomerate



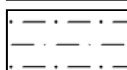
Conglomerate



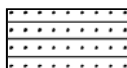
Conglomeratic sandstone



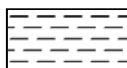
Sandstone



Siltstone



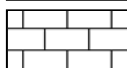
Laminite



Mudstone, claystone, shale

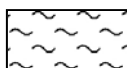


Coal

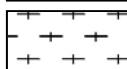


Limestone

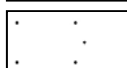
Metamorphic Rocks



Slate, phyllite, schist

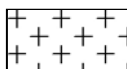


Gneiss

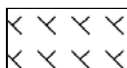


Quartzite

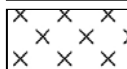
Igneous Rocks



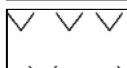
Granite



Dolerite, basalt, andesite



Dacite, epidote



Tuff, breccia



Porphyry



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 longer 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:

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

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.

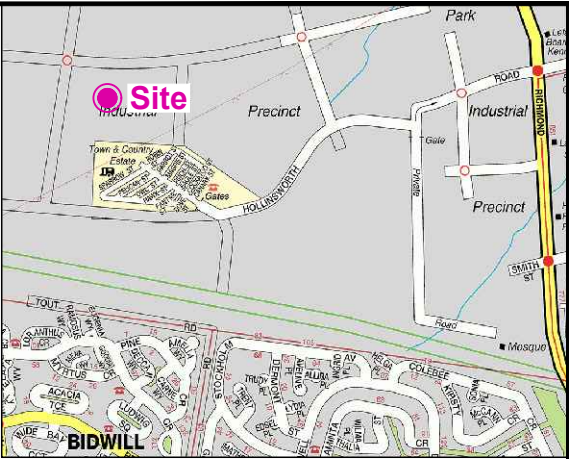
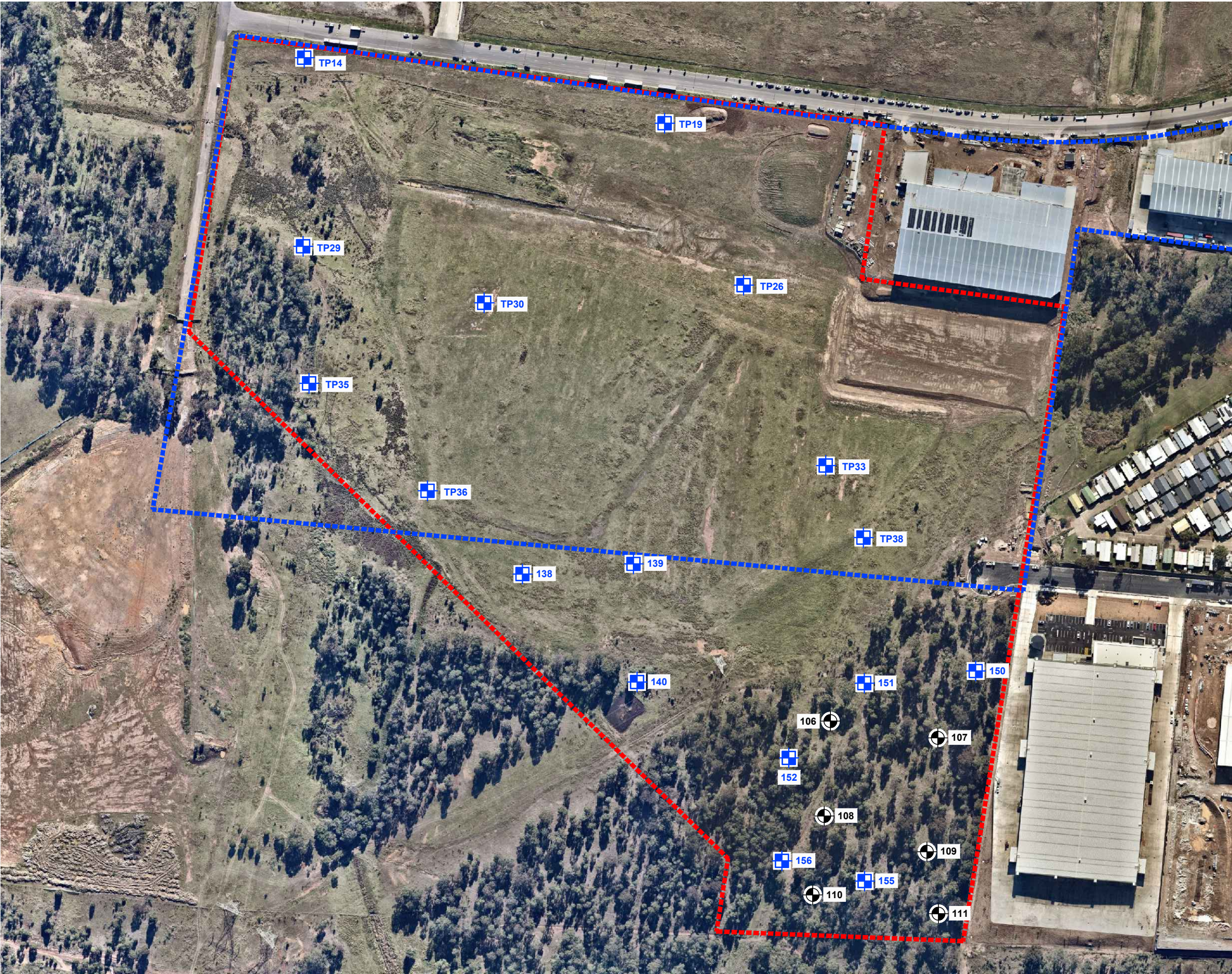
Stratification Spacing

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

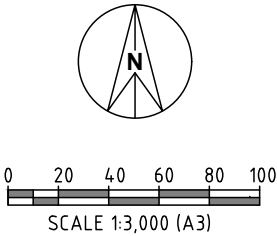
Term	Separation of Stratification Planes
Thinly laminated	< 6 mm
Laminated	6 mm to 20 mm
Very thinly bedded	20 mm to 60 mm
Thinly bedded	60 mm to 0.2 m
Medium bedded	0.2 m to 0.6 m
Thickly bedded	0.6 m to 2 m
Very thickly bedded	> 2 m

Appendix B

Drawings 1- 4 and Figure 5 of GHD (2009



Location Plan




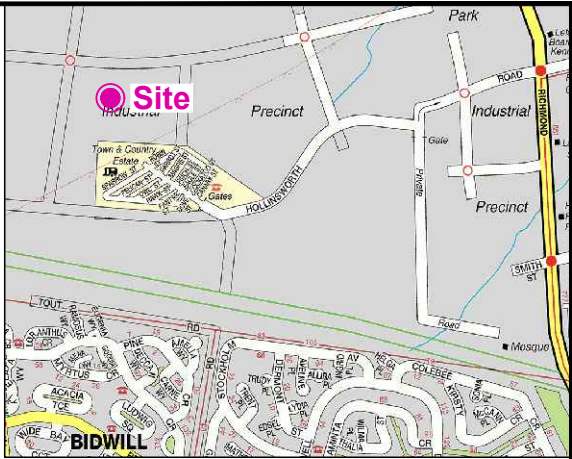
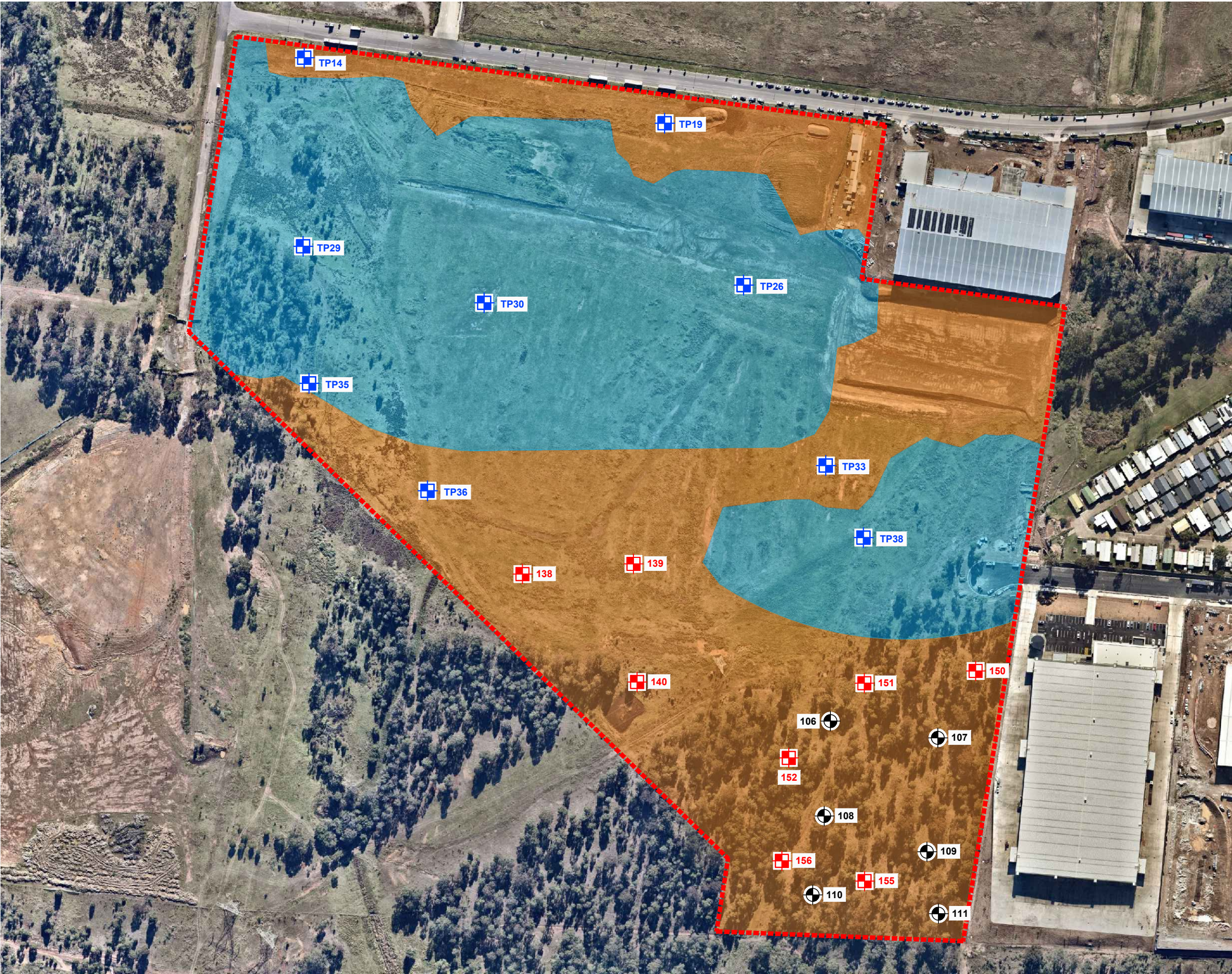
LEGEND:-

- Site boundary
- DP (2017) Site boundary
- Salinity test pits
- Geotechnical boreholes

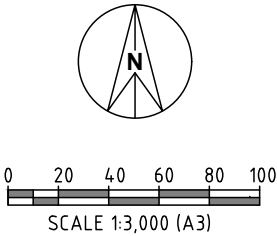
NOTE:-

- Image obtained from Near Map. Date of imagery 23-06-2020.
- Test locations are approximate only and are shown with reference to existing site features.

	CLIENT: Marsden Park Developments (Construction) Pty Ltd		TITLE: Sampling Locations Sydney Business Park Stage 3 Astoria Street, Marsden Park	PROJECT No: 94616.01	
	OFFICE: North West Sydney	DRAWN BY: JST		DRAWING No: 1	
	SCALE: As shown	DATE: 14 July 2020		REVISION: 0	



Location Plan

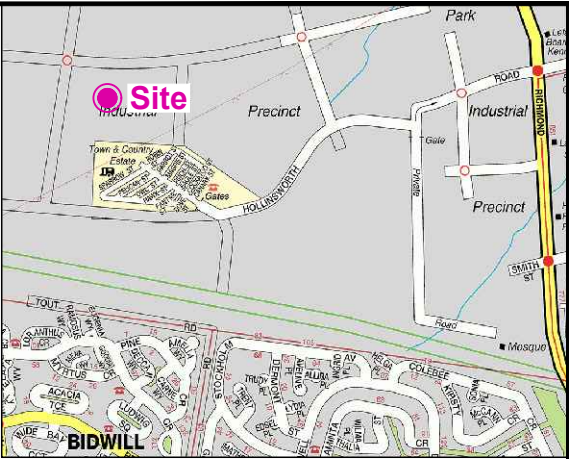
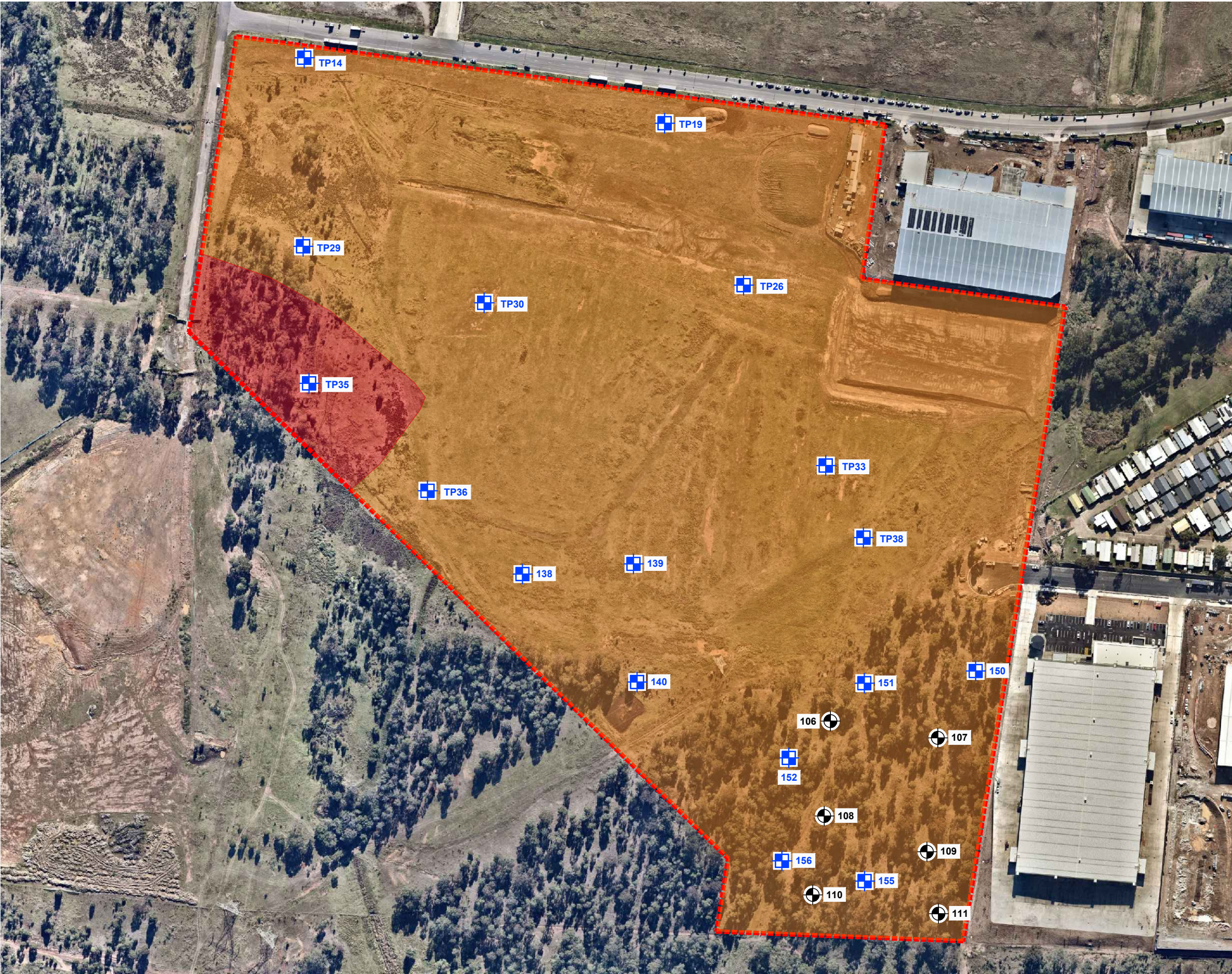


LEGEND:-

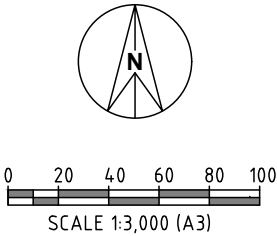
- Salinity test pits
- Geotechnical boreholes
- Mildly aggressive
- Non aggressive
- Site boundary

NOTE:-

- Image obtained from Near Map. Date of imagery 23-06-2020.
- Test locations are approximate only and are shown with reference to existing site features.



Location Plan




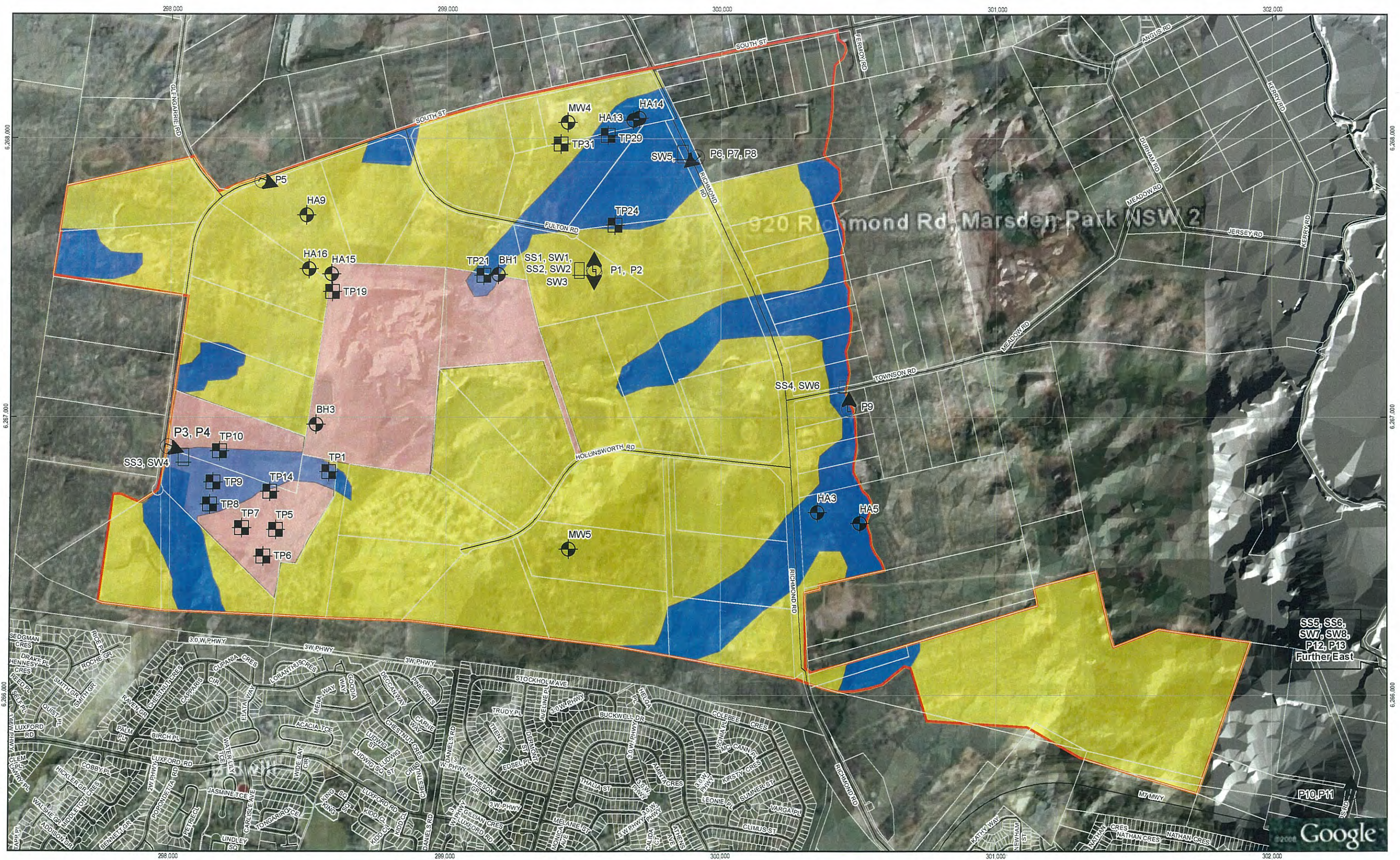
LEGEND:-

- Salinity test pits
- Geotechnical boreholes
- Moderately Saline
- Very saline
- Site boundary

NOTE:-

- Image obtained from Near Map. Date of imagery 23-06-2020.
- Test locations are approximate only and are shown with reference to existing site features.

