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Geotechnics / Environment / Groundwater

Integrated Practical Solutions

Report on
Salinity Investigation and Management Plan

Proposed Budawang School Relocation
17 Croobyar Road, Milton

Prepared for
School Infrastructure New South Wales (SINSW)

Project 89390.03
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Douglas Partners
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| | | | |

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

| | Signature | | Date |
|---|---|---|---|
| Author | | | 23 April 2021 |
| Reviewer | | For Christopher C. Kline | 23 April 2021 |

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# Report on Salinity Investigation and Management Plan
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## 1. Introduction

Douglas Partners Pty Ltd (DP) has been engaged by School Infrastructure New South Wales (SINSW) to undertake a Salinity Investigation and Salinity Management Plan (SMP) within part of the former Shoalhaven Anglican College at 17 Croobyar Road, Milton (the site). The investigation was commissioned in an email dated 17 November 2020 from Mr Ben Marshall of S.J.A Construction Services Pty Ltd (project managers) on behalf of SINSW (the client) and was undertaken in accordance with Douglas Partners' variation letter WOL200347 Variation 1 dated 26 October 2020.

The site has an approximate area of 2.4 ha, the location and layout of which, is presented on Drawing 1 in Appendix A. DP understands that the site is proposed to be developed for the relocation of the Budawang School. The proposed development of the site will include the demolition of some existing buildings and the construction of new school buildings along with proposed car parks and pavements.

Salinity can affect urban structures in a number of ways, including corrosion of concrete, break-down of bricks and mortar, corrosion of steel (including reinforcement), break-up of roads, attach on buried infrastructure, reduced ability to grow vegetation and increased erosion potential.

It is understood that an assessment of soil salinity for the Croobyar Road site is required in accordance with Section 18 of the Planning Secretary's Environmental Assessment Requirements for the development *"Provide: an assessment of salinity, including a salinity management plan where relevant"* and to assist in planning and design of the development.

The investigation comprised the drilling of boreholes with in-situ testing and sampling followed by laboratory testing of selected samples, analysis and reporting. Details of the work undertaken and the results obtained are given herein, together with comments relating to design and construction practice.

A preliminary masterplan showing the proposed development layout and existing buildings were provided by the client for the investigation. Two proposed (alternate) master plans were provided by the client, following the field work part of the investigation. An additional revised master plan was provided to DP by S.J.A Construction Services Pty Ltd. As requested, the revised master plan has been included in Appendix A of this report.

The investigation was undertaken concurrently with geotechnical and contamination investigations, the results of which are given in separate reports (Project 89390.02.R.001.Rev0 dated 6 November 2020 and Project 89390.02.R.002.Rev0 dated 8 December 2020).

## 2. Scope of Works

The current report includes two parts:

1. Salinity assessment of the site based upon:

- Collection of samples at regular depth intervals from eight boreholes to depths of up to 5.5 m;
- Inspection of the site for signs of salinity;
- Analysis of electrical conductivity (EC1:5), pH and soil texture test results for 45 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 (ten samples), sodicities and dispersibility testing (five samples) at a NATA accredited analytical laboratory; and
- Assessment of the results with respect to potential for salinity impacts on the development.

2. Comments on salinity management for the proposed development.

## 3. Site Information

| | |
|---|---|
| Site Address | 17 Croobyar Road, Milton |
| Legal Description | Part Lot 200 on Deposited Plan (D.P.) 1192140 |
| Area | Approx 2.4 ha |
| Local Council Area | Shoalhaven City Council |
| Current Use | Commercial (Educational) |
| Surrounding Uses | North – A Sewage Pumping Station & Croobyar Road<br>East – Low Density Residential<br>South – Former Grounds of Shoalhaven Anglican College<br>West – Rural residential (Lot 1 in DP811690). |

At the time of the investigation, single storey buildings associated with the former college were located in the northern and southern sections of the site (refer Drawing 1, Appendix A). A north to south trending drainage depression was located along the western boundary. Stands of healthy, mature trees were noted along the eastern and western boundaries and sporadically throughout the remainder of the site. The vegetation observed throughout the site was typically in good health and well maintained. No dead trees/foliage or signs of salt scalding or effervescence were observed.

An existing netball/basketball playing surface was located in the western part of the site. Other parts of the site were typically lightly grassed/landscaped (near existing buildings) or asphalt sealed (car parks and driveways). A sewer main diagonally crosses the site (refer Drawing 1, Appendix A).

# 4. Environmental Setting

| | |
|---|---|
| Regional Topography | Generally sloping to the south, away from a west-east trending spur. |
| Site Topography | Surface levels generally fall in the westerly direction at grades of 1 in 20 to 1 in 90 with some near level terraces associated with the existing school infrastructure. The overall difference in level across the site is estimated to be about 8 m from the highest part of the site (north-eastern part) to the lowest (south-western part). |
| Soil Landscape | The site is not covered by the NSW Soil Landscape Mapping, however, reference to the Great Soil Groups land and soil map indicates that the site is underlain by Kurosol Soils (Soil Unit KU) of Regolith Stability Class R1. These soils are characterised by brown podzolic, typically residual soils of low erodibility and relatively high sodicity. The soils are typically moderately to highly reactive with impermeable, highly plastic, highly organic subsoil. |
| Geology | Reference to the geological survey of NSW (GSNSW, 2019) indicates that the site is underlain by Milton Monzonite (a medium to coarse grained igneous rock) of Mesozoic age. The results of the field work were consistent with the broad-scale geological mapping with monzonite intersected in the 6 of the 8 boreholes that intersected bedrock. |
| Salinity | The National Land and Water Resources Audit, *Dryland Salinity National Assessment* indicates that the occurrence of saline soils is unlikely at the site. A walkover of the site by an experienced geotechnical engineer indicated there were no visible signs of shallow saline soils. |
| Surface Water | Given the general topography of the site, groundwater and surface water are expected to flow towards the west and south. There is a small marshy wetland located in the western part of the site, however the nearest permanent water body is a farm dam on Pettys Creek, a perennial watercourse located about 650 m south-west of the site. |
| Groundwater Bores | A search of the NSW Department of Primary Industries (DPI) groundwater bore database confirms that there are no registered groundwater bores located within 1 km of the site boundary. |