 Douglas Partners <i>Geotechnics Environment Groundwater</i>	CLIENT: Marsden Park Developments (Construction) Pty Ltd		TITLE: Salinities within investigated depth zone (0 to 3 m bgl) Sydney business park stage 3 Astoria Street, Marsden Park	PROJECT No: 94616.01	
	OFFICE: North West Sydney	DRAWN BY: JST		DRAWING No: 4	
	SCALE: As shown	DATE: 14 July 2020		REVISION: 0	



Appendix C

Test Pit and Borehole Logs

TEST PIT LOG

CLIENT: Marsden Park Developments Pty Ltd
PROJECT: Stage 3.01 Sydney Business Park
LOCATION: Marsden Park, NSW

SURFACE LEVEL: 38 mAHD
EASTING: 298044
NORTHING: 6266958

PIT No: 14
PROJECT No: 76669.03
DATE: 29/11/2016
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
38	0.0	FILLING - brown clayey silt with rootlets (topsoil)		E	0.0							
	0.1	FILLING - brown silty clay with a trace of charcoal gravel			0.1							
	0.5	FILLING - grey, red and orange mottled sandy silty clay with some siltstone gravel		D	0.5							
37	1.0	FILLING - orange, grey and red mottled siltstone with silt clay banding		D	1.0			1				
	1.1			E	1.1							
	1.5			D	1.5							
	1.6	- becoming natural below 1.6m			1.6							
	1.7			E	1.7							
36	1.8	SILTY CLAY - grey, orange and red mottled silty clay with siltstone banding										
	1.9											
35	2.0	SILTSTONE - medium strength, moderately weathered, grey, red and orange mottled siltstone		D	2.0			2				
	2.5	SHALE AND SILTSTONE - highly weathered, shale and siltstone		D	2.5							
34	3.0			D	3.0			3				
33	3.1	Pit discontinued at 3.1m - limit of investigation										
32												
31												
30												
29												
28												
27												
26												
25												
24												
23												
22												
21												
20												
19												
18												
17												
16												
15												
14												
13												
12												
11												
10												
9												
8												
7												
6												
5												
4												
3												
2												
1												
0												

RIG: Komatsu PC300LC excavator - 450mm bucket

LOGGED: CKM/LML

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

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

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

TEST PIT LOG

CLIENT: Marsden Park Developments Pty Ltd
PROJECT: Stage 3.01 Sydney Business Park
LOCATION: Marsden Park, NSW

SURFACE LEVEL: 42 mAHD
EASTING: 298323
NORTHING: 6266909

PIT No: 19
PROJECT No: 76669.03
DATE: 1/12/2016
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
42	0.1	FILLING - light brown clayey silt with some sandstone, shale and siltstone gravel and rootlets		E	0.0							
	0.1			E	0.1							
	0.5	FILLING - brown and orange silty clay with some siltstone, ironstone and sandstone gravel		E	0.4							
	0.5			D	0.5							
		SILTY CLAY - grey mottled red and orange silty clay with some siltstone and ironstone gravel										
41	1			D	1.0							
		- with sandstone banding below 1.2m		D	1.5							
				D	2.0							
40	2.0	SHALE - very low strength, extremely to highly weathered, light grey and orange brown shale		D	2.0							
				D	2.5							
	2.7	Pit discontinued at 2.7m - refusal on very low strength shale										
39	3											
38	4											
37	5											
36	6											
35	7											

RIG: Komatsu PC300LC excavator - 450mm bucket

LOGGED: CKM/LML

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

- ☐ 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	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	W	Water seep	S	Standard penetration test
E	Environmental sample	WL	Water level	V	Shear vane (kPa)

TEST PIT LOG

CLIENT: Marsden Park Developments Pty Ltd
PROJECT: Stage 3.01 Sydney Business Park
LOCATION: Marsden Park, NSW

SURFACE LEVEL: 41 mAHD
EASTING: 298382
NORTHING: 6266782

PIT No: 26
PROJECT No: 76669.03
DATE: 30/11/2016
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
41		FILLING - brown silty clay with rootlets and a trace of shale, siltstone and anthropogenics comprising glass (topsoil)		E	0.0 0.1							
				D	0.5							
	1			D	1.0				1			
		- becoming grey and brown mottled with a trace of rootlets, ironstone and siltstone gravel below 1.9m		E	1.3							
				D	1.4 1.5							
	2	- becoming dark brown silty clay with a trace of shale, ironstone and siltstone gravel below 2.0m		D	2.0				2			
				D	2.5							
	3			D	3.0				3			
	3.5	SILTY CLAY - grey, orange and brown mottled silty clay with shale, ironstone and siltstone gravel		E	3.8 3.9							
	4	Pit discontinued at 4.0m - limit of investigation							4			
	5							5				
	6							6				
	7							7				

RIG: Komatsu PC300LC excavator - 450mm bucket

LOGGED: CKM/LML

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

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

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



Douglas Partners
Geotechnics | Environment | Groundwater

TEST PIT LOG

CLIENT: Marsden Park Developments Pty Ltd
PROJECT: Stage 3.01 Sydney Business Park
LOCATION: Marsden Park, NSW

SURFACE LEVEL: 37 mAHD
EASTING: 298043
NORTHING: 6266810

PIT No: 29
PROJECT No: 76669.03
DATE: 29/11/2016
SHEET 1 OF 1

[illegible]

RIG: Komatsu PC300LC excavator - 450mm bucket

LOGGED: CKM/LML

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS: * Replicate sample BD1/291116 collected; Test pit on track/path

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

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





Douglas Partners
Geotechnics | Environment | Groundwater

TEST PIT LOG

CLIENT: Marsden Park Developments Pty Ltd
PROJECT: Stage 3.01 Sydney Business Park
LOCATION: Marsden Park, NSW

SURFACE LEVEL: 39 mAHD
EASTING: 298458
NORTHING: 6266785

PIT No: 30
PROJECT No: 76669.03
DATE: 30/11/2016
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
38		FILLING - grey silty clay with shale and siltstone gravel and cobbles		E	0.0							
					0.1							
		- becoming sandy with sandstone gravel below 0.5m		D	0.5							
38	1			D	1.0							
				E	1.1							
		- becoming grey, red and orange mottled silty clay below 1.2m										
				D	1.5							
		- becoming dark grey clayey sand with some sandstone, shale and siltstone gravel, cobbles and boulders										
38	2			D	2.0							
				E	2.1							
				D	2.5							
36	3			D	3.0							
				E	3.1							
35	4	SILTY CLAY - orange silty clay with some ironstone and charcoal gravel		E	4.0							
					4.1							
34	5	- becoming grey mottled orange with a trace of siltstone and ironstone gravel below 5.0m		E	5.0							
					5.1							
33	6	Pit discontinued at 5.8m - limit of investigation										
32	7											

RIG: Komatsu PC300LC excavator - 450mm bucket

LOGGED: CKM/LML

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

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

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

TEST PIT LOG

CLIENT: Marsden Park Developments Pty Ltd
PROJECT: Stage 3.01 Sydney Business Park
LOCATION: Marsden Park, NSW

SURFACE LEVEL: 45 mAHD
EASTING: 298452
NORTHING: 6266643

PIT No: 33
PROJECT No: 76669.03
DATE: 30/11/2016
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
45.0	0.2	FILLING - brown silty clay with rootlets and a trace of siltstone (topsoil)		E	0.0							
		FILLING - brown silty clay and siltstone gravel with a trace of rootlets			0.1							
				D	0.5							
				E	0.6							
					0.7							
44.0	1.0	- becoming brown, grey and red with a trace of ironstone and siltstone gravel below 1.0m		D	1.0							
				D	1.5							
				E	1.6							
43.0	2.0	SILTY CLAY - orange brown silty clay with a trace of gravel		D	2.0							
		- becoming grey, brown and orange mottled with a trace of ironstone, shale and siltstone below 2.5m		D	2.5							
				E	2.6							
42.0	3.0			D	3.0							
		- becoming grey and orange mottled silty clay with ironstone and siltstone gravel below 3.2m		E	3.1							
					3.2							
41.0	3.4	Pit discontinued at 3.4m - limit of investigation										
40.0	4.0											
39.0	5.0											
38.0	6.0											
37.0	7.0											

RIG: Komatsu PC300LC excavator - 450mm bucket

LOGGED: CKM/LML

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

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

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

TEST PIT LOG

CLIENT: Marsden Park Developments Pty Ltd
PROJECT: Stage 3.01 Sydney Business Park
LOCATION: Marsden Park, NSW

SURFACE LEVEL: 38 mAHD
EASTING: 298048
NORTHING: 6266705

PIT No: 35
PROJECT No: 76669.03
DATE: 29/11/2016
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
38	0.15	TOPSOIL - brown silty clay with rootlets		E	0.0							
		SILTY CLAY - red and grey mottled orange silty clay with a trace of siltstone and ironstone gravel		E	0.1							
				E	0.4							
		- with siltstone banding below 0.7m		D	0.5							
				D	1.0							
37	1			D	1.0							
	1.2	SHALE - low strength, grey mottled brown shale		D	1.5							
				D	2.0							
36	2			D	2.5							
				D	3.0							
35	3			D	3.0							
	3.2	Pit discontinued at 3.2m - limit of investigation										
34	4											
33	5											
32	6											
31	7											

RIG: Komatsu PC300LC excavator - 450mm bucket

LOGGED: CKM/LML

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS: * Replicate sample BD2/291116 collected adjacent to creekline

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

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

TEST PIT LOG

CLIENT: Marsden Park Developments Pty Ltd
PROJECT: Stage 3.01 Sydney Business Park
LOCATION: Marsden Park, NSW

SURFACE LEVEL: 41 mAHD
EASTING: 628142
NORTHING: 6266623

PIT No: 36
PROJECT No: 76669.03
DATE: 29/11/2016
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
41		TOPSOIL - brown silty clay with rootlets		E	0.0							
					0.1							
	0.4	SANDY SILTY CLAY - orange sandy silty clay with some siltstone and ironstone gravel		E	0.4							
				D	0.5							
	0.8	SILTY CLAY - grey mottled red and orange silty clay with a trace of siltstone and ironstone gravel										
39	1			D	1.0							
				E	1.1							
					1.2							
		- with siltstone banding below 1.8m		D	1.5							
38	2			D	2.0							
				D	2.5							
36	3	- with shale banding below 2.8m		D	3.0							
32	3.2	Pit discontinued at 3.2m - limit of investigation										
	4											
37	4											
	5											
36	5											
	6											
35	6											
	7											
34	7											

RIG: Komatsu PC300LC excavator - 450mm bucket

LOGGED: CKM/LML

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

- ☐ 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	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	W	Water seep	S	Standard penetration test
E	Environmental sample	WL	Water level	V	Shear vane (kPa)

TEST PIT LOG

CLIENT: Marsden Park Developments Pty Ltd
PROJECT: Stage 3.01 Sydney Business Park
LOCATION: Marsden Park, NSW

SURFACE LEVEL: 48 mAHD
EASTING: 628482
NORTHING: 6266589

PIT No: 38
PROJECT No: 76669.03
DATE: 30/11/2016
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
48.2	0.2	FILLING - brown silty clay with rootlets and a trace of shale gravel (topsoil)		E	0.0							
		SILTY CLAY - orange brown mottled silty clay with a trace of siltstone and ironstone gravel		D	0.1							
				D	0.5							
				E	0.6							
47.1	1	- becoming orange and brown with siltstone and ironstone gravel below 0.9m		D	1.0							
				D	1.5							
				E	1.6							
46.2	2.0	SHALE - extremely low strength, extremely to highly weathered, light brown and orange mottled shale with highly to moderately weathered shale bands		D	2.0							
				E	2.3							
				D	2.4							
				D	2.5							
45.3	3	- mottled grey and orange brown with shale and ironstone gravel		D	3.0							
	3.2	Pit discontinued at 3.2m - limit of investigation		E	3.1							
					3.2							
44.4	4											
43.5	5											
42.6	6											
41.7	7											

RIG: Komatsu PC300LC excavator - 450mm bucket

LOGGED: CKM/LML

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

- ☐ 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	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	W	Water seep	S	Standard penetration test
E	Environmental sample	WL	Water level	V	Shear vane (kPa)

BOREHOLE LOG

CLIENT: Marsden Park Developments Pty Ltd
PROJECT: Proposed Industrial Development
LOCATION: Astoria Street, Marsden Park

SURFACE LEVEL: 40.5 mAHD
EASTING: 298178
NORTHING: 6266922
DIP/AZIMUTH: 90°/-

BORE No: 101
PROJECT No: 94616.00
DATE: 2/7/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Degree of Weathering						Graphic Log	Rock Strength					Water	Fracture Spacing (m)	Discontinuities		Sampling & In Situ Testing						
			EW	HW	MW	SW	FS	FR		Ex Low	Very Low	Low	Medium	High			Very High	Ex High	B - Bedding S - Shear	J - Joint F - Fault	Type	Core Rec. %	RQD %	Test Results & Comments	
	0.1	FILL / TOPSOIL: silty clay CH, medium plasticity, brown, with rootlets throughout, trace gravel FILL / Silty CLAY CH: medium to high plasticity, brown and grey, trace fine gravel, w < PL, variably compacted Silty CLAY CH: medium to high plasticity, pale grey mottled orange and brown, trace ironstone and shale gravel, w < PL, stiff to very stiff, residual																							
	0.3																								
	1																								
	39																								
	2																								
	38	2.5																							
	3	SILTSTONE: grey-brown, very low strength, moderately weathered, fractured, trace sandstone laminations Bringelly Shale																							
	3.25	SANDSTONE: fine grained, orange-brown, low strength, moderately weathered, fractured, trace siltstone laminations, Bringelly Shale																							
	3.63																								
	4	SILTSTONE: grey, low strength, moderately then slightly weathered, fractured, with 30% sandstone laminations, Bringelly Shale																							
	5																								
	6																								
	7	7.0																							
	33	Bore discontinued at 7.0m																							
	8																								
	32																								
	9																								
	31																								

RIG: XC

DRILLER: Traccess

LOGGED: JY

CASING: 0-2.6m

TYPE OF BORING: 150mm diameter SFA to 2.6m then NMLC coring to 7.0m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U	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	W	Water seep	S	Standard penetration test
E	Environmental sample	W	Water level	V	Shear vane (kPa)



Douglas Partners
 Geotechnics | Environment | Groundwater

BORE: BH101

PROJECT: 94616.00

July 2020



Project No: 94616.00
BH ID: 101
Depth: 2.6-7.0m
Core Box No.: 1/1



2.6m - 7.0m

BOREHOLE LOG

CLIENT: Marsden Park Developments Pty Ltd
PROJECT: Proposed Industrial Development
LOCATION: Astoria Street, Marsden Park

SURFACE LEVEL: 43.7 mAH
EASTING: 298405
NORTHING: 6266893
DIP/AZIMUTH: 90°/-

BORE No: 102
PROJECT No: 94616.00
DATE: 1/7/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Degree of Weathering					Graphic Log	Rock Strength					Water	Fracture Spacing (m)	Discontinuities		Sampling & In Situ Testing			
			EW	HW	MW	SW	FS		FR	Ex Low	Very Low	Low	Medium			High	Very High	Ex High	B - Bedding S - Shear	J - Joint F - Fault	Type
43 1 42 2 41 3 40 4 39 5 38 6 37 7 36 8 35 9 34	0.05	FILL / TOPSOIL: silty clay CH, grey-brown, with fine to coarse gravel, trace rootlets, w < PL,																			7,7,8 N = 15
	0.7	FILL / Silty CLAY CI: grey-brown, trace fine to coarse gravel, w <PL, variably compacted																D			
	1	Silty CLAY CH: medium to high plasticity, orange brown and brown, w < PL, stiff to very stiff, residual becoming pale grey mottled orange-brown, with ironstone gravel from 1.0m																D			
	1.9	Silty CLAY CH: medium to high plasticity, pale grey mottled orange-brown, with ironstone and shale gravel,w <PL, hard, residual (possibly extremely weathered bedrock)																S			
	2.5																	D			10/40B refusal
	3	SANDSTONE: fine to medium grained, orange-brown, with approximately 10-20% siltstone laminations and 5% extremely weathered (clay) bands, medium to high strength, moderately weathered fractured, Bringelly Shale																D			
	4	3.3-3.37m: siltstone band 3.51-4.15m: low to medium strength band																S			
	4.74	LAMINITE: dark grey (50%) siltstone interbedded and interlaminated, with fine to medium grained, orange-brown and yellow-brown sandstone (50%), medium to high strength, moderately to slightly weathered, fractured to slightly fractured, Bringelly Shale																C	100	60	PL(A) = 0.54 PL(A) = 0.81 PL(A) = 0.26 PL(A) = 1.16
	5.8	SILTSTONE: pale grey, with approximately 10% sandstone laminations, very high strength, fresh with some iron staining, unbroken, Bringelly Shale																C	100	97	PL(A) = 0.44 PL(A) = 3.27
	6.74	Bore discontinued at 6.74m																			

RIG: XC

DRILLER: Traccess

LOGGED: JY / IT

CASING: 0-2.6m

TYPE OF BORING: 150mm diameter SFA to 2.6m then NMLC coring to 6.74m.

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

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

BORE: BH102

PROJECT: 94616.00

July 2020



Douglas Partners
Geotechnics | Environment | Groundwater

Project No: 94616.00
BH ID: BH102
Depth: 2.6 - 6.74m
Core Box No.: 1/1



2.6m - 6.74m

BOREHOLE LOG

CLIENT: Marsden Park Developments Pty Ltd
PROJECT: Proposed Industrial Development
LOCATION: Astoria Street, Marsden Park

SURFACE LEVEL: 41.9 mAH
EASTING: 298270
NORTHING: 6266817
DIP/AZIMUTH: 90°/--

BORE No: 103
PROJECT No: 94616.00
DATE: 30/6/2020
SHEET 1 OF 1

[illegible]

RIG: Hanjin D&B 8D

DRILLER: Sytech

LOGGED: JY

CASING: Uncased

TYPE OF BORING: 150mm diameter SFA

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

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



BOREHOLE LOG

CLIENT: Marsden Park Developments Pty Ltd
PROJECT: Proposed Industrial Development
LOCATION: Astoria Street, Marsden Park

SURFACE LEVEL: 41.8 mAHD
EASTING: 298168
NORTHING: 6266753
DIP/AZIMUTH: 90°/--

BORE No: 104
PROJECT No: 94616.00
DATE: 1/7/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Degree of Weathering					Graphic Log	Rock Strength					Water	Fracture Spacing (m)				Discontinuities		Sampling & In Situ Testing						
			EW	HW	MW	SW	FS		FR	Ex Low	Very Low	Low	Medium		High	Very High	Ex High	0.01	0.05	0.10	0.50	1.00	B - Bedding S - Shear	J - Joint F - Fault	Type	Core Rec. %	RQD %
	0.1	FILL/ TOPSOIL: silty clay CH, grey-brown, trace gravel and rootlets, w < PL																									
	0.5	FILL / Silty CLAY CH: grey-brown, trace gravel, w < PL																				D					
	1	FILL / Gravelly CLAY CL: grey, ripped shale gravel, trace sand, w < PL																				D					
	2																					S					8,12,8 N = 20
	3																										
	3.9	Silty CLAY CH: medium to high plasticity, orange-brown mottled grey, trace fine to medium ironstone gravel and rootlets, w < PL, stiff, residual																				D					
	4	becoming very stiff and pale grey mottled orange from 4.5m																				S					10,14,13 N = 27
	5																					D					
	5.5	SILTSTONE: dark brown to dark grey, with approximately 10% extremely weathered (clay bands), very low to low strength, highly to moderately weathered, fractured, Bringelly Shale																				S					18/50 refusal
	6																					C	100				PL(A) = 0.25
	7																										PL(A) = 0.13
	7.42	SILTSTONE / SHALE: dark grey, with approximately 10% sandstone laminations, low to medium strength, fresh, slightly fractured to unbroken, Bringelly Shale																									PL(A) = 0.17
	8																										PL(A) = 0.27
	9																					C	100				PL(A) = 0.34
	10.0																										PL(A) = 0.3
																											PL(A) = 0.36

Bore discontinued at 10.0m

RIG: XC

DRILLER: Traccess

LOGGED: JY

CASING: 0-5.7m

TYPE OF BORING: 150mm diameter SFA to 5.55m then NMLC coring to 10.0m

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U	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)

BORE: BH104

PROJECT: 94616.00

July 2020



Project No: 94616.00
BH ID: BH104
Depth: 5.7 - 10.0m
Core Box No.: 1/1



5.7m - 10.0m

BOREHOLE LOG

CLIENT: Marsden Park Developments Pty Ltd
PROJECT: Proposed Industrial Development
LOCATION: Astoria Street, Marsden Park

SURFACE LEVEL: 44.3 mAHD
EASTING: 298372
NORTHING: 6266725
DIP/AZIMUTH: 90°/-

BORE No: 105
PROJECT No: 94616.00
DATE: 30/6/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Degree of Weathering					Graphic Log	Rock Strength					Water	Fracture Spacing (m)				Discontinuities		Sampling & In Situ Testing						
			EW	HW	MW	SW	FS		FR	Ex Low	Very Low	Low	Medium		High	Very High	Ex High	0.01	0.05	0.10	0.50	1.00	B - Bedding S - Shear	J - Joint F - Fault	Type	Core Rec. %	RQD %
44	0.1	FILL / TOPSOIL / Silty CLAY: grey-brown, trace gravel rootlets, w < PL, surficial rootlets																									
43	1	FILL / Gravelly CLAY: grey, with sand, gravel is fine to coarse siltstone, w < PL, apparently well compacted																									
42	2																					D					
41	3.2	Silty CLAY CH: medium to high plasticity, pale grey mottled red and orange, w < PL, stiff to very stiff, residual																				D					
40	4																				S						6,8,8 N = 16
39	4.4	LAMINITE: fine grained, orange-brown to red-brown, interbedded sandstone (60-80%) with approximately 20 - 40% siltstone laminations, medium strength, moderately weathered, Bringelly Shale																									PL(A) = 0.57
38	5	5.63m: grading to medium grained sandstone																									PL(A) = 0.95
37	6																					C	100	90			PL(A) = 0.53
36	6.55	SANDSTONE: fine grained, pale grey and orange-brown, medium to high strength, fresh with some iron staining, unbroken, Bringelly Shale																									PL(A) = 0.6
35	7																										PL(A) = 0.64
34	8																										PL(A) = 1.08
33	8.54	Bore discontinued at 8.54m																									
32	9																										

RIG: XC

DRILLER: Traccess

LOGGED: JY / IT

CASING: Uncased

TYPE OF BORING: 150mm diameter SFA to 4.4m then NMLC coring to 8.54m

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U	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)

BORE: BH105

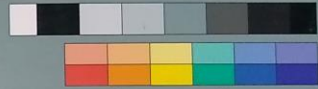
PROJECT: 94616.00

July 2020



Douglas Partners
Geotechnics | Environment | Groundwater

Project No: 94616.00
BH ID: BH105
Depth: 4.4 - 8.54m
Core Box No.: 1/1



94616.00 BH105 START 4.4m

5

6

7

8

END = 8.54m

4.4m - 8.54m

BOREHOLE LOG

CLIENT: Marsden Park Developments Pty Ltd
PROJECT: Proposed Industrial Development
LOCATION: Astoria Street, Marsden Park

SURFACE LEVEL: 49.5 mAHD
EASTING: 298461
NORTHING: 6266448
DIP/AZIMUTH: 90°/-

BORE No: 106
PROJECT No: 94616.00
DATE: 30/6/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Degree of Weathering					Graphic Log	Rock Strength					Water	Fracture Spacing (m)				Discontinuities		Sampling & In Situ Testing							
			EW	HW	MW	SW	FS		FR	Ex Low	Very Low	Low	Medium		High	Very High	Ex High	0.01	0.05	0.10	0.50	1.00	B - Bedding S - Shear	J - Joint F - Fault	Type	Core Rec. %	RQD %	Test Results & Comments
	0.05	FILL/TOPSOIL: silty clay CH, brown with rootlets throughout																										
	49	Silty CLAY CH: medium to high plasticity, orange-brown mottled grey, trace fine gravel, w < PL, stiff to very stiff, residual - becoming very stiff from 0.7m - becoming pale grey mottled orange and red and trace of ironstone gravel from 1.0m																										
	1																											
	48																											
	2																											
	47	2.5																										
	3	SANDSTONE: fine grained, red-brown, medium strength, moderately weathered, fractured to slightly fractured, Bringelly Shale																										
	46																											
	4																											
	45	4.38																										
	5	SANDSTONE: fine to medium grained, orange-brown and pale grey, laminated with cross bedding, with ironstone bands, high strength, moderately to slightly weathered, fractured, Bringelly Shale																										
	5.21																											
	44	LAMINITE: fine to medium grained, pale grey and orange-brown, 60 - 70% sandstone and 30 - 40 % siltstone, laminated to very thinly bedded, with ironstone bands, low strength, moderately to slightly weathered, slightly fractured to unbroken, Bringelly Shale																										
	6																											
	43	6.51m: grading to low strength sandstone																										
	7																											
	42																											
	7.71	7.71																										
	8	SILTSTONE: fine to coarse grained, pale grey, 50 - 60% sandstone and 40 - 50% siltstone, interbedded and interlaminated, low and medium strength with high strength band, fresh, slightly fractured, Bringelly Shale																										
	41																											
	9	8.75m: grading to 70% siltstone and 30% sandstone, moderately weathered																										
	40	8.98m: highly fractured																										
	9.79	Bore discontinued at 9.79m																										

RIG: Hanjin D&B 8D

DRILLER: Sytech

LOGGED: JY

CASING: 0-2.5m

TYPE OF BORING: 150mm diameter SFA to 2.5m then NMLC coring to 9.79m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Well constructions details: Blank 0-5.3m, Screen 5.3-8.3m, Backfill: 5mm gravel 0-4.3m bgl, Bentonite 4.3-4.8m bgl, 5mm gravel 4.8-9.79m

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	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	sp	Standard penetration test
E	Environmental sample	≡	Water level	V	Shear vane (kPa)



Douglas Partners
 Geotechnics | Environment | Groundwater



BOREHOLE LOG

CLIENT: Marsden Park Developments Pty Ltd
PROJECT: Proposed Industrial Development
LOCATION: Astoria Street, Marsden Park

SURFACE LEVEL: 51.0 mAHD
EASTING: 298543
NORTHING: 6266435
DIP/AZIMUTH: 90°/--

BORE No: 107
PROJECT No: 94616.00
DATE: 30/6/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Well Construction Details	
				Type	Depth	Sample	Results & Comments			
51	0.05	FILL/TOPSOIL: silty clay CH, brown with vegetation throughout		D	0.4					
		FILL / Silty CLAY: brown and grey, trace fine to medium gravel, w < PL			0.5					
50	0.8	Silty CLAY: medium to high plasticity, pale grey mottled red and orange, w < PL, very stiff, residual		U50	1.0				1	
49	1				1.25					
				S	1.5		6,10,13 N = 23			
					1.95				2	
48	2									
		- hard clay (possibly extremely weathered shale)		S	3.0		11,15,20/120 refusal		3	
					3.42					
47	3.6	SHALE: grey-brown, very low strength, with clay seams, moderately weathered, Bringelly Shale								
47	3.7	Bore discontinued at 3.7m							4	
		- Practical refusal at 3.7m								
46	4								5	
45	5								6	
44	6								7	
43	7								8	
42	8								9	

RIG: XC

DRILLER: Traccess

LOGGED: JY

CASING: Uncased

TYPE OF BORING: 150mm diameter SFA

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

SAMPLING & IN SITU TESTING LEGEND					
A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U	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)

BOREHOLE LOG

CLIENT: Marsden Park Developments Pty Ltd
PROJECT: Proposed Industrial Development
LOCATION: Astoria Street, Marsden Park

SURFACE LEVEL: 51.8 mAHD
EASTING: 298456
NORTHING: 6266375
DIP/AZIMUTH: 90°/-

BORE No: 108
PROJECT No: 94616.00
DATE: 30/6/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Degree of Weathering EW HW MW SW FS FR	Graphic Log	Rock Strength Ex Low Very Low Low Medium High Very High Ex High	Water 0.01 0.05 0.10 0.50 1.00	Fracture Spacing (m)	Discontinuities		Sampling & In Situ Testing			
								B - Bedding S - Shear	J - Joint F - Fault	Type	Core Rec. %	RQD %	Test Results & Comments
0.05		FILL/TOPSOIL: silty clay CH, brown with vegetation throughout Silty CLAY CH: medium to high plasticity, mottled pale grey and orange-brown, w < PL, stiff, residual											
1.0		Silty CLAY CH: medium to high plasticity, pale grey mottled red, trace ironstone gravel, w < PL, very stiff, residual								D			6,9,12 N = 21
2.85		- hard (extremely weathered siltstone)								S			20,R refusal
3.63		SILTSTONE: grey and orange-brown, low strength, moderately weathered, fractured, with extremely weathered seams, Bringelly Shale											
4.0		LAMINITE: fine grained, grey-brown, medium strength, moderately weathered, slightly fractured, 40 - 50% sandstone with 50- 60% siltstone laminations, Bringelly Shale								C	100	30	PL(A) = 0.94
5.31										C	100	67	PL(A) = 0.68
6.0		SANDSTONE: fine to medium grained, pale grey and brown, high strength, moderately to slightly weathered, slightly fractured, Bringelly Shale											PL(A) = 1.77
7.15										C	100	83	PL(A) = 1.05
8.35		8.20-8.23m and 8.4-8.44m: siltstone band SILTSTONE: fine to medium grained, grey, medium strength, fresh stained, with 30% sandstone laminations, Bringelly Shale											PL(A) = 0.51
9.28										C	100	72	PL(A) = 0.56

Bore discontinued at 10.0m

RIG: XC

DRILLER: Traccess

LOGGED: JY

CASING: 0-2.85m

TYPE OF BORING: 150mm diameter SFA to ___ then NMLC coring to

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U	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)



BOREHOLE LOG

CLIENT: Marsden Park Developments Pty Ltd
PROJECT: Proposed Industrial Development
LOCATION: Astoria Street, Marsden Park

SURFACE LEVEL: 51.9 mAHD
EASTING: 298535
NORTHING: 6266348
DIP/AZIMUTH: 90°/-

BORE No: 109
PROJECT No: 94616.00
DATE: 29/6/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Degree of Weathering					Graphic Log	Rock Strength					Water	Fracture Spacing (m)				Discontinuities		Sampling & In Situ Testing					
			EW	HW	MW	SW	FS		FR	Ex Low	Very Low	Low	Medium		High	Very High	Ex High	0.01	0.05	0.10	0.50	1.00	B - Bedding S - Shear	J - Joint F - Fault	Type	Core Rec. %
	0.05	FILL/TOPSOIL: silty clay CH, brown with vegetation throughout																								
	1	Silty CLAY CH: medium to high plasticity, pale grey mottled orange, trace ironstone gravel and carbonaceous material, w < PL, stiff, residual																				D				3,6,7 N = 13
	2	Silty CLAY CH: medium to high plasticity, pale grey mottled red, with ironstone gravel, w < PL, very stiff, residual																				S				7,10,16 N = 26
	3	Silty CLAY CH: medium to high plasticity, pale grey mottled red, with bands of ironstone and extremely weathered siltstone, w < PL, hard, residual (extremely weathered siltstone)																								
	4	SILTSTONE: grey-brown, very low strength, highly to moderately weathered, slightly fractured, with 5% clay seams, Bringelly Shale																								12,16,20 N = 36
	5	LAMINITE: grey and brown, low strength, moderately then slightly weathered, fractured, 30% sandstone laminations, Bringelly Shale																								PL(A) = 0.09
	6																									PL(A) = 0.22
	7																									PL(A) = 0.09
	8																									PL(A) = 0.19
	9																									PL(A) = 0.23
	10																									PL(A) = 0.11
	11																									PL(A) = 0.93
	12																									PL(A) = 1.08

Bore discontinued at 10.0m

RIG: Hanjin D&B 8D

DRILLER: Sytech

LOGGED: JY

CASING: 0-3.15m

TYPE OF BORING: 150mm diameter SFA to 3.0m then coring to 10.0m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Well construction details: Blank 0-5.3m, Screen 5.3-8.3m, Backfill: 5mm gravel, Bentonite 4.3-4.8m, 5mm gravel 4.8-10m

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	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	W	Water seep	S	Standard penetration test
E	Environmental sample	W	Water level	V	Shear vane (kPa)



Douglas Partners
 Geotechnics | Environment | Groundwater



BOREHOLE LOG

CLIENT: Marsden Park Developments Pty Ltd
PROJECT: Proposed Industrial Development
LOCATION: Astoria Street, Marsden Park

SURFACE LEVEL: 50.9 mAHD
EASTING: 298447
NORTHING: 6266314
DIP/AZIMUTH: 90°/--

BORE No: 110
PROJECT No: 94616.00
DATE: 29/6/2020
SHEET 1 OF 2

[illegible]

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Marsden Park Developments Pty Ltd
PROJECT: Proposed Industrial Development
LOCATION: Astoria Street, Marsden Park

SURFACE LEVEL: 50.9 mAHd
EASTING: 298447
NORTHING: 6266314
DIP/AZIMUTH: 90°/--

BORE No: 110
PROJECT No: 94616.00
DATE: 29/6/2020
SHEET 2 OF 2

[illegible]

CASING: 0-3.0m

TYPE OF BORING: 150mm diameter SFA to 30.0m then NMLC coring to 10.14m

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Well construction details: Blank 0-5.6m, Screen 5.6-8.6m, Backfill: 5mm gravel 0-2.5m, Bentonite 2.5-3.0m, 5mm gravel 3.0-8.6m

SAMPLING & IN SITU TESTING LEGEND

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U _t	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	W _s	Water seep
E	Environmental sample	W _l	Water level
		PID	Photo ionisation detector (ppm)
		PL(A)	Point load axial test ls(50) (MPa)
		PL(D)	Point load diametral test ls(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)





BOREHOLE LOG

CLIENT: Marsden Park Developments Pty Ltd
PROJECT: Proposed Industrial Development
LOCATION: Astoria Street, Marsden Park

SURFACE LEVEL: 41.9 mAH
EASTING: 298309
NORTHING: 6266894
DIP/AZIMUTH: 90°/-

BORE No: 157
PROJECT No: 94616.00
DATE: 2/7/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Degree of Weathering					Graphic Log	Rock Strength					Water	Fracture Spacing (m)	Discontinuities		Sampling & In Situ Testing				
			EW	HW	MW	SW	FS		FR	Ex Low	Very Low	Low	Medium			High	Very High	Ex High	B - Bedding S - Shear	J - Joint F - Fault	Type	Core Rec. %
	0.1	FILL / TOPSOIL: Silty CLAY: brown, with rootlets throughout, trace sand and fine gravel, FILL / Silty CLAY CH: grey-brown, trace sand and fine gravel, w < PL, appears well compacted Silty CLAY CH: medium to high plasticity, red-brown mottled grey, trace fine ironstone gravel, w < PL, stiff to very stiff, residual																				
	0.3																		D			
41	1																		S			4,5,7 N = 12
	1.8	LAMINITE: grey-brown, very low strength, moderately weathered, fractured, Bringelly Shale																	D S			8/80B refusal
	2.5	SANDSTONE: fine to medium grained, grey-brown, medium then high strength, moderately weathered, slightly fractured, 30% siltstone laminations, Bringelly Shale																				PL(A) = 0.6
39	3																					PL(A) = 1.2
	3.7																					PL(A) = 3.5
	4	SANDSTONE: fine grained, grey and orange-brown, very high strength, moderately weathered and fresh stained, slightly fractured, Bringelly Shale																	C	100	87	
	5.0	SANDSTONE: fine to medium grained, grey, fresh stained, slightly fractured with 10% siltstone laminations, Bringelly Shale Bore discontinued at 5.5m																				4.26m: J90°, pl, ro, cly vn, fe stn 4.32m: J45°, pl, ro, cly vn, fe stn 4.32-4.64m: J40-45°, pl, ro, cly vn, fe stn (x2)
	5.5																					PL(A) = 0.7
	6																					
	7																					
	8																					
	9																					

RIG: XC

DRILLER: Traccess

LOGGED: JY

CASING: 0-2.5m

TYPE OF BORING: 150mm diameter SFA to 2.5 m then NMLC Coring to 5.5 m

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U	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	W	Water seep	S	Standard penetration test
E	Environmental sample	W	Water level	V	Shear vane (kPa)

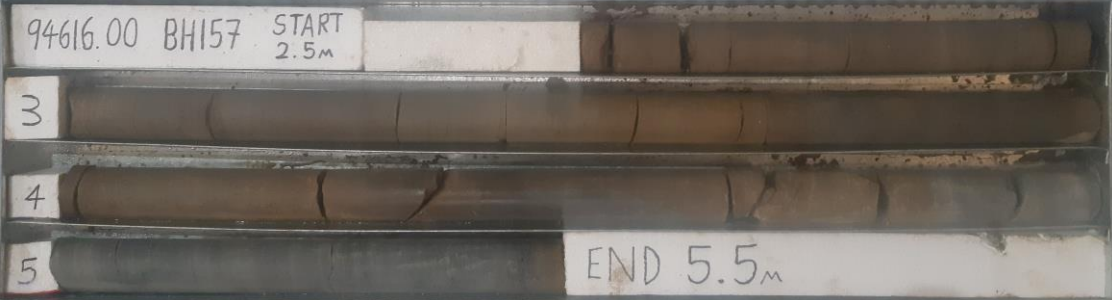
BORE: BH157

PROJECT: 94616.00

July 2020



Project No: 94616.00
BH ID: 157
Depth: 2.5-5.5m
Core Box No.: 1/1



2.5m - 5.5m

BOREHOLE LOG

CLIENT: Marsden Park Developments Pty Ltd
PROJECT: Proposed Industrial Development
LOCATION: Astoria Street, Marsden Park

SURFACE LEVEL: 53.2 mAHD
EASTING: 298544
NORTHING: 6266300
DIP/AZIMUTH: 90°/-

BORE No: 111
PROJECT No: 94616.00
DATE: 30/6/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing			Water	Well Construction Details		
				Type	Depth	Sample				Results & Comments
53	0.05	FILL/TOPSOIL: silty clay CH, brown with vegetation throughout								
		Silty CLAY CH: medium to high plasticity, brown mottled grey, w < PL, stiff, residual, surficial vegetation		D	0.4 0.5					
1	1.0	Silty CLAY CH: medium to high plasticity, pale grey mottled orange and brown, trace carbonaceous material and ironstone gravel, w < PL, very stiff, residual		S	1.0		5,8,10 N = 18		1	
52					1.45					
2				D	1.9 2.0				2	
51				S	2.5		6,11,17 N = 28			
3					2.95				3	
50										
4		- hard from 3.7m (extremely weathered siltstone)								
49	4.1	SILTSTONE: grey-brown, very low strength, moderately weathered, Bringelly Shale Bore discontinued at 4.21m		S	4.0		20,20/60 refusal		4	
48	4.2				4.21					
5									5	
48									6	
47									7	
46									8	
45									9	
44										

RIG: Hanjin D&B 8D

DRILLER: Sytech

LOGGED: JY

CASING: Uncased

TYPE OF BORING: 150mm diameter SFA

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

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

TEST PIT LOG

CLIENT: Marsden Park Developments Pty Ltd
PROJECT: Proposed Industrial Development
LOCATION: Astoria Street, Marsden Park

SURFACE LEVEL: 40.3 mAHD
EASTING: 298142
NORTHING: 6266946

PIT No: 112
PROJECT No: 94616.00
DATE: 30/6/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
	0.1	FILL / TOPSOIL : gravelly clay CL, brown, with rootlets throughout		D	0.1							
	0.45	FILL / Gravelly CLAY CL: low to medium plasticity, dark-brown, trace cobbles (gravel is igneous and siltstone), w < PL, appears well compacted										
		Silty CLAY CH: medium to high plasticity, red-brown, trace ironstone gravel, very stiff to hard, w < PL, residual		B	0.5							
				D	0.6							
	1											
				D	1.2							
					1.5		pp >400					
	2			D	2.0		pp >400					
					2.5		pp = 400					
	3			D	3.0							
	3.0	SILTSTONE: grey, very low to low strength, highly weathered, with clay bands, Bringelly Shale										
	3.2	Pit discontinued at 3.2m										
	4											

RIG: 14 tonne excavator - 600mm bucket

LOGGED: RB

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ 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	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	W	Water seep	S	Standard penetration test
E	Environmental sample	W	Water level	V	Shear vane (kPa)

TEST PIT LOG

CLIENT: Marsden Park Developments Pty Ltd
PROJECT: Proposed Industrial Development
LOCATION: Astoria Street, Marsden Park

SURFACE LEVEL: 41.5 mAHD
EASTING: 298219
NORTHING: 6266939

PIT No: 113
PROJECT No: 94616.00
DATE: 30/6/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)
				Type	Depth	Sample	Results & Comments		
41.15	0.15	FILL / TOPSOIL: Gravelly clay CL, low to medium plasticity, grey, gravel is ripped siltstone, trace sand, with rootlets throughout		D	0.1				
41.0		Silty CLAY CH: medium to high plasticity, brown and grey, with ironstone gravel, w < PL, stiff to very stiff, residual (possibly disturbed to 0.4m)		D	0.5				
40.0	1.0			D	1.0				
39.0		1.4m: with ironstone bands,		D	1.5		pp = 250		
38.0	2.0			D	2.0		pp = 300		
37.0	2.8				2.5				
36.0	3.0	SILTSTONE: grey brown, very low to low strength, with clay bands, Bringelly Shale		D	2.9				
35.0		Pit discontinued at 3.0m							

RIG: 14 tonne excavator - 600mm bucket

LOGGED: RB

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

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

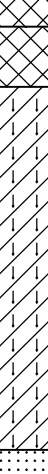
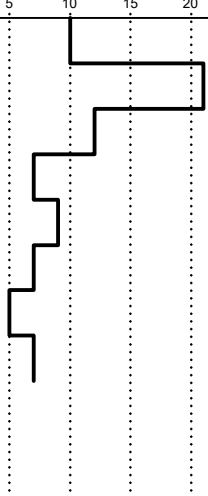

SAMPLING & IN SITU TESTING LEGEND					
A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket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

TEST PIT LOG

CLIENT: Marsden Park Developments Pty Ltd
PROJECT: Proposed Industrial Development
LOCATION: Astoria Street, Marsden Park

SURFACE LEVEL: 42.9 mAHD
EASTING: 298350
NORTHING: 6266921

PIT No: 114
PROJECT No: 94616.00
DATE: 30/6/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)
				Type	Depth	Sample	Results & Comments		
42	0.1	FILL / TOPSOIL : gravelly clay CL, brown, with rootlets throughout		D	0.1		pp = 250		
	0.3	FILL / Gravelly CLAY CH: medium to high plasticity, dark-brown, with cobbles (gravel and cobbles are siltstone of medium and high strength), w < PL, appears well compacted		D	0.5				
		Silty CLAY CH: medium to high plasticity, orange brown, trace ironstone gravel, w < PL, stiff to very stiff, residual (possible disturbed to 0.5m)							
	1	0.9m: grading to grey mottled red-brown		D	1.0			1	
	1.5	1.4m: hard (possibly extremely weathered sandstone)		D	1.4				
41	1.6	SANDSTONE: fine grained, grey and brown, very low to low strength, highly weathered, Bringelly Shale			1.5				
		Pit discontinued at 1.6m Practical refusal on at least low strength sandstone							
40	2							2	
39	3							3	
38	4							4	

RIG: 14 tonne excavator - 600mm bucket

LOGGED: RB

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

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


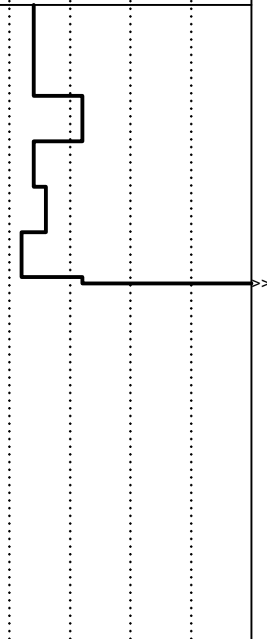


SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	W	Water seep
E	Environmental sample	W	Water level
		PID	Photo ionisation detector (ppm)
		PL(A)	Point load axial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

TEST PIT LOG

CLIENT: Marsden Park Developments Pty Ltd
PROJECT: Proposed Industrial Development
LOCATION: Astoria Street, Marsden Park

SURFACE LEVEL: 45.8 mAHD
EASTING: 298490
NORTHING: 6266896

PIT No: 115
PROJECT No: 94616.00
DATE: 30/6/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)
				Type	Depth	Sample	Results & Comments		
45	0.1	FILL/ROADBASE: 20 mm, fine to medium, grey, igneous		D	0.0				
		FILL / Silty CLAY CH: low to medium plasticity, brown, trace gravel, (igneous and siltstone) w < PL, appears well compacted		D	0.1				
				D	0.4				
	0.5	FILL / Gravelly CLAY CH: medium to high plasticity, red-brown, gravel (siltstone), w, PL, appears well compacted		D	0.6				
				D	0.7				
44				D	1.0				
		1.1m: gravel band (150mm)		D	1.5				
				D	1.9				
43	2.1	Silty CLAY CH: medium to high plasticity, red-brown, trace ironstone gravel, w < PL, very stiff, residual		D	2.0		pp = 350		
		Pit discontinued at 2.1m							
42									
41									

RIG: 14 tonne excavator - 600mm bucket

LOGGED: RB

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

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



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

TEST PIT LOG

CLIENT: Marsden Park Developments Pty Ltd
PROJECT: Proposed Industrial Development
LOCATION: Astoria Street, Marsden Park

SURFACE LEVEL: 46.1 mAHD
EASTING: 298435
NORTHING: 6266864

PIT No: 116
PROJECT No: 94616.00
DATE: 30/6/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)
				Type	Depth	Sample	Results & Comments		
46	0.15	FILL / TOPSOIL: gravelly clay CL, medium plasticity, dark-brown, with gravel and rootlets throughout, w < PL		D	0.1				
		FILL / CLAY CH: medium to high plasticity, dark-brown, trace rootlets, with siltstone gravel, w ~ PL, poorly compacted		B	0.4				
				D	0.5				
				D	0.6				
1				D	1.0				
				D	1.5				
2		1.9m: brown, w < PL, appears well compacted below 1.9 m		D	2.0				
				D	2.5				
3	3.0	2.9m: metal fragments Pit discontinued at 3.0m		D	3.0				
4									

RIG: 14 tonne excavator - 600mm bucket

LOGGED: RB

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ 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	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)

TEST PIT LOG

CLIENT: Marsden Park Developments Pty Ltd
PROJECT: Proposed Industrial Development
LOCATION: Astoria Street, Marsden Park

SURFACE LEVEL: 42.5 mAHD
EASTING: 298347
NORTHING: 6266885

PIT No: 117
PROJECT No: 94616.00
DATE: 30/6/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)
				Type	Depth	Sample	Results & Comments		
	0.15	FILL / TOPSOIL: silty clay CH, medium to high plasticity, dark-brown, with siltstone/sandstone gravel, trace cobbles, with rootlets throughout		D	0.1				
		Silty CLAY CH: medium to high plasticity, red-brown and grey, with ironstone gravel, with tree roots to 0.6m depth, w < PL, stiff, residual		D	0.5				
	1.0	Silty CLAY CH: medium to high plasticity, red-brown mottled grey, with ironstone gravel, w < PL, very stiff, residual		D	1.0				
				D	1.5		pp = 300		
	1.65	SANDSTONE: fine to medium grained, grey-brown, very low to low strength, highly weathered, Bringelly Shale		D	1.7				
	1.75	Pit discontinued at 1.75m Practical refusal on at least low strength sandstone							

RIG: 14 tonne excavator - 600mm bucket

LOGGED: RB

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

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

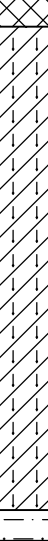
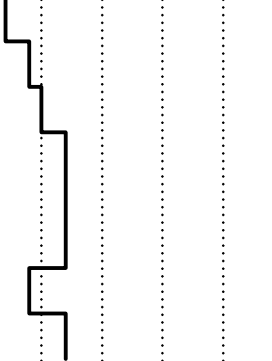

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	W	Water seep
E	Environmental sample	W	Water level
		PID	Photo ionisation detector (ppm)
		PL(A)	Point load axial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

TEST PIT LOG

CLIENT: Marsden Park Developments Pty Ltd
PROJECT: Proposed Industrial Development
LOCATION: Astoria Street, Marsden Park

SURFACE LEVEL: 41.3 mAHD
EASTING: 298271
NORTHING: 6266894

PIT No: 118
PROJECT No: 94616.00
DATE: 30/6/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)
				Type	Depth	Sample	Results & Comments		
41	0.1	FILL / TOPSOIL: silty clay CH, medium to high plasticity, dark-brown, with siltstone gravel and rootlets throughout		D	0.05				
		Silty CLAY CH: medium to high plasticity, red-brown and grey, with ironstone gravel, w < PL, stiff to very stiff, residual (possibly disturbed to 0.4m)		D	0.5				
	1			D	1.0				
				D	1.5		pp = 300		
	1.7	SILTSTONE: grey, very low to low strength, highly weathered, Bringelly Shale		D	1.7				
	1.8	Pit discontinued at 1.8m Practical refusal on at least low strength siltstone		D	1.8				

RIG: 14 tonne excavator - 600mm bucket

LOGGED: RB

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ 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 _s	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	W	Water seep	S	Standard penetration test
E	Environmental sample	W	Water level	V	Shear vane (kPa)

TEST PIT LOG

CLIENT: Marsden Park Developments Pty Ltd
PROJECT: Proposed Industrial Development
LOCATION: Astoria Street, Marsden Park

SURFACE LEVEL: 39.6 mAHD
EASTING: 298134
NORTHING: 6266885

PIT No: 119
PROJECT No: 94616.00
DATE: 30/6/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
39	0.2	FILL / TOPSOIL: silty clay CH, low to medium plasticity, brown, trace sand and gravel, with rootlets throughout		D	0.1							
				B	0.3							
				D	0.4							
				B	0.6							
1	0.95	FILL / Gravelly CLAY CH: low to medium plasticity, grey, trace cobbles (gravel and cobbles are siltstone estimated to be of low and medium strength), w < PL, appears well compacted (ripped shale)										
38	1	Silty CLAY CH: medium to high plasticity, red-brown, with ironstone gravel, w < PL, stiff to very stiff, residual (possibly disturbed to 1.2m)		D	1.1							
				D	1.5							
2	2	2.0m: grey with red-brown, hard (possibly extremely weathered siltstone)		D	2.0		pp = 400					
37	2.5						pp > 400					
2.8	2.8	SILTSTONE: grey, very low to low strength, highly weathered, with clay bands, Bringelly Shale		D	2.8							
2.9	2.9	Pit discontinued at 2.9m Practical refusal on at least low strength siltstone										
3	3											
36	4											
35	4											

RIG: 14 tonne excavator - 600mm bucket

LOGGED: RB

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

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

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

TEST PIT LOG

CLIENT: Marsden Park Developments Pty Ltd
PROJECT: Proposed Industrial Development
LOCATION: Astoria Street, Marsden Park

SURFACE LEVEL: 41.5 mAHD
EASTING: 298204
NORTHING: 6266866

PIT No: 120
PROJECT No: 94616.00
DATE: 30/6/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
41	0.15	FILL / TOPSOIL: silty clay CH, low to medium plasticity, brown, trace sand and gravel, with rootlets throughout		D	0.1							
		FILL / Silty CLAY CH: medium to high plasticity, dark-brown, with gravel and trace rootlets, w > PL, poorly compacted		B	0.4							
				D	0.5							
				D	0.6							
1	0.9	FILL / Gravelly CLAY: low to medium plasticity, grey, with cobbles and boulders (gravel, cobbles and boulders are siltstone estimated to be of medium or high strength), w < PL, variably compacted (ripped shale)		D	1.0							
40	1.5	Silty CLAY CH: medium to high plasticity, red-brown and grey, with ironstone gravel, w < PL, very stiff to hard, residual		D	1.6							
					2.0		pp = 250					
				D	2.5		pp = 350					
					3.0							
3		2.5m: with ironstone bands		D	3.0							
	3.3	Pit discontinued at 3.3m										
38												
4												
37												

RIG: 14 tonne excavator - 600mm bucket

LOGGED: RB

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

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


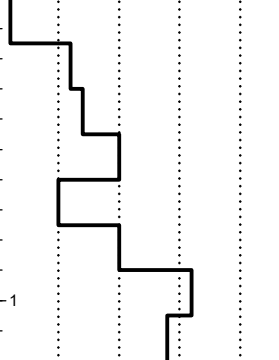

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	W	Water seep
E	Environmental sample	W	Water level
		PID	Photo ionisation detector (ppm)
		PL(A)	Point load axial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

TEST PIT LOG

CLIENT: Marsden Park Developments Pty Ltd
PROJECT: Proposed Industrial Development
LOCATION: Astoria Street, Marsden Park

SURFACE LEVEL: 41.8 mAH
EASTING: 298342
NORTHING: 6266848

PIT No: 121
PROJECT No: 94616.00
DATE: 30/6/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)		
				Type	Depth	Sample	Results & Comments				
41	0.1	FILL / TOPSOIL: silty clay CH, low to medium plasticity, brown, trace gravel, with rootlets throughout		D	0.1		pp = 250				
		FILL / Silty CLAY CH: medium to high plasticity, brown to dark-brown, with gravel, cobbles and boulders (siltstone estimated to be of medium or high strength), w < PL, variably compacted (ripped shale)		D	0.5						
	0.7	Silty CLAY CH: medium to high plasticity, red-brown and grey, trace ironstone gravel and rootlets, w < PL, very stiff to hard (possibly disturbed to 0.9m)									
			D	1.0							
			D	1.2							
40	1.7	SANDSTONE: fine grained, grey brown, very low to low strength, highly weathered, Bringelly Shale		D	1.5						
	1.8			D	1.8						
2		Pit discontinued at 1.8m Practical refusal on at least low strength sandstone									
3											
4											
37											

RIG: 14 tonne excavator - 600mm bucket

LOGGED: RB

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

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


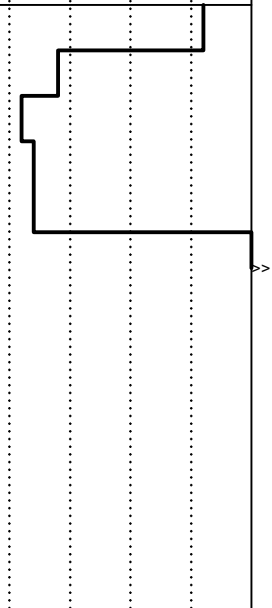
SAMPLING & IN SITU TESTING LEGEND					
A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket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

TEST PIT LOG

CLIENT: Marsden Park Developments Pty Ltd
PROJECT: Proposed Industrial Development
LOCATION: Astoria Street, Marsden Park

SURFACE LEVEL: 45.6 mAHD
EASTING: 298480
NORTHING: 6266835

PIT No: 122
PROJECT No: 94616.00
DATE: 30/6/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)
				Type	Depth	Sample	Results & Comments		
	0.2	FILL / TOPSOIL: silty clay CH, low to medium plasticity, brown, trace sand and gravel, with rootlets throughout		D	0.1				
		FILL / Gravelly CLAY CH: medium plasticity, dark-brown, with cobbles (siltstone estimated to be medium strength), w < PL, appears well compacted		B	0.4				
				D	0.5				
	1.0			D	1.0				
				D	1.5				
				D	1.9				
	2.0	Pit discontinued at 2.0m Practical refusal. Very slow progress in fill			2.0				

RIG: 14 tonne excavator - 600mm bucket

LOGGED: RB

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ 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	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	W	Water seep	S	Standard penetration test
E	Environmental sample	W	Water level	V	Shear vane (kPa)

TEST PIT LOG

CLIENT: Marsden Park Developments Pty Ltd
PROJECT: Proposed Industrial Development
LOCATION: Astoria Street, Marsden Park

SURFACE LEVEL: 43.1 mAHD
EASTING: 298450
NORTHING: 6266807

PIT No: 123
PROJECT No: 94616.00
DATE: 30/6/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)
				Type	Depth	Sample	Results & Comments		
42.5	0.25	FILL / TOPSOIL: silty clay CH, low to medium plasticity, brown, trace gravel and cobbles, with rootlets throughout		D	0.1				5
		FILL / Gravelly CLAY CH: medium plasticity, dark-brown, with cobbles (siltstone estimated to be of medium strength), w < PL, appears well compacted (ripped shale)		D	0.4				10
41.5	1.1	FILL / Gravelly CLAY CH: medium to high plasticity, dark brown, with gravel (siltstone and river gravel), w < PL, appears well compacted (mixture of ripped shale and river gravel)		D	1.0				15
				D	1.4				20
40.5	1.6	Silty CLAY CH: medium to high plasticity, brown and grey, with ironstone gravel, w < PL, hard, residual		D	1.9		pp >400		
39.5	2.1	Pit discontinued at 2.1m							

RIG: 14 tonne excavator - 600mm bucket

LOGGED: RB

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

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

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

TEST PIT LOG

CLIENT: Marsden Park Developments Pty Ltd
PROJECT: Proposed Industrial Development
LOCATION: Astoria Street, Marsden Park

SURFACE LEVEL: 43.1 mAHD
EASTING: 298334
NORTHING: 6266796

PIT No: 124
PROJECT No: 94616.00
DATE: 26/6/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)
				Type	Depth	Sample	Results & Comments		
42	0.15	FILL / Topsoil: silty clay CH, medium to high plasticity, red-brown and dark brown, with rootlets and gravel		D	0.05 0.1				
		FILL / Silty CLAY CH: medium to high plasticity, brown and grey, with gravel (siltstone), w<PL, variably compacted			0.4 0.5				
	0.6	FILL / Gravelly CLAY CL: medium plasticity, grey, trace siltstone cobbles and boulders, w < PL, appears well compacted (ripped shale)							
1				D	0.9 1.0				
2									
2.5		- siltstone boulders (estimated to be high or very high strength) up to 0.5 m diameter at 2.4m Pit discontinued at 2.5m = Practical Refusal. Very slow progress in fill							
3									
4									

RIG: 8 tonne excavator - 600mm bucket

LOGGED: RB

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ 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	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	W	Water seep	S	Standard penetration test
E	Environmental sample	WL	Water level	V	Shear vane (kPa)

TEST PIT LOG

CLIENT: Marsden Park Developments Pty Ltd
PROJECT: Proposed Industrial Development
LOCATION: Astoria Street, Marsden Park

SURFACE LEVEL: 41.9 mAHD
EASTING: 298231
NORTHING: 6266796

PIT No: 125
PROJECT No: 94616.00
DATE: 29/6/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)
				Type	Depth	Sample	Results & Comments		
41 <									

RIG: 14 tonne excavator - 600mm bucket

LOGGED: RB

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

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

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

TEST PIT LOG

CLIENT: Marsden Park Developments Pty Ltd
PROJECT: Proposed Industrial Development
LOCATION: Astoria Street, Marsden Park

SURFACE LEVEL: 41.4 mAHD
EASTING: 298199
NORTHING: 6266811

PIT No: 126
PROJECT No: 94616.00
DATE: 29/6/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)
				Type	Depth	Sample	Results & Comments		
41	0.15	FILL / TOPSOIL: silty clay CH, low to medium plasticity, brown, trace sand and gravel, with rootlets throughout		D	0.1				
		FILL / Gravelly CLAY CH: low to medium plasticity, grey, with cobbles and trace boulders (gravel, cobbles and boulders are siltstone and sandstone estimated to be of medium and high strength), w < PL, appears well compacted (ripped shale and sandstone)		D	0.5				
1									
40									
2									
39	2.3	Silty CLAY CH: medium to high plasticity, grey and red-brown, trace ironstone gravel, w < PL, stiff to very stiff, residual		D	2.5		pp = 200		
				D	2.9				
3	3.0	Pit discontinued at 3.0m			3.0		pp = 300		
38									
4									
37									

RIG: 14 tonne excavator - 600mm bucket

LOGGED: RB

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

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

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

TEST PIT LOG

CLIENT: Marsden Park Developments Pty Ltd
PROJECT: Proposed Industrial Development
LOCATION: Astoria Street, Marsden Park

SURFACE LEVEL: 39.1 mAHD
EASTING: 298125
NORTHING: 6266805

PIT No: 127
PROJECT No: 94616.00
DATE: 29/6/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
38.0	0.15	FILL / TOPSOIL: silty clay CH, low to medium plasticity, brown, trace sand and gravel, with rootlets throughout		D	0.1							
		FILL / Silty CLAY CH: medium plasticity, brown, trace sand, gravel, cobbles and boulders (gravel, cobbles and boulders are siltstone estimated to be medium or high strength), w < PL, poorly compacted (ripped shale)		D	0.5							
1	1.2	FILL / Sandy GRAVEL GC: fine to coarse, grey, with clay, cobbles and boulders (gravel, cobbles and boulders are a mixture of sub-rounded river gravel and siltstone estimated to be of medium and high strength), wet, variably compacted (a mixture of river gravels and ripped shale)		D	1.5							
	1.7	Silty CLAY CH: medium to high plasticity, grey and red-brown, ironstone gravel, w < PL, stiff to very stiff, residual		D	1.9							
2				D	2.0		pp = 250					
					2.5		pp = 200					
3	2.9	SILTSTONE: grey brown, very low to low strength, highly weathered, Bringley Shale		D	3.0							
	3.0	Pit discontinued at 3.0m										

RIG: 14 tonne excavator - 600mm bucket

LOGGED: RB

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

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

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

TEST PIT LOG

CLIENT: Marsden Park Developments Pty Ltd
PROJECT: Proposed Industrial Development
LOCATION: Astoria Street, Marsden Park

SURFACE LEVEL: 38.8 mAHD
EASTING: 298116
NORTHING: 6266750

PIT No: 128
PROJECT No: 94616.00
DATE: 29/6/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
	0.15	FILL / TOPSOIL: silty clay CH, low to medium plasticity, brown, trace gravel and glass fragments, with rootlets throughout		D	0.1							
	0.6	FILL / Gravelly CLAY CH: medium to high plasticity, dark brown, trace cobbles (gravel and cobbles are siltstone estimated to be of medium and high strength), w < PL, appears well compacted (ripped shale)		D	0.5							
	1.0	Silty CLAY CH: medium to high plasticity, grey and red-brown, with ironstone gravel, w < PL, firm to stiff, residual		D	1.0							
	1.5	Silty CLAY CH: medium to high plasticity, grey and red-brown, with ironstone gravel, w < PL, stiff to very stiff, residual		D	1.5		pp = 200					
	2.0			D	2.0		pp = 200					
	2.5			D	2.5		pp = 250					
	3.0	Pit discontinued at 3.0m		D	3.0							

RIG: 14 tonne excavator - 600mm bucket

LOGGED: RB

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ 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	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	W	Water seep	S	Standard penetration test
E	Environmental sample	W	Water level	V	Shear vane (kPa)

TEST PIT LOG

CLIENT: Marsden Park Developments Pty Ltd
PROJECT: Proposed Industrial Development
LOCATION: Astoria Street, Marsden Park

SURFACE LEVEL: 42.3 mAHD
EASTING: 298200
NORTHING: 6266748

PIT No: 129
PROJECT No: 94616.00
DATE: 29/6/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)
				Type	Depth	Sample	Results & Comments		
32.41	0.15	FILL / TOPSOIL: silty clay CH, low to medium plasticity, brown, trace gravel and cobbles with rootlets throughout		D	0.1				5
		FILL / Gravelly CLAY CH: medium to high plasticity, dark brown, trace cobbles (gravel and cobbles are siltstone and sandstone estimated to be of medium and high strength), w < PL, appears well compacted (ripped shale)		D	0.5				10
	1			D	1.0				15
				D	1.5				20
				D	2.0				
33.40	3.0	Pit discontinued at 3.0m							
38.38	4								

RIG: 14 tonne excavator - 600mm bucket

LOGGED: RB

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

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

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

TEST PIT LOG

CLIENT: Marsden Park Developments Pty Ltd
PROJECT: Proposed Industrial Development
LOCATION: Astoria Street, Marsden Park

SURFACE LEVEL: 43.6 mAHD
EASTING: 298278
NORTHING: 6266741

PIT No: 130
PROJECT No: 94616.00
DATE: 26/6/2020
SHEET 1 OF 1

[illegible]

RIG: 8 tonne excavator - 600mm bucket

LOGGED: RB

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

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

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



Douglas Partners
Geotechnics | Environment | Groundwater

TEST PIT LOG

CLIENT: Marsden Park Developments Pty Ltd
PROJECT: Proposed Industrial Development
LOCATION: Astoria Street, Marsden Park

SURFACE LEVEL: 43.7 mAHD
EASTING: 298329
NORTHING: 6266750

PIT No: 131
PROJECT No: 94616.00
DATE: 29/6/2020
SHEET 1 OF 1

[illegible]

RIG: 14 tonne excavator - 600mm bucket

LOGGED: RB

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

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

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	W _s	Water seep
E	Environmental sample	W _l	Water level
		PID	Photo ionisation detector (ppm)
		PL(A)	Point load axial test (s(50) (MPa)
		PL(D)	Point load diametral test (s(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)



TEST PIT LOG

CLIENT: Marsden Park Developments Pty Ltd
PROJECT: Proposed Industrial Development
LOCATION: Astoria Street, Marsden Park

SURFACE LEVEL: 43.4 mAHD
EASTING: 298397
NORTHING: 6266783

PIT No: 132
PROJECT No: 94616.00
DATE: 26/6/2020
SHEET 1 OF 1

[illegible]

RIG: 14 tonne excavator - 600mm bucket

LOGGED: RB

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

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

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	W _s	Water seep
E	Environmental sample	W _l	Water level
		PID	Photo ionisation detector (ppm)
		PL(A)	Point load axial test (s(50) (MPa)
		PL(D)	Point load diametral test (s(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)



Douglas Partners
Geotechnics | Environment | Groundwater

TEST PIT LOG

CLIENT: Marsden Park Developments Pty Ltd
PROJECT: Proposed Industrial Development
LOCATION: Astoria Street, Marsden Park

SURFACE LEVEL: 43.6 mAHD
EASTING: 298486
NORTHING: 6266776

PIT No: 133
PROJECT No: 94616.00
DATE: 29/6/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
43	0.15	FILL / TOPSOIL: silty clay CH, low to medium plasticity, brown, trace gravel and cobbles with rootlets throughout		D	0.1							
		FILL / Gravelly CLAY CH: medium plasticity, brown, trace cobbles and boulders (siltstone estimated to be medium or high strength), w<PL, well compacted (ripped shale)		B	0.4							
				B	0.6							
42	1.6	Silty CLAY: medium to high plasticity, red-brown then brown, trace ironstone gravel, w < PL, very stiff to hard, residual										
2				D	2.0		pp >400					
				D	2.4		pp = 350					
41	2.5	Pit discontinued at 2.5m										
3												
40												
39												

RIG: 14 tonne excavator - 600mm bucket

LOGGED: RB

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

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





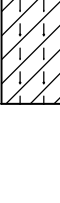


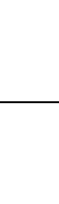
SAMPLING & IN SITU TESTING LEGEND					
A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket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

TEST PIT LOG

CLIENT: Marsden Park Developments Pty Ltd
PROJECT: Proposed Industrial Development
LOCATION: Astoria Street, Marsden Park

SURFACE LEVEL: 45.3 mAHD
EASTING: 298454
NORTHING: 6266707

PIT No: 134
PROJECT No: 94616.00
DATE: 26/6/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
45	0.05	FILL / TOPSOIL: silty clay CH, low plasticity, brown, trace gravel, with rootlets throughout, w < PL		D	0.05							
	0.1											
	0.25	FILL / CLAY CH: medium to high plasticity, dark brown, with gravel (shale), trace subrounded cobbles and boulders (river gravel), w < PL, poorly compacted										
	0.4			D								
	0.5	FILL / Gravelly CLAY CH: medium plasticity, dark brown, trace subrounded cobbles and boulders, trace shale cobbles and boulders, w < PL, appears well compacted		Bx2								
1	0.6											
44												
2												
43												
3												
42												
41												
	3.0	Pit discontinued at 3.0m		D	3.0		pp = 250					

RIG: 14 tonne excavator - 600mm bucket

LOGGED: RB

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

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

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

TEST PIT LOG

CLIENT: Marsden Park Developments Pty Ltd
PROJECT: Proposed Industrial Development
LOCATION: Astoria Street, Marsden Park

SURFACE LEVEL: 45.1 mAHD
EASTING: 298438
NORTHING: 6266709

PIT No: 135
PROJECT No: 94616.00
DATE: 26/6/2020
SHEET 1 OF 1

[illegible]

RIG: 8 tonne excavator - 600mm bucket

LOGGED: RB

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

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

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	W _s	Water seep
E	Environmental sample	W _l	Water level
		PID	Photo ionisation detector (ppm)
		PL(A)	Point load axial test (s(50) (MPa)
		PL(D)	Point load diametral test (s(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)



Douglas Partners
Geotechnics | Environment | Groundwater

TEST PIT LOG

CLIENT: Marsden Park Developments Pty Ltd
PROJECT: Proposed Industrial Development
LOCATION: Astoria Street, Marsden Park

SURFACE LEVEL: 44.8 mAHD
EASTING: 298355
NORTHING: 6266659

PIT No: 136
PROJECT No: 94616.00
DATE: 29/6/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)
				Type	Depth	Sample	Results & Comments		
	0.2	FILL / TOPSOIL: gravelly clay CH, medium plasticity, brown, with rootlets throughout							
	0.6	FILL / Gravelly CLAY CH: medium plasticity, grey, siltstone and sandstone, angular to subangular, w < PL, variably compacted, with cobbles, trace boulders, w < PL, variably compacted							
	1.0	FILL / Gravelly CLAY CH: medium plasticity, grey, with cobbles and trace boulders (gravel, cobbles and boulders are a mixture of siltstone and sandstone estimated to be of medium or high strength), w < PL, appears well compacted		D	1.0				
	1.6			D	1.6				
	2.7	Silty CLAY CH: medium to high plasticity, grey and red-brown, trace ironstone gravel, w < PL, very stiff, residual (first 300mm possibly disturbed)			2.8		pp = 250		
	3.0	Pit discontinued at 3.0m							

RIG: 14 tonne excavator - 600mm bucket

LOGGED: RB

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

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



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

TEST PIT LOG

CLIENT: Marsden Park Developments Pty Ltd
PROJECT: Proposed Industrial Development
LOCATION: Astoria Street, Marsden Park

SURFACE LEVEL: 41.8 mAHD
EASTING: 298173
NORTHING: 6266667

PIT No: 137
PROJECT No: 94616.00
DATE: 29/6/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)					
				Type	Depth	Sample	Results & Comments		5	10	15	20		
	0.15	FILL / TOPSOIL: silty clay CH, low plasticity, brown, trace gravel and cobbles, with rootlets throughout, w < PL		D	0.0									
		FILL / Gravelly CLAY CH: medium plasticity, grey, with cobbles and boulders (gravel, cobbles and boulders siltstone estimated to be of medium or high strength), w < PL, appears generally well compacted below 0.6 m depth												
				D	0.5									
				D	1.0									
	2.7	Silty CLAY CL: medium to high plasticity, pale brown and red-brown, w<PL, very stiff, residual		D	3.0		pp = 250							
	3.1	Pit discontinued at 3.1m												

RIG: 14 tonne excavator - 600mm bucket

LOGGED: RB

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

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

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	W _s	Water seep
E	Environmental sample	W _l	Water level
		PID	Photo ionisation detector (ppm)
		PL(A)	Point load axial test (s(50) (MPa)
		PL(D)	Point load diametral test (s(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)



Douglas Partners
Geotechnics | Environment | Groundwater

TEST PIT LOG

CLIENT: Marsden Park Developments Pty Ltd
PROJECT: Proposed Industrial Development
LOCATION: Astoria Street, Marsden Park

SURFACE LEVEL: 42.8 mAHD
EASTING: 298223
NORTHING: 6266562

PIT No: 138
PROJECT No: 94616.00
DATE: 29/6/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)
				Type	Depth	Sample	Results & Comments		
	0.1	FILL / TOPSOIL: silty clay CH low plasticity, brown, trace fine gravel, with rootlets throughout, w < PL		E,D	0.1				
	0.3	FILL / Silty CLAY CH: medium to high plasticity, brown, trace gravel and ironstone, w < PL, variably compacted		E,D	0.5				
		FILL / Gravelly CLAY CL: medium plasticity, grey, with cobbles and trace boulders (gravel, cobbles and boulders a mixture of river gravel and siltstone estimated to be of medium or high strength, w < PL, appears well compacted		E,D	1.0				
	1.55	Gravelly CLAY CL: medium to high plasticity, brown, ironstone, angular to subangular, very stiff, w < PL, residual (top 300mm possibly disturbed)		E,D	1.5				
	1.9	Silty CLAY CH: medium to high plasticity, red-brown, with ironstone gravel, w < PL, very stiff, residual		D	2.0				
				D	2.5		pp = 250		
	3.0	Pit discontinued at 3.0m		D	3.0		pp = 250		

RIG: 14 tonne excavator - 600mm bucket

LOGGED: RB

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

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

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

TEST PIT LOG

CLIENT: Marsden Park Developments Pty Ltd
PROJECT: Proposed Industrial Development
LOCATION: Astoria Street, Marsden Park

SURFACE LEVEL: 44.6 mAHD
EASTING: 298309
NORTHING: 6266570

PIT No: 139
PROJECT No: 94616.00
DATE: 29/6/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
	0.15	FILL / TOPSOIL: silty clay CH low plasticity, brown, trace fine gravel, with rootlets throughout, w < PL		D	0.1							
		FILL / Gravelly CLAY CH: low to medium plasticity, grey and brown, with cobbles and trace boulders (gravel, cobbles and boulders are siltstone and sandstone estimated to be of medium, high and very high strength), w < PL, appears well compacted		D	0.5							
				D	1.0							
				D,E	1.3							
	1.5	Silty CLAY CH: medium to high plasticity, red-brown and grey, trace ironstone gravel, trace decomposed rootlets, w < PL, very stiff, residual			1.5							
				D,E	2.0		pp = 300					
				D	2.5		pp = 250					
	3.2	Pit discontinued at 3.2m										

RIG: 14 tonne excavator - 600mm bucket

LOGGED: RB

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ 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	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	W	Water seep	S	Standard penetration test
E	Environmental sample	W	Water level	V	Shear vane (kPa)

TEST PIT LOG

CLIENT: Marsden Park Developments Pty Ltd
PROJECT: Proposed Industrial Development
LOCATION: Astoria Street, Marsden Park

SURFACE LEVEL: 46.8 mAHD
EASTING: 298311
NORTHING: 6266479

PIT No: 140
PROJECT No: 94616.00
DATE: 29/6/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
	0.1	FILL / TOPSOIL: silty clay CH, low plasticity, brown, trace gravel, with rootlets throughout, w < PL		D	0.1							
	0.25	FILL / Silty CLAY CH: low to medium plasticity, dark brown, with rootlets and sand, trace gravel, w < PL, variably compacted										
		Silty CLAY CH: medium to high plasticity, red-brown, w < PL, very stiff, residual		D	0.5							
		- extremely weathered sandstone from 0.7m		D	0.8							
46	0.9											
1	1.0	SANDSTONE: very low strength, highly weathered, red-brown and grey, sandstone, Bringelly Shale Pit discontinued at 1.0m						1				
		- Practical refusal on at least low strength sandstone										
45												
2								2				
44												
3								3				
43												
4								4				
42												

RIG: 14 tonne excavator - 600mm bucket

LOGGED: RB

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

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


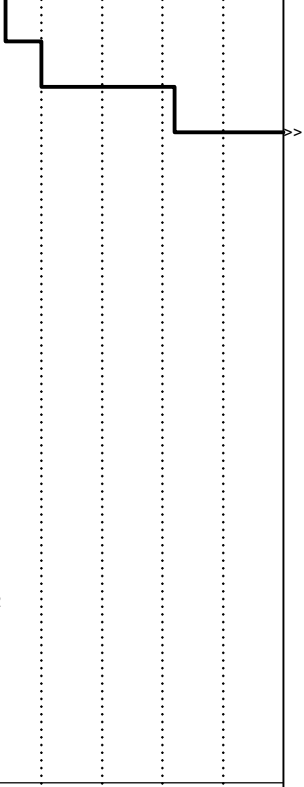
SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	W	Water seep
E	Environmental sample	W	Water level
		PID	Photo ionisation detector (ppm)
		PL(A)	Point load axial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

TEST PIT LOG

CLIENT: Marsden Park Developments Pty Ltd
PROJECT: Proposed Industrial Development
LOCATION: Astoria Street, Marsden Park

SURFACE LEVEL: 45.9 mAHD
EASTING: 298442
NORTHING: 6266653

PIT No: 141
PROJECT No: 94616.00
DATE: 26/6/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)
				Type	Depth	Sample	Results & Comments		
45.1	0.0	FILL / TOPSOIL: silty clay CH, brown, with siltstone gravel, trace sand and rootlets throughout		D	0.0				
	0.1				0.1				
	0.2			D	0.2				
	0.3				0.3				
	0.4	FILL / Clayey GRAVEL: grey, with trace cobbles (gravel and cobbles are siltstone estimated to be of medium to high strength), w < PL, variably compacted			0.4				
	0.5			B	0.5				
	0.6				0.6				
	0.9				0.9				
	1.0			D	1.0				
	1.4				1.4				
44.1	1.5			D	1.5				
	2.4				2.4				
	2.5	Silty CLAY CH: medium to high plasticity, grey mottled red-brown, trace rootlets, w < PL, very stiff to hard, residual (possibly fill)			2.5		pp = 400		
	2.6	Pit discontinued at 2.6m		D	2.6				
43.1									
42.1									
41.1									

RIG: 14 tonne excavator - 600mm bucket

LOGGED: RB

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

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

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

TEST PIT LOG

CLIENT: Marsden Park Developments Pty Ltd
PROJECT: Proposed Industrial Development
LOCATION: Astoria Street, Marsden Park

SURFACE LEVEL: 46.0 mAHD
EASTING: 298494
NORTHING: 6266691

PIT No: 142
PROJECT No: 94616.00
DATE: 26/6/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)
				Type	Depth	Sample	Results & Comments		
46	0.0	FILL / TOPSOIL: silty clay CH, brown, with siltstone gravel, trace sand and rootlets throughout		D	0.0				5
	0.1				0.1				10
	0.2	FILL / Gravelly CLAY CL: brown, gravel (siltstone gravel), w < PL, appears well compacted							15
	0.4			D	0.4				20
	0.5				0.5				
	0.6	FILL / GRAVEL: grey, with sub-rounded cobbles and boulders (river gravel estimated to be medium and high strength), trace clay, dry, appears variable compacted							
	0.9			D	0.9				
	1.0				1.0				
45	1.1	FILL / Silty CLAY CH: medium to high plasticity, grey-brown, with gravel and cobbles (ironstone and siltstone estimated to be medium and high strength), w < PL, appears well compacted							
	1.4			D	1.4				
	1.5				1.5				
		- siltstone boulder (up to 300mm diameter) at 1.7m							
44	2								
	2.6			D	2.6				
	2.7				2.7				
	2.8	Silty CLAY CH: medium to high plasticity, pale grey mottled red-brown, trace rootlets, w < PL, hard, residual		D	2.8		pp >400		
	2.9				2.9				
43	3	Pit discontinued at 3.0m							
42	4								

RIG: 14 tonne excavator - 600mm bucket

LOGGED: RB

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

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

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

TEST PIT LOG

CLIENT: Marsden Park Developments Pty Ltd
PROJECT: Proposed Industrial Development
LOCATION: Astoria Street, Marsden Park

SURFACE LEVEL: 48.2 mAH
EASTING: 298591
NORTHING: 6266624

PIT No: 143
PROJECT No: 94616.00
DATE: 26/6/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
48.0 47.0 46.0 45.0 44.0	0.1	FILL / TOPSOIL: silty clay CH, low plasticity, brown, trace fine gravel, with rootlets throughout, w < PL		D	0.0							
	0.2	FILL / Silty CLAY CH: low to medium plasticity, dark brown, with gravel, w < PL, poorly compacted			0.1							
	0.5	Silty CLAY CH: medium to high plasticity, pale brown grey, w < PL, soft to firm, residual (possibly disturbed)		D	0.5		pp = 100					
		Silty CLAY CH: medium to high plasticity, pale brown and red brown, with ironstone gravel, w < PL, stiff, residual			0.8		pp = 150					
	1.0	Silty CLAY CH: medium to high plasticity, pale brown and red brown, with ironstone gravel, w < PL, hard, residual (extremely weathered sandstone)		D	0.9							
	1.2				1.2							
	1.3	SANDSTONE: very low and low strength, red-brown and grey, Briggly Shale		D	1.3							
		Pit discontinued at 1.3m										
		- Practical refusal on at least low strength sandstone										

RIG: 14 tonne excavator - 600mm bucket

LOGGED: RB

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

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

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

TEST PIT LOG

CLIENT: Marsden Park Developments Pty Ltd
PROJECT: Proposed Industrial Development
LOCATION: Astoria Street, Marsden Park

SURFACE LEVEL: 49.5 mAHD
EASTING: 298541
NORTHING: 6266571

PIT No: 144
PROJECT No: 94616.00
DATE: 29/6/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)
				Type	Depth	Sample	Results & Comments		
	0.0	FILL / TOPSOIL: gravelly clay CH, low to medium plasticity, brown, with rootlets throughout		D	0.0				
	0.1				0.1				
	0.2	FILL / Sandy GRAVEL GM: fine to coarse, dark brown, with cobbles (sandstone estimated to be of medium strength), moist, variably compacted		B	0.3				
	0.5			D	0.5				
	0.6	Silty CLAY CH: medium to high plasticity, red-brown, trace ironstone gravel, w < PL, very stiff, residual (top 300mm possibly disturbed)							
	1.0			D	1.0				
	1.5	Silty CLAY CH: medium to high plasticity, red-brown mottled grey, trace ironstone gravel, w < PL, very stiff, residual		D	1.5		pp >400		
	2.0			D	2.0		pp >400		
	2.5			D	2.5		pp >400		
	3.2	Pit discontinued at 3.2m							

RIG: 14 tonne excavator - 600mm bucket

LOGGED: RB

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ 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	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	W	Water seep	S	Standard penetration test
E	Environmental sample	W	Water level	V	Shear vane (kPa)

TEST PIT LOG

CLIENT: Marsden Park Developments Pty Ltd
PROJECT: Proposed Industrial Development
LOCATION: Astoria Street, Marsden Park

SURFACE LEVEL: 47.8 mAHD
EASTING: 298484
NORTHING: 6266573

PIT No: 145
PROJECT No: 94616.00
DATE: 26/6/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)
				Type	Depth	Sample	Results & Comments		
47	0.2	FILL / TOPSOIL: silty clay CH, medium plasticity, dark brown, with siltstone gravel and rootlets, trace sand		D	0.0				
					0.1				
		Silty CLAY CL: medium to high plasticity, red-brown and grey, trace gravel, w < PL, stiff, residual (top 200mm possibly disturbed)			0.5		pp = 250		
					0.7		pp = 250		
					0.9				
1	1.0	SANDSTONE: very low strength, brown and grey, Bringelly Shale		D	1.0				
	1.1				1.1				
46	2	Pit discontinued at 1.15m							
		- Practical refusal on at least low strength sandstone							
45	3								
44	4								
43									

RIG: 14 tonne excavator - 600mm bucket

LOGGED: RB

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

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


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

TEST PIT LOG

CLIENT: Marsden Park Developments Pty Ltd
PROJECT: Proposed Industrial Development
LOCATION: Astoria Street, Marsden Park

SURFACE LEVEL: 46.6 mAHD
EASTING: 298438
NORTHING: 6266580

PIT No: 146
PROJECT No: 94616.00
DATE: 26/6/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
46	0.2	FILL / TOPSOIL: silty clay CH, brown, trace sand, with siltstone gravel and rootlets throughout		D	0.0							

TEST PIT LOG

CLIENT: Marsden Park Developments Pty Ltd
PROJECT: Proposed Industrial Development
LOCATION: Astoria Street, Marsden Park

SURFACE LEVEL: 48.3 mAHD
EASTING: 298434
NORTHING: 6266522

PIT No: 147
PROJECT No: 94616.00
DATE: 26/6/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
48	0.0	FILL / TOPSOIL: silty clay CH, low plasticity, brown, trace sand and rootlets, glass shard fragments observed with rootlets throughout		D	0.0		pp = 150					
	0.1				0.1							
	0.2	Silty CLAY CH: medium plasticity, mottled grey and orange, with gravel, w < PL, stiff, residual (0.2 - 0.5m possibly disturbed)			0.4							
	0.6			D	0.6							
	0.7				0.7							
47	0.8	SANDSTONE: fine grained, grey, very low strength, Bringelly Shale		D	0.8							
	0.8	Pit discontinued at 0.8m										
46	1.0	- Practical refusal on at least low strength sandstone										
45	2.0											
44	3.0											
43	4.0											

RIG: 14 tonne excavator - 600mm bucket

LOGGED: RB

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ 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	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	W	Water seep	SP	Standard penetration test
E	Environmental sample	WL	Water level	V	Shear vane (kPa)

TEST PIT LOG

CLIENT: Marsden Park Developments Pty Ltd
PROJECT: Proposed Industrial Development
LOCATION: Astoria Street, Marsden Park

SURFACE LEVEL: 50.1 mAHD
EASTING: 298515
NORTHING: 6266539

PIT No: 148
PROJECT No: 94616.00
DATE: 26/6/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)
				Type	Depth	Sample	Results & Comments		
0.07	0.07	FILL / TOPSOIL: silty clay CH, medium plasticity, dark brown, with gravel and rootlets throughout		D	0.05				
		FILL / Silty CLAY: medium plasticity, brown with gravel, trace cobbles (siltstone), w<PL, appears well compacted			0.1				
				B	0.4				
				D	0.5				
0.8	0.8	Silty CLAY CH: medium to high plasticity, red-brown and grey, with ironstone gravel, w < PL, stiff to very stiff, residual							
1	1				1.5		pp = 300		
1.9	1.9	SANDSTONE: fine grained, very low and low strength, grey, Bringelly Shale		D	1.9				
2	2.0				2.0				
2.4	2.4	Pit discontinued at 2.4m							
		- Practical refusal on at least low strength sandstone							
3	3								
4	4								

RIG: 14 tonne excavator - 600mm bucket

LOGGED: RB

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ 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	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	W	Water seep	S	Standard penetration test
E	Environmental sample	W	Water level	V	Shear vane (kPa)

TEST PIT LOG

CLIENT: Marsden Park Developments Pty Ltd
PROJECT: Proposed Industrial Development
LOCATION: Astoria Street, Marsden Park

SURFACE LEVEL: 50.4 mAHD
EASTING: 298538
NORTHING: 6266514

PIT No: 149
PROJECT No: 94616.00
DATE: 26/6/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)
				Type	Depth	Sample	Results & Comments		
50 49 1 49 2 2 48 3 47 4 46	0.1	FILL / TOPSOIL: silty clay CH, medium plasticity, dark brown, with gravel and rootlets throughout		D	0.05 0.1				
		Silty CLAY CH: medium to high plasticity, dark brown then brown, with rootlets, w < PL, very stiff, residual (possibly fill)		D	0.25 0.3				
	0.5	Silty CLAY CH: medium to high plasticity, grey with brown, trace ironstone gravel, w < PL, very stiff, residual		D	0.6 0.7				
				D	1.4 1.5		pp = 300		
	1.9	SANDSTONE: very low to low strength, highly weathered, sandstone		D	1.9 2.0				
	2.1	Pit discontinued at 2.1m							
		- Practical refusal on at least low strength sandstone							

RIG: 14 tonne excavator - 600mm bucket

LOGGED: RB

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

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


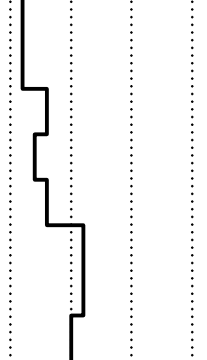


SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	W	Water seep
E	Environmental sample	W	Water level
		PID	Photo ionisation detector (ppm)
		PL(A)	Point load axial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

TEST PIT LOG

CLIENT: Marsden Park Developments Pty Ltd
PROJECT: Proposed Industrial Development
LOCATION: Astoria Street, Marsden Park

SURFACE LEVEL: 50.4 mAHD
EASTING: 298573
NORTHING: 6266487

PIT No: 150
PROJECT No: 94616.00
DATE: 26/6/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
50	0.05	FILL / TOPSOIL: silty clay CH, medium plasticity, dark brown, with gravel and rootlets throughout Silty CLAY CH: medium to high plasticity, brown and grey, with ironstone gravel, w < PL, very stiff, residual		D,E	0.0		pp >400					
				0.1								
			D	0.5								
	0.9	Gravelly CLAY CH: medium to high plasticity, grey and red brown, with ironstone gravel, w < PL, very stiff to hard, residual		D	1.0							
				D	1.5							
				D	2.0							
49				D	2.5							
	2.9	SANDSTONE: fine grained, very low to low strength, yellow brown and grey, Bringelly Shale Pit discontinued at 3.0m			2.9							
	3.0			3.0								
47												
46												

RIG: 14 tonne excavator - 600mm bucket

LOGGED: RB

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ 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	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	W	Water seep	sp	Standard penetration test
E	Environmental sample	W	Water level	V	Shear vane (kPa)

TEST PIT LOG

CLIENT: Marsden Park Developments Pty Ltd
PROJECT: Proposed Industrial Development
LOCATION: Astoria Street, Marsden Park

SURFACE LEVEL: 50.7 mAHD
EASTING: 298487
NORTHING: 6266478

PIT No: 151
PROJECT No: 94616.00
DATE: 26/6/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)
				Type	Depth	Sample	Results & Comments		
	0.05	FILL / TOPSOIL: silty clay CH, medium plasticity, dark brown, with gravel and rootlets throughout		D, E	0.01				
	0.15	FILL / Gravelly CLAY CH: low plasticity, dark brown, with sand and rootlets, trace siltstone cobbles, w < PL, variably compacted		D	0.1				
		FILL / Gravelly CLAY CH: low plasticity, brown, trace cobbles and boulders (siltstone estimated to be low and medium strength), w < PL, appears well compacted (ripped shale)		D, E	0.5				
	0.7	Silty CLAY CH: medium to high plasticity, red-brown, trace gravel, ironstone, w < PL, very stiff to hard, residual							
50					1.0		pp >400	1	
				D	1.5		pp >400		
49					2.0		pp >400	2	
					2.2				
				D	2.5				
				D	2.8				
48	2.7	SILTSTONE: very low to low strength, grey, Bringelly Shale							
	2.8	Pit discontinued at 2.8m							
		- Practical refusal on at least low strength siltstone							
47									
46									

RIG: 14 tonne excavator - 600mm bucket

LOGGED: RB

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

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









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

TEST PIT LOG

CLIENT: Marsden Park Developments Pty Ltd
PROJECT: Proposed Industrial Development
LOCATION: Astoria Street, Marsden Park

SURFACE LEVEL: 49.2 mAH
EASTING: 298428
NORTHING: 6266420

PIT No: 152
PROJECT No: 94616.00
DATE: 26/6/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
48	0.05	FILL / TOPSOIL: silty clay CH, medium plasticity, dark brown, with gravel and rootlets throughout		D,E	0.0							
					0.1							
	0.3	FILL / Silty CLAY CH: medium to high plasticity, brown, with rootlets and gravel (mixture of siltstone and river gravel), trace sand, w < PL, appears well compacted		Bx2 D,S	0.4							
					0.5							
		Silty CLAY CH: medium to high plasticity, red-brown and grey, trace roots to 0.6m depth, trace ironstone gravel, w < PL, very stiff, residual,		D,S	0.6							
	1	SANDSTONE: fine grained, very low to low strength, red-brown and grey, Bringelly Shale		D	1.0							
					1.2							
47	1.7	SANDSTONE: fine grained, very low to low strength, red-brown and grey, Bringelly Shale			1.8							
	1.9											
		Pit discontinued at 1.9m - Practical refusal on at least low strength sandstone										
	2											
46	3	Pit discontinued at 1.9m - Practical refusal on at least low strength sandstone										
45	4	Pit discontinued at 1.9m - Practical refusal on at least low strength sandstone										

RIG: 14 tonne excavator - 600mm bucket

LOGGED: RB

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

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

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

TEST PIT LOG

CLIENT: Marsden Park Developments Pty Ltd
PROJECT: Proposed Industrial Development
LOCATION: Astoria Street, Marsden Park

SURFACE LEVEL: 50.8 mAHD
EASTING: 298491
NORTHING: 6266395

PIT No: 153
PROJECT No: 94616.00
DATE: 26/6/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
	0.05	FILL / TOPSOIL: silty clay CH, medium plasticity, dark brown, with gravel and rootlets throughout		D	0.0							
					0.1							
	0.3	Silty CLAY CH: medium to high plasticity, brown, with rootlets, trace gravel, w < PL, very stiff, residual (possibly disturbed)		D	0.5							
		Silty CLAY CH: medium to high plasticity, red-brown and grey, trace roots to 0.6m, w < PL, stiff to very stiff, residual										
				D	1.5		pp >400					
				D	2.0		pp >400					
				D	2.5		pp >400					
	3.0	2.9m: hard (extremely weathered siltstone)										
		Pit discontinued at 3.0m										

RIG: 14 tonne excavator - 600mm bucket

LOGGED: RB

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ 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	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	W	Water seep	S	Standard penetration test
E	Environmental sample	W	Water level	V	Shear vane (kPa)

TEST PIT LOG

CLIENT: Marsden Park Developments Pty Ltd
PROJECT: Proposed Industrial Development
LOCATION: Astoria Street, Marsden Park

SURFACE LEVEL: 51.3 mAHD
EASTING: 298568
NORTHING: 6266364

PIT No: 154
PROJECT No: 94616.00
DATE: 26/6/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)
				Type	Depth	Sample	Results & Comments		
51.50	0.15	FILL / TOPSOIL: silty clay CH, medium plasticity, dark brown, with gravel and rootlets throughout		D	0.1				
		Silty CLAY CH: medium to high plasticity, red-brown, with rootlets to 0.5m, w < PL, stiff to very stiff, residual		D	0.5				
	1.5	Silty CLAY CH: medium to high plasticity, red-brown, with ironstone gravel, w < PL, stiff to very stiff, residual		D	1.5		pp >400		
	2.0			D	2.0		pp <=400		
49.50	2.8m	ironstone bands							
	3.0	Pit discontinued at 3.0m							
48.50									
47.50									

RIG: 14 tonne excavator - 600mm bucket

LOGGED: RB

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

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

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

TEST PIT LOG

CLIENT: Marsden Park Developments Pty Ltd
PROJECT: Proposed Industrial Development
LOCATION: Astoria Street, Marsden Park

SURFACE LEVEL: 52.0 mAHD
EASTING: 298487
NORTHING: 6266325

PIT No: 155
PROJECT No: 94616.00
DATE: 26/6/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)
				Type	Depth	Sample	Results & Comments		
8.0 7.5 7.0 6.5 6.0	0.1	FILL / TOPSOIL: silty clay CH, medium plasticity, dark brown, with gravel and rootlets throughout		D,E	0.0				
		Silty CLAY CH: medium to high plasticity, brown, with rootlets, w<PL, very stiff, residual (possibly disturbed)			0.1				
	0.45	Silty CLAY CH: medium to high plasticity, pale brown, with ironstone gravel, w < PL, very stiff, residual		D	0.5				
	1.0			D	1.0				
	1.5			D	1.5		pp = 300		
5.5 5.0 4.5 4.0	2.0			D	2.0		pp = 350		
	2.5			D	2.5		pp = 350		
3.5 3.0 2.5 2.0 1.5 1.0 0.5	3.0			D	3.0				
	3.1	Pit discontinued at 3.1m							
0.5 0.0 -0.5 -1.0 -1.5 -2.0 -2.5 -3.0 -3.5 -4.0									

RIG: 14 tonne excavator - 600mm bucket

LOGGED: RB

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

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

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

TEST PIT LOG

CLIENT: Marsden Park Developments Pty Ltd
PROJECT: Proposed Industrial Development
LOCATION: Astoria Street, Marsden Park

SURFACE LEVEL: 51.1 mAHD
EASTING: 298423
NORTHING: 6266341

PIT No: 156
PROJECT No: 94616.00
DATE: 26/6/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
-5	0.1	FILL / TOPSOIL: silty clay CH, low plasticity, brown, trace fine gravel, with rootlets throughout		E/D	0.0							
		FILL / Gravelly CLAY CH: medium plasticity, brown, trace sand, cobbles and boulders (gravel, cobbles and boulders siltstone estimated to be of medium or high strength), w < PL, appears well compacted			0.1							
-10	0.8	Silty CLAY CH: medium to high plasticity, red-brown, trace gravel, w < PL, very stiff, residual		D	0.8		pp = 250					
				B	0.9							
				D	1.0							
				D	1.1							
-15		1.8m: grading to grey with red-brown		D	1.5		pp = 350					
				D	2.0		pp = 250					
				D	2.5		pp = 300					
-20		- hard, possibly extremely weathered sandstone		D	3.0							
				D	3.1							
				D	3.2							
-25	3.1	SANDSTONE: fine grained, very low to low strength, grey and brown, Bringelly Shale										
	3.2											
-30		Pit discontinued at 3.2m										
-35												
-40												
-45												
-50												

RIG: 14 tonne excavator - 600mm bucket

LOGGED: RB

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ 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	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	SP	Standard penetration test
E	Environmental sample	≡	Water level	V	Shear vane (kPa)

Appendix D

Summary Table: Laboratory Tests and Assessments

Test Bore or Pit	Sample Depth	pH	Chloride Concentration	Sulphate Concentration	Resistivity	Soil Condition	Sample Aggressivity Class				
					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 bgl)	(pH units)	(mg/kg)	(mg/kg)	Ω.cm	[AS2159-2009]	[AS2159-2009]				
14	0.5	5.1			9091	B	Mild		Non-Aggressive		Non-Aggressive
	1.0	5	360	170	2941	B	Mild	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive
	1.5	6.1			1818	B	Non-Aggressive		Non-Aggressive		Mild
	2.0	6	770	160	1724	B	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive	Mild
	2.5	5.8			2000	B	Non-Aggressive		Non-Aggressive		Non-Aggressive
	3.0	6.9			1250	B	Non-Aggressive		Non-Aggressive		Mild
19	0.5	4.6			1099	B	Mild		Non-Aggressive		Mild
	1.0	4.8			1923	B	Mild		Non-Aggressive		Mild
	1.5	5.1	510	170	2381	B	Mild	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive
	2.0	5			1087	B	Mild		Non-Aggressive		Mild
	2.5	5.7			2273	B	Non-Aggressive		Non-Aggressive		Non-Aggressive
26	0.5	8.1			2703	B	Non-Aggressive		Non-Aggressive		Non-Aggressive
	1.0	8.9	640	170	1754	B	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive	Mild
	1.5	9.2			2439	B	Non-Aggressive		Non-Aggressive		Non-Aggressive
	2.0	9.3	350	220	2326	B	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive
	2.5	9.2			3704	B	Non-Aggressive		Non-Aggressive		Non-Aggressive
	3.0	9.2			3226	B	Non-Aggressive		Non-Aggressive		Non-Aggressive
28	0.5	5.4			1923	B	Mild		Non-Aggressive		Mild
	1.0	5.3			1818	B	Mild		Non-Aggressive		Mild
	1.5	4.7			2703	B	Mild		Non-Aggressive		Non-Aggressive
	2.0	4.9			2778	B	Mild		Non-Aggressive		Non-Aggressive
	2.5	5.2	490	260	2128	B	Mild	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive
	3.0	5.5			2273	B	Mild		Non-Aggressive		Non-Aggressive
29	0.5	5.8			1695	B	Non-Aggressive		Non-Aggressive		Mild
	1.0	7.8	1000	160	1351	B	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive	Mild
	1.5	7.2			1176	B	Non-Aggressive		Non-Aggressive		Mild
	2.0	7.7	1000	160	1408	B	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive	Mild
	2.5	7.9			1316	B	Non-Aggressive		Non-Aggressive		Mild
	3.0	7.8			1316	B	Non-Aggressive		Non-Aggressive		Mild

Test Bore or Pit	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
				[Na/CEC]			(from Emerson Class)	(for detailed soil logs see Report Appendix)		[Lab.]	[M x EC _{1.5}]	(Based on sample ECE)
	(m bgl)			(%)	[after DLWC]		[AS1289.3.8.1]	[after DLWC]		(microS/cm)	(deciS/m)	[Richards 1954]
14	0.5	0.58	6.8	8	Sodic			Heavy clay	6	110	0.7	Non-Saline
	1.0							Heavy clay	6	340	2.0	Slightly Saline
	1.5					2	Some	Heavy clay	6	550	3.3	Slightly Saline
	2.0							Light medium clay	8	580	4.6	Moderately Saline
	2.5							Light clay	8.5	500	4.3	Moderately Saline
	3.0							Light medium clay	8	800	6.4	Moderately Saline
19	0.5							Medium clay	7	910	6.4	Moderately Saline
	1.0							Medium clay	7	520	3.6	Slightly Saline
	1.5	2.3	9.4	24	Highly Sodic			Medium clay	7	420	2.9	Slightly Saline
	2.0							Medium clay	7	920	6.4	Moderately Saline
	2.5							Medium clay	7	440	3.1	Slightly Saline
26	0.5	1.9	15	12	Sodic			Medium clay	7	370	2.6	Slightly Saline
	1.0							Medium clay	7	570	4.0	Slightly Saline
	1.5							Medium clay	7	410	2.9	Slightly Saline
	2.0							Sandy loam	14	430	6.0	Moderately Saline
	2.5							Sand	17	270	4.6	Moderately Saline
	3.0							Sandy loam	14	310	4.3	Moderately Saline
28	0.5							Light medium clay	8	520	4.2	Moderately Saline
	1.0					5	No	Medium clay	7	550	3.9	Slightly Saline
	1.5							Light clay	8.5	370	3.1	Slightly Saline
	2.0							Light clay	8.5	360	3.1	Slightly Saline
	2.5							Light medium clay	8	470	3.8	Slightly Saline
	3.0							Clay loam	9	440	4.0	Slightly Saline
29	0.5							Heavy clay	6	590	3.5	Slightly Saline
	1.0							Medium clay	7	740	5.2	Moderately Saline
	1.5							Light medium clay	8	850	6.8	Moderately Saline
	2.0							Loam	10	710	7.1	Moderately Saline
	2.5							Light medium clay	8	760	6.1	Moderately Saline
	3.0							Clay loam	9	760	6.8	Moderately Saline

Test Bore or Pit	Sample Depth	pH	Chloride Concentration	Sulphate Concentration	Resistivity	Soil Condition	Sample Aggressivity Class				
					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 bgl)	(pH units)	(mg/kg)	(mg/kg)	Ω.cm	[AS2159-2009]	[AS2159-2009]				
30	0.5	9.1	780	570	1266	B	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive	Mild
	1.0	9.6			2857	B	Non-Aggressive		Non-Aggressive		Non-Aggressive
	1.5	9.5			5556	B	Non-Aggressive		Non-Aggressive		Non-Aggressive
	2.0	9.5			5882	B	Non-Aggressive		Non-Aggressive		Non-Aggressive
	2.5	9.4	90	50	4545	B	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive
	3.0	9.4			3030	B	Non-Aggressive		Non-Aggressive		Non-Aggressive
33	0.5	8.2			1299	B	Non-Aggressive		Non-Aggressive		Mild
	1.5	8.7	330	270	2326	B	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive
	2.0	5			3030	B	Mild		Non-Aggressive		Non-Aggressive
	2.5	5			2326	B	Mild		Non-Aggressive		Non-Aggressive
	3.0	5.5			1563	B	Mild		Non-Aggressive		Mild
35	0.5	4.7	1000	330	1299	B	Mild	Non-Aggressive	Non-Aggressive	Non-Aggressive	Mild
	1.0	6.6			1235	B	Non-Aggressive		Non-Aggressive		Mild
	1.5	7.3	620	91	2222	B	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive
	2.0	8			1852	B	Non-Aggressive		Non-Aggressive		Mild
	2.5	6.8			1449	B	Non-Aggressive		Non-Aggressive		Mild
	3.0	8			2500	B	Non-Aggressive		Non-Aggressive		Non-Aggressive
36	0.5	5.3			3226	B	Mild		Non-Aggressive		Non-Aggressive
	1.0	5	870	390	1370	B	Mild	Non-Aggressive	Non-Aggressive	Non-Aggressive	Mild
	1.5	4.9			1493	B	Mild		Non-Aggressive		Mild
	2.0	5.2	1200	370	1000	B	Mild	Non-Aggressive	Non-Aggressive	Non-Aggressive	Mild
	2.5	6.1			1299	B	Non-Aggressive		Non-Aggressive		Mild
	3.0	5.8			1449	B	Non-Aggressive		Non-Aggressive		Mild
38	0.5	5.8	160	270	4000	B	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive
	1.0	5.8			1887	B	Non-Aggressive		Non-Aggressive		Mild
	1.5	6.7			2439	B	Non-Aggressive		Non-Aggressive		Non-Aggressive
	2.0	7.1	450	160	2632	B	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive
	2.5	7			1471	B	Non-Aggressive		Non-Aggressive		Mild
	3.0	6.9			1667	B	Non-Aggressive		Non-Aggressive		Mild

Test Bore or Pit	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
				[Na/CEC]			(from Emerson Class)	(for detailed soil logs see Report Appendix)		[Lab.]	[M x EC _{1:5}]	(Based on sample ECE)
	(m bgl)			(%)	[after DLWC]		[AS1289.3.8.1]	[after DLWC]		(microS/cm)	(deciS/m)	[Richards 1954]
30	0.5							Light clay	8.5	790	6.7	Moderately Saline
	1.0	3.7	45	8	Sodic			Sand	17	350	6.0	Moderately Saline
	1.5							Sand	17	180	3.1	Slightly Saline
	2.0							Clay loam	9	170	1.5	Non-Saline
	2.5							Sandy loam	14	220	3.1	Slightly Saline
	3.0							Heavy clay	6	330	2.0	Non-Saline
33	0.5							Medium clay	7	770	5.4	Moderately Saline
	1.5							Medium clay	7	430	3.0	Slightly Saline
	2.0							Medium clay	7	330	2.3	Slightly Saline
	2.5							Medium clay	7	430	3.0	Slightly Saline
	3.0							Medium clay	7	640	4.5	Moderately Saline
35	0.5							Medium clay	7	770	5.4	Moderately Saline
	1.0							Light medium clay	8	810	6.5	Moderately Saline
	1.5	4.4	14	31	Highly Sodic			Sandy loam	14	450	6.3	Moderately Saline
	2.0							Sandy loam	14	540	7.6	Moderately Saline
	2.5							Sandy loam	14	690	9.7	Very Saline
	3.0							Sand	17	400	6.8	Moderately Saline
36	0.5							Clay loam	9	310	2.8	Slightly Saline
	1.0							Heavy clay	6	730	4.4	Moderately Saline
	1.5					5	No	Medium clay	7	670	4.7	Moderately Saline
	2.0							Heavy clay	6	1000	6.0	Moderately Saline
	2.5							Medium clay	7	770	5.4	Moderately Saline
	3.0							Medium clay	7	690	4.8	Moderately Saline
38	0.5							Heavy clay	6	250	1.5	Non-Saline
	1.0							Medium clay	7	530	3.7	Slightly Saline
	1.5	4.5	17	27	Highly Sodic			Medium clay	7	410	2.9	Slightly Saline
	2.0							Medium clay	7	380	2.7	Slightly Saline
	2.5							Heavy clay	6	680	4.1	Moderately Saline
	3.0							Medium clay	7	600	4.2	Moderately Saline

Test Bore or Pit	Sample Depth	pH	Chloride Concentration	Sulphate Concentration	Resistivity	Soil Condition	Sample Aggressivity Class				
					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 bgl)	(pH units)	(mg/kg)	(mg/kg)	Ω.cm	[AS2159-2009]	[AS2159-2009]				
138/ .	0.5	9.1			2615	B	Non-Aggressive		Non-Aggressive		Non-Aggressive
	1.0	9.5			2157	B	Non-Aggressive		Non-Aggressive		Non-Aggressive
	1.5	5			1886	B	Mild		Non-Aggressive		Mild
	2.0	4.8	28	75	1565	B	Mild	Non-Aggressive	Non-Aggressive	Non-Aggressive	Mild
	2.5	4.9			1643	B	Mild		Non-Aggressive		Mild
	3.0	5.2			1328	B	Mild		Non-Aggressive		Mild
139/ .	0.5	9.6			3736	B	Non-Aggressive		Non-Aggressive		Non-Aggressive
	1.0	8.4			2793	B	Non-Aggressive		Non-Aggressive		Non-Aggressive
	1.5	9.1			2234	B	Non-Aggressive		Non-Aggressive		Non-Aggressive
	2.0	5.2	27	72	1207	B	Mild	Non-Aggressive	Non-Aggressive	Non-Aggressive	Mild
	2.5	5			1218	B	Mild		Non-Aggressive		Mild
	3.0	5.5			1376	B	Mild		Non-Aggressive		Mild
140/ .	0.5	6.6			26316	B	Non-Aggressive		Non-Aggressive		Non-Aggressive
	0.8	5.8			6061	B	Non-Aggressive		Non-Aggressive		Non-Aggressive
150/ .	0.5	4.9			1708	B	Mild		Non-Aggressive		Mild
	1.0	4.8			1326	B	Mild		Non-Aggressive		Mild
	1.5	4.7			1252	B	Mild		Non-Aggressive		Mild
	2.0	4.8			1258	B	Mild		Non-Aggressive		Mild
	2.5	5.2			1085	B	Mild		Non-Aggressive		Mild
	3.0	5.9			1247	B	Non-Aggressive		Non-Aggressive		Mild
151/ .	0.5	9	10	29	12392	B	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive
	1.0	7.8			4496	B	Non-Aggressive		Non-Aggressive		Non-Aggressive
	1.5	5.1			1972	B	Mild		Non-Aggressive		Mild
	2.0	5.1			1753	B	Mild		Non-Aggressive		Mild
	2.5	5.3			1550	B	Mild		Non-Aggressive		Mild
152/ .	0.5	4.9			1700	B	Mild		Non-Aggressive		Mild
	1.0	4.8			1478	B	Mild		Non-Aggressive		Mild
	1.5	5.5			1468	B	Mild		Non-Aggressive		Mild

Test Bore or Pit	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
				[Na/CEC]			(from Emerson Class)	(for detailed soil logs see Report Appendix)		[Lab.]	[M x EC _{1.5}]	(Based on sample ECE)
	(m bgl)			(%)	[after DLWC]		[AS1289.3.8.1]	[after DLWC]		(microS/cm)	(deciS/m)	[Richards 1954]
138/	0.5	2.5	31	8	Sodic			Loam	10	382.4	3.8	Slightly Saline
	1.0							Loam	10	463.5	4.6	Moderately Saline
	1.5							Light medium clay	8	530.3	4.2	Moderately Saline
	2.0							Light medium clay	8	638.9	5.1	Moderately Saline
	2.5							Light clay	8.5	608.8	5.2	Moderately Saline
	3.0							Light medium clay	8	753.1	6.0	Moderately Saline
139/	0.5							Clay loam	9	267.7	2.4	Slightly Saline
	1.0							Clay loam	9	358	3.2	Slightly Saline
	1.5							Clay loam	9	447.7	4.0	Moderately Saline
	2.0							Heavy clay	6	828.8	5.0	Moderately Saline
	2.5							Heavy clay	6	821.2	4.9	Moderately Saline
	3.0							Medium clay	7	727	5.1	Moderately Saline
140/	0.5							Heavy clay	6	38	0.2	Non-Saline
	0.8							Heavy clay	6	165	1.0	Non-Saline
150/	0.5							Heavy clay	6	585.4	3.5	Slightly Saline
	1.0							Heavy clay	6	754.3	4.5	Moderately Saline
	1.5							Medium clay	7	798.8	5.6	Moderately Saline
	2.0							Light medium clay	8	794.6	6.4	Moderately Saline
	2.5							Light medium clay	8	921.6	7.4	Moderately Saline
	3.0							Clay loam	9	801.8	7.2	Moderately Saline
151/	0.5	0.6	54	1	Non-Sodic	4	No	Loam	10	80.7	0.8	Non-Saline
	1.0							Heavy clay	6	222.4	1.3	Non-Saline
	1.5							Medium clay	7	507.1	3.5	Slightly Saline
	2.0							Medium clay	7	570.6	4.0	Slightly Saline
	2.5							Medium clay	7	645.2	4.5	Moderately Saline
152/	0.5							Heavy clay	6	588.2	3.5	Slightly Saline
	1.0							Heavy clay	6	676.5	4.1	Moderately Saline
	1.5							Medium clay	7	681.1	4.8	Moderately Saline

Test Bore or Pit	Sample Depth	pH	Chloride Concentration	Sulphate Concentration	Resistivity	Soil Condition	Sample Aggressivity Class				
					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 bgl)	(pH units)	(mg/kg)	(mg/kg)	Ω.cm	[AS2159-2009]	[AS2159-2009]				
155/	0.5	4.6			1454	B	Mild		Non-Aggressive		Mild
	1.0	4.6			1141	B	Mild		Non-Aggressive		Mild
	1.5	4.7			1004	B	Mild		Non-Aggressive		Mild
	2.0	4.7	21	58	984	B	Mild	Non-Aggressive	Non-Aggressive	Non-Aggressive	Moderate
	2.5	4.7			966	B	Mild		Non-Aggressive		Moderate
	3.0	4.8			962	B	Mild		Non-Aggressive		Moderate
156/	0.5	9.1			9634	B	Non-Aggressive		Non-Aggressive		Non-Aggressive
	1.0	5.6			1066	B	Non-Aggressive		Non-Aggressive		Mild
	1.5	5			1272	B	Mild		Non-Aggressive		Mild
	2.0	5.3	20	54	1086	B	Mild	Non-Aggressive	Non-Aggressive	Non-Aggressive	Mild
106/	4.0	9.8			2439	B	Non-Aggressive		Non-Aggressive		Non-Aggressive
	5.0	9.4			2174	B	Non-Aggressive		Non-Aggressive		Non-Aggressive
	6.0	9.8			2500	B	Non-Aggressive		Non-Aggressive		Non-Aggressive
108/	4.0	9.1			3704	B	Non-Aggressive		Non-Aggressive		Non-Aggressive
	5.0	8.6			2778	B	Non-Aggressive		Non-Aggressive		Non-Aggressive
	6.0	9.3			3571	B	Non-Aggressive		Non-Aggressive		Non-Aggressive
109/	4.0	7.5			1613	B	Non-Aggressive		Non-Aggressive		Mild
	5.0	7.4			1351	B	Non-Aggressive		Non-Aggressive		Mild
	6.0	8			2041	B	Non-Aggressive		Non-Aggressive		Non-Aggressive
110/	4.0	6.9			1053	B	Non-Aggressive		Non-Aggressive		Mild
	5.0	8.5			2273	B	Non-Aggressive		Non-Aggressive		Non-Aggressive
	6.0	8.9			2778	B	Non-Aggressive		Non-Aggressive		Non-Aggressive

Test Bore or Pit	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
				[Na/CEC]			(from Emerson Class)	(for detailed soil logs see Report Appendix)		[Lab.]	[M x EC _{1:5}]	(Based on sample ECE)
	(m bgl)			(%)	[after DLWC]		[AS1289.3.8.1]	[after DLWC]		(microS/cm)	(deciS/m)	[Richards 1954]
155/	0.5							Heavy clay	6	687.9	4.1	Moderately Saline
	1.0							Heavy clay	6	876.6	5.3	Moderately Saline
	1.5							Medium clay	7	996	7.0	Moderately Saline
	2.0	3.3	11	31	Highly Sodic			Medium clay	7	1016	7.1	Moderately Saline
	2.5							Heavy clay	6	1035	6.2	Moderately Saline
	3.0							Heavy clay	6	1040	6.2	Moderately Saline
156/	0.5							Loam	10	103.8	1.0	Non-Saline
	1.0							Heavy clay	6	937.8	5.6	Moderately Saline
	1.5							Medium clay	7	786.1	5.5	Moderately Saline
	2.0							Light medium clay	8	920.8	7.4	Moderately Saline
106/	4.0							Heavy clay	6	410	2.5	Slightly Saline
	5.0							Heavy clay	6	460	2.8	Slightly Saline
	6.0							Sandy loam	14	400	5.6	Moderately Saline
108/	4.0							Sandy loam	14	270	3.8	Slightly Saline
	5.0							Sandy loam	14	360	5.0	Moderately Saline
	6.0							Sandy loam	14	280	3.9	Slightly Saline
109/	4.0							Medium clay	7	620	4.3	Moderately Saline
	5.0							Medium clay	7	740	5.2	Moderately Saline
	6.0							Heavy clay	6	490	2.9	Slightly Saline
110/	4.0							Medium clay	7	950	6.7	Moderately Saline
	5.0							Heavy clay	6	440	2.6	Slightly Saline
	6.0							Medium clay	7	360	2.5	Slightly Saline

Appendix E

NATA Reports and Chain of Custody sheets

Material Test Report

Report Number: 94616.00-1
Issue Number: 1
Date Issued: 09/07/2020
Client: Marsden Park Developments Pty Ltd
920 Richmond Road, Marsden Park NSW 2765
Contact: Michael Gray
Project Number: 94616.01
Project Name: Proposed Industrial Development
Project Location: Lot 36, Lot 4 and Lot 5, Marsden Park
Work Request: 3062
Sample Number: MA-3062AO
Date Sampled: 26/06/2020
Dates Tested: 06/07/2020 - 08/07/2020
Sample Location: TP151 (0.5 m)
Material: Soil

Emerson Class Number of a Soil (AS 1289 3.8.1)		Min	Max
Emerson Class	4 *		
Soil Description	Gravelly CLAY - dark brown gravelly clay		
Nature of Water	Distilled water		
Temperature of Water (°C)	23		
* Mineral Present	Carbonate		



Meragal Henaka Arachchi

Approved Signatory: Meragal Henaka Arachchi
clean lab

NATA Accredited Laboratory Number: 828

Material Test Report



Report Number: 94616.00-1
Issue Number: 1
Date Issued: 09/07/2020
Client: Marsden Park Developments Pty Ltd
 920 Richmond Road, Marsden Park NSW 2765
Contact: Michael Gray
Project Number: 94616.01
Project Name: Proposed Industrial Development
Project Location: Lot 36, Lot 4 and Lot 5, Marsden Park
Work Request: 3062
Dates Tested: 06/07/2020 - 08/07/2020

Douglas Partners Pty Ltd
 Macarthur Laboratory
 18 Waler Crescent Smeaton Grange NSW 2567
 Phone: (02) 4647 0075
 Fax: (02) 4646 1886
 Email: meregal.henakaa@douglaspartners.com.au

Accredited for compliance with ISO/IEC 17025 - Testing



Meragal Henaka

Approved Signatory: Meragal Henaka Arachchi
 clean lab

NATA Accredited Laboratory Number: 828

Determination of EC of Soil (In-House) DP MAC2				
Sample Number	Location	Depth (m)	Material	EC Value (µS/cm)
MA-3062A	TP138	0.5 m	Soil	382.40
MA-3062B	TP138	1.0 m	Soil	463.50
MA-3062C	TP138	1.5 m	Soil	530.30
MA-3062D	TP138	2.0 m	Soil	638.90
MA-3062E	TP138	2.5 m	Soil	608.80
MA-3062F	TP139	3.0 m	Soil	753.10
MA-3062G	TP139	0.5 m	Soil	267.70
MA-3062H	TP139	1.0 m	Soil	358.00
MA-3062I	TP139	1.5 m	Soil	447.70
MA-3062J	TP139	2.0 m	Soil	828.80
MA-3062K	TP139	2.5 m	Soil	821.20
MA-3062L	TP139	3.0 m	Soil	727.00
MA-3062M	TP140	0.5 m	Soil	38.00
MA-3062N	TP140	0.8 m	Soil	165.00
MA-3062O	TP145	0.5 m	Soil	307.70
MA-3062P	TP145	1.1 m	Soil	407.60
MA-3062Q	TP150	0.5 m	Soil	585.40
MA-3062R	TP150	1.0 m	Soil	754.30
MA-3062S	TP150	1.5 m	Soil	798.80
MA-3062T	TP150	2.0 m	Soil	794.60
MA-3062U	TP150	2.5 m	Soil	921.60
MA-3062V	TP150	3.0 m	Soil	801.80
MA-3062W	TP151	0.5 m	Soil	80.70
MA-3062X	TP151	1.0 m	Soil	222.40
MA-3062Y	TP151	1.5 m	Soil	507.10
MA-3062Z	TP151	2.0 m	Soil	570.60
MA-3062AA	TP151	2.5 m	Soil	645.20
MA-3062AB	TP152	0.5 m	Soil	588.20
MA-3062AC	TP152	1.0 m	Soil	676.50
MA-3062AD	TP152	1.5 m	Soil	681.10
MA-3062AE	TP155	0.5 m	Soil	687.90
MA-3062AF	TP155	1.0 m	Soil	876.60
MA-3062AG	TP155	1.5 m	Soil	996.00
MA-3062AH	TP155	2.0 m	Soil	1016.00
MA-3062AI	TP155	2.5 m	Soil	1035.00

Sample Number	Location	Depth (m)	Material	EC Value (µS/cm)
MA-3062AJ	TP155	3.0 m	Soil	1040.00
MA-3062AK	TP156	0.5 m	Soil	103.80
MA-3062AL	TP156	1.0 m	Soil	937.80
MA-3062AM	TP156	1.5 m	Soil	786.10
MA-3062AN	TP156	2.0 m	Soil	920.80

Material Test Report

Report Number: 94616.00-1
Issue Number: 1
Date Issued: 09/07/2020
Client: Marsden Park Developments Pty Ltd
 920 Richmond Road, Marsden Park NSW 2765
Contact: Michael Gray
Project Number: 94616.01
Project Name: Proposed Industrial Development
Project Location: Lot 36, Lot 4 and Lot 5, Marsden Park
Work Request: 3062
Dates Tested: 06/07/2020 - 08/07/2020



Douglas Partners Pty Ltd

Macarthur Laboratory

18 Waler Crescent Smeaton Grange NSW 2567

Phone: (02) 4647 0075

Fax: (02) 4646 1886

Email: meragal.henakaa@douglaspartners.com.au

Accredited for compliance with ISO/IEC 17025 - Testing



Meragal Henaka

Approved Signatory: Meragal Henaka Arachchi
 clean lab

NATA Accredited Laboratory Number: 828

Determination of pH of Soil (In-House) DP MAC1

Sample Number	Location	Depth (m)	Material	pH Value
MA-3062A	TP138	0.5 m	Soil	9.1
MA-3062B	TP138	1.0 m	Soil	9.5
MA-3062C	TP138	1.5 m	Soil	5.0
MA-3062D	TP138	2.0 m	Soil	4.8
MA-3062E	TP138	2.5 m	Soil	4.9
MA-3062F	TP139	3.0 m	Soil	5.2
MA-3062G	TP139	0.5 m	Soil	9.6
MA-3062H	TP139	1.0 m	Soil	8.4
MA-3062I	TP139	1.5 m	Soil	9.1
MA-3062J	TP139	2.0 m	Soil	5.2
MA-3062K	TP139	2.5 m	Soil	5.0
MA-3062L	TP139	3.0 m	Soil	5.5
MA-3062M	TP140	0.5 m	Soil	6.6
MA-3062N	TP140	0.8 m	Soil	5.8
MA-3062O	TP145	0.5 m	Soil	5.6
MA-3062P	TP145	1.1 m	Soil	5.7
MA-3062Q	TP150	0.5 m	Soil	4.9
MA-3062R	TP150	1.0 m	Soil	4.8
MA-3062S	TP150	1.5 m	Soil	4.7
MA-3062T	TP150	2.0 m	Soil	4.8
MA-3062U	TP150	2.5 m	Soil	5.2
MA-3062V	TP150	3.0 m	Soil	5.9
MA-3062W	TP151	0.5 m	Soil	9.0
MA-3062X	TP151	1.0 m	Soil	7.8
MA-3062Y	TP151	1.5 m	Soil	5.1
MA-3062Z	TP151	2.0 m	Soil	5.1
MA-3062AA	TP151	2.5 m	Soil	5.3
MA-3062AB	TP152	0.5 m	Soil	4.9
MA-3062AC	TP152	1.0 m	Soil	4.8
MA-3062AD	TP152	1.5 m	Soil	5.5
MA-3062AE	TP155	0.5 m	Soil	4.6
MA-3062AF	TP155	1.0 m	Soil	4.6
MA-3062AG	TP155	1.5 m	Soil	4.7
MA-3062AH	TP155	2.0 m	Soil	4.7
MA-3062AI	TP155	2.5 m	Soil	4.7

Sample Number	Location	Depth (m)	Material	pH Value
MA-3062AJ	TP155	3.0 m	Soil	4.8
MA-3062AK	TP156	0.5 m	Soil	9.1
MA-3062AL	TP156	1.0 m	Soil	5.6
MA-3062AM	TP156	1.5 m	Soil	5.0
MA-3062AN	TP156	2.0 m	Soil	5.3

Project No: 94616.01			Suburb: Marsden Park			To: Envirolab Services		
Project Name: Proposed Open Space Development			Order Number			12 Ashley St, Chatswood		
Project Manager: Rod Gray			Sampler: Jeremie Young			Attn: Aileen Hie		
Emails: rod.gray@douglaspartners.com.au								
Date Required: Same day <input type="checkbox"/> 24 hours <input type="checkbox"/> 48 hours <input type="checkbox"/> 72 hours <input type="checkbox"/> Standard <input checked="" type="checkbox"/>								
Prior Storage: <input type="checkbox"/> Esky <input type="checkbox"/> Fridge <input type="checkbox"/> Shelved Do samples contain 'potential' HBM? Yes <input type="checkbox"/> No <input type="checkbox"/> (If YES, then handle, transport and store in accordance with FPM HAZID)								

Sample ID	Lab ID	Date Sampled	Sample Type	Container Type	Analytes								Notes/preservation	
			S - soil W - water	G - glass P - plastic	Combo 6a	Combo 8a	Metals + PAH	Combo 3a	Chloride and sulphate					
TP138-0.1	1	29/06/20	S	G		X								
TP138-0.5	2	29/06/20	S	G										hold
TP138-1.5	3	29/06/20	S	G					X					
TP138-2.0	4	29/06/20	S	G						X				
TP139-0.1	5	29/06/20	S	G	X									
TP139-0.5	6	29/06/20	S	G										hold
TP139-1.1-1.3	7	29/06/20	S	G					X					
TP139-2.0	8	29/06/20	S	G						X				
TP140-0.1	9	29/06/20	S	G	X									
TP145-0.1	10	26/06/20	S	G		X								
TP150-0.1	11	26/06/20	S	G	X									
TP151-0.1	12	26/06/20	S	G	X									
TP151-0.5	13	26/06/20	S	G						X				
TP152-0.1	14	26/06/20	S	G	X									
PQL (S) mg/kg										ANZECC PQLs req'd for all water analytes <input type="checkbox"/>				
PQL = practical quantitation limit. If none given, default to Laboratory Method Detection Limit										Lab Report/Reference No:				
Metals to Analyse: 8HM unless specified here:														
Total number of samples in container:					Relinquished by:					Transported to laboratory by:				
Send Results to: Douglas Partners Pty Ltd					Address: 18 Waler Cres, Smeaton Grange NSW 2567					Phone:				
Signed:					Received by: EUS JUD					Date & Time: 3/7/20 11/0				

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

Job No: 246224

Date Received: 3/7/20

Time Received: 11/0

Received by: UM

Temp: Cool/Ambient

Cooling: Icepack

Security: Intact/Broken/None

246224 CM

CHAIN OF CUSTODY DESPATCH SHEET

Project No: 94616.01				Suburb: Marsden Park				To: Envirolab Services			
Project Name: Proposed Open Space Development				Order Number				12 Ashley St, Chatswood			
Project Manager: Rod Gray				Sampler: Jeremie Young				Attn: Aileen Hie			
Emails: rod.gray@douglaspartners.com.au											
Date Required: Same day <input type="checkbox"/> 24 hours <input type="checkbox"/> 48 hours <input type="checkbox"/> 72 hours <input type="checkbox"/> Standard <input checked="" type="checkbox"/>											
Prior Storage: <input type="checkbox"/> Esky <input type="checkbox"/> Fridge <input type="checkbox"/> Shelved				Do samples contain 'potential' HBM? Yes <input type="checkbox"/> No <input type="checkbox"/> (If YES, then handle, transport and store in accordance with FPM HAZID)							

Sample ID	Lab ID	Sampling Date	Sample Type	Container Type	Analytes										Notes/preservation	
			S - soil W - water	G - glass P - plastic	Combo 6a	Combo 8a	metals and PAH	BTEX	Chloride and sulphate							
TP155-0.1	15	26/06/20	S	G	X											
TP155-2.0	16	26/06/20	S	G						X						
TP156-0.1	17	26/06/20	S	G	X											
TP156-2.0	18	26/06/20	S	G						X						
BD1	19	29/06/20	S	G				X								
TS	20		S	G					X							
TB	21		S	G				X								
TP150 0.5	22		S	- Extra received												
PQL (S) mg/kg															ANZECC PQLs req'd for all water analytes <input type="checkbox"/>	
PQL = practical quantitation limit. If none given, default to Laboratory Method Detection Limit															Lab Report/Reference No:	
Metals to Analyse: 8HM unless specified here:																
Total number of samples in container:					Relinquished by:					Transported to laboratory by:						
Send Results to: Douglas Partners Pty Ltd					Address: 18 Waler Cres, Smeaton Grange NSW 2567					Phone:					Fax:	
Signed:					Received by:					Date & Time:						

CERTIFICATE OF ANALYSIS 246224

Client Details

Client	Douglas Partners Pty Ltd
Attention	Rod Gray
Address	96 Hermitage Rd, West Ryde, NSW, 2114

Sample Details

Your Reference	94616.01, Proposed Open Space Development
Number of Samples	22 Soil
Date samples received	03/07/2020
Date completed instructions received	03/07/2020

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	10/07/2020
Date of Issue	09/07/2020
NATA Accreditation Number 2901. This document shall not be reproduced except in full.	
Accredited for compliance with ISO/IEC 17025 - Testing. Tests not covered by NATA are denoted with *	

Asbestos Approved By

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

Results Approved By

Diego Bigolin, Team Leader, Inorganics
 Dragana Tomas, Senior Chemist
 Loren Bardwell, Senior Chemist
 Lucy Zhu, Asbestos Supervisor
 Manju Dewendrage, Chemist
 Priya Samarawickrama, Senior Chemist

Authorised By



Nancy Zhang, Laboratory Manager

Miscellaneous Inorg - soil						
Our Reference		246224-4	246224-8	246224-13	246224-16	246224-18
Your Reference	UNITS	TP138-2.0	TP139-2.0	TP151-0.5	TP155-2.0	TP156-2.0
Date Sampled		29/06/2020	29/06/2020	26/06/2020	26/06/2020	26/06/2020
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	08/07/2020	08/07/2020	08/07/2020	08/07/2020	08/07/2020
Date analysed	-	08/07/2020	08/07/2020	08/07/2020	08/07/2020	08/07/2020
Sulphate, SO ₄ 1:5 soil:water	mg/kg	75	72	29	58	54
Chloride, Cl 1:5 soil:water	mg/kg	28	27	10	21	20

Client Reference: 94616.01, Proposed Open Space Development

QUALITY CONTROL: Misc Soil - Inorg						Duplicate		Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-5	[NT]
Date prepared	-			06/07/2020	[NT]	[NT]	[NT]	[NT]	06/07/2020	[NT]
Date analysed	-			06/07/2020	[NT]	[NT]	[NT]	[NT]	06/07/2020	[NT]
Total Phenolics (as Phenol)	mg/kg	5	Inorg-031	<5	[NT]	[NT]	[NT]	[NT]	102	[NT]

Client Reference: 94616.01, Proposed Open Space Development

QUALITY CONTROL: Miscellaneous Inorg - soil					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-5	[NT]
Date prepared	-			08/07/2020	4	08/07/2020	08/07/2020		08/07/2020	[NT]
Date analysed	-			08/07/2020	4	08/07/2020	08/07/2020		08/07/2020	[NT]
Sulphate, SO4 1:5 soil:water	mg/kg	10	Inorg-081	<10	4	75	72	4	100	[NT]
Chloride, Cl 1:5 soil:water	mg/kg	10	Inorg-081	<10	4	28	27	4	106	[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.	
The recommended maximums for analytes in urine are taken from "2018 TLVs and BEIs", as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.	
Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2	

Laboratory Acceptance Criteria

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

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

Spikes for Physical and Aggregate Tests are not applicable.

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

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

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

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

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

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Report Comments

8 metals in soil:

- The laboratory RPD acceptance criteria has been exceeded for 246224-17 for Cr. Therefore a triplicate result has been issued as laboratory sample number 246224-23.
- # Percent recovery is not possible to report due to the inhomogeneous nature of the element/s in the sample/s. However an acceptable recovery was obtained for the LCS.

Asbestos: A portion of the supplied sample was sub-sampled for asbestos analysis according to Envirolab procedures.

We cannot guarantee that this sub-sample is indicative of the entire sample. Envirolab recommends supplying 40-50g of sample in its own container.

Note: Samples were sub-sampled from jars provided by the client.

Andrew (Fitzy) Fitzsimons

From: Aileen Hie
Sent: Monday, 6 July 2020 10:29 AM
To: Andrew (Fitzy) Fitzsimons
Subject: FW: Sample Receipt for 246224 94616.01, Proposed Open Space Development

Follow Up Flag: Follow up
Flag Status: Flagged

246224-A
Due: 13/7/20

Kind Regards,

Aileen Hie | Customer Service Coordinator | Envirolab Services Pty Ltd
(Monday to Friday 10am to 6pm)
Celebrating 15 years of Great Science. Great Service.
12 Ashley Street Chatswood NSW 2067
T 612 9910 6200 F 612 9910 6201
E ahie@envirolab.com.au | W www.envirolab.com.au

[View reduced sampling bottle provision for PFAS in water](#) | [COVID-19 Update](#)

Please note that all samples submitted to the Envirolab Group laboratories will be analysed under the Envirolab Group Terms and Conditions. The Terms and Conditions are accessible by clicking this link

From: Rod Gray <Rod.Gray@douglaspartners.com.au>
Sent: Monday, 6 July 2020 10:14 AM
To: Aileen Hie <AHie@envirolab.com.au>
Subject: RE: Sample Receipt for 246224 94616.01, Proposed Open Space Development

CAUTION: This email originated from outside of the organisation. Do not act on instructions, click links or open attachments unless you recognise the sender and know the content is authentic and safe.

Hi Aileen,

Could I please also get sodicity on samples:

- 2 – 138-0.5
- 13 – 151-0.5
- 16 – 155-2.0

Thanks

CERTIFICATE OF ANALYSIS 246224-A

Client Details

Client	Douglas Partners Pty Ltd
Attention	Rod Gray
Address	96 Hermitage Rd, West Ryde, NSW, 2114

Sample Details

Your Reference	<u>94616.01, Proposed Open Space Development</u>
Number of Samples	22 Soil
Date samples received	03/07/2020
Date completed instructions received	06/07/2020

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.

Report Details

Date results requested by	13/07/2020
Date of Issue	09/07/2020
NATA Accreditation Number 2901. This document shall not be reproduced except in full.	
Accredited for compliance with ISO/IEC 17025 - Testing. Tests not covered by NATA are denoted with *	

Results Approved By

Jaimie Loa-Kum-Cheung, Metals Supervisor

Authorised By



Nancy Zhang, Laboratory Manager

ESP/CEC				
Our Reference		246224-A-2	246224-A-13	246224-A-16
Your Reference	UNITS	TP138-0.5	TP151-0.5	TP155-2.0
Date Sampled		29/06/2020	26/06/2020	26/06/2020
Type of sample		Soil	Soil	Soil
Date prepared	-	08/07/2020	08/07/2020	08/07/2020
Date analysed	-	08/07/2020	08/07/2020	08/07/2020
Exchangeable Ca	meq/100g	14	36	<0.1
Exchangeable K	meq/100g	0.6	0.4	0.3
Exchangeable Mg	meq/100g	14	17	7.1
Exchangeable Na	meq/100g	2.5	0.60	3.3
Cation Exchange Capacity	meq/100g	31	54	11
ESP	%	8	1	31

Method ID	Methodology Summary
Metals-020	Determination of exchangeable cations and cation exchange capacity in soils using 1M Ammonium Chloride exchange and ICP-AES analytical finish.

Client Reference: 94616.01, Proposed Open Space Development

QUALITY CONTROL: ESP/CEC						Duplicate		Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			08/07/2020	[NT]	[NT]	[NT]	[NT]	08/07/2020	[NT]
Date analysed	-			08/07/2020	[NT]	[NT]	[NT]	[NT]	08/07/2020	[NT]
Exchangeable Ca	meq/100g	0.1	Metals-020	<0.1	[NT]	[NT]	[NT]	[NT]	102	[NT]
Exchangeable K	meq/100g	0.1	Metals-020	<0.1	[NT]	[NT]	[NT]	[NT]	102	[NT]
Exchangeable Mg	meq/100g	0.1	Metals-020	<0.1	[NT]	[NT]	[NT]	[NT]	99	[NT]
Exchangeable Na	meq/100g	0.1	Metals-020	<0.1	[NT]	[NT]	[NT]	[NT]	93	[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.	
The recommended maximums for analytes in urine are taken from "2018 TLVs and BEIs", as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.	
Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2	

Laboratory Acceptance Criteria

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

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

Spikes for Physical and Aggregate Tests are not applicable.

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

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

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

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

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

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.