# 5. Field Work

## 5.1 Methods

The field work comprised an inspection of the site by an experienced geotechnical engineer for signs of salinity followed by the drilling of eight boreholes (Bores 101 – 108) to depths of 2.2 – 5.5 m using a Kubota KX018-4 mini-excavator fitted with a 150 mm diameter auger attachment. The boreholes were logged on site by a geotechnical engineer who collected disturbed and bulk samples to assist in strata identification and for laboratory testing.

The approximate borehole locations are shown on Drawing 1 in Appendix B. The surface levels to Australian Height Datum (AHD) and coordinates to Map Grid of Australia (MGA) were determined using a digital GPS receiver for which a typical accuracy of ±20 mm is expected.

### 5.2 Results

Details of the subsurface conditions encountered during the field investigation are provided on the borehole logs (refer Appendix B), which should be read in conjunction with the accompanying notes defining classification methods and descriptive terms.

The field work indicated slightly variable subsurface conditions, which were typically consistent with the results of the previous investigation. The succession of strata is broadly summarised as follows:

| | |
|---|---|
| TOPSOIL / TOPSOIL FILL: | to depths of 0.1 – 0.2 m in all the boreholes; |
| FILL: | silty gravel fill to a depth of 1.0 m in Bore 101 and possible fill (sandy clay) in Bore 104 to a depth of 0.5 m; |
| CLAY: | variably firm to hard (but typically stiff to very stiff) clay and sandy clay to depths of 1.9 – 5.5 m in all boreholes. Bores 101 and 104 were terminated in very stiff to hard clays at depths of 5.5 and 4.0 m, respectively; |
| MONZONITE: | very low strength monzonite to the termination depths (on refusal of the auger) at depths of 2.2 – 4.0 m in Bores 102, 103 and 105 – 108. |

Groundwater seepage was observed at depths of 3.5 m, 3.4 m and 2.7 m in Bores 101, 104 and 107 (ie typically within with residual clay profile). No free groundwater was observed in the remaining boreholes during excavation. It is noted however, that the boreholes were immediately backfilled following excavation, sampling and logging which precluded longer term monitoring of groundwater levels. Furthermore, groundwater levels are affected by climatic conditions and soil permeability and will therefore vary with time.

No signs of salt efflorescence or salt scalds were noted during the site inspection.

## 6. Laboratory Testing

Laboratory testing (at a third party NATA accredited laboratory) was undertaken on samples collected from the boreholes for; 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 results of the laboratory testing are given in a Summary Table (Appendix C). 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 included in Appendix D.

A “worst case” scenario was used to classify the extent of salinity and aggressivity of the site materials below the current ground surface to the depth of investigation. The “worst case” classification was carried out by utilising a maxima/minima analysis within the full investigated depth zone of 0 up to a maximum of 5.5 m at individual locations.

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

**Table 1: Summary of Parameters Tested**

| Parameter | | Units | Samples | Minimum | Maximum |
|---|---|---|---|---|---|
| pH | | pH units | 45 | 4.3 | 8.0 |
| Chlorides | | (mg/kg) | 10 | <10 | 150 |
| Sulphates | | (mg/kg) | 10 | <10 | 350 |
| Aggressivity | to Concrete | [AS2159] | - | Non-Aggressive | Moderate |
| | to Steel | [AS2159] | - | Non-Aggressive | Non-Aggressive |
| Exchangeable Sodium (Na) | | (meq/100g) | 5 | 0.1 | 1.9 |
| CEC (cation exchange capacity) | | (meq/100g) | 5 | 11 | 18 |
| Sodicity [Na/CEC] | | (ESP%) | 5 | 0.6 | 15.8 |
| Sodicity Class | | [after DLWC] | - | Non-Sodic | Highly Sodic |
| EC1:5 [Lab.] | | (mS/cm) | 45 | 36 | 310 |
| Resistivity | | Ω.cm | 45 | 3,226 | 27,778 |
| ECe [M x EC1:5] [1] | | (dS/m) | 45 | 0.3 | 2.6 |
| Salinity Class | | [after Richards 1954] | - | Non-Saline | Slightly Saline |

1 M is soil textural factor

## 6.1 Aggressivity

Figure 1 (following page) presents variations of aggressivity with depth, based on pH profiles at all sampling locations, together with class ranges indicated in the Australian Standard for Design and Installation of Piled Footings, AS2159:2009 (Standards Australia, 2009). The absence of free groundwater in all locations and the permeability of the sampled clay-rich soils at all sampling locations indicate that soils are in Condition “B” as defined by AS2159:2009.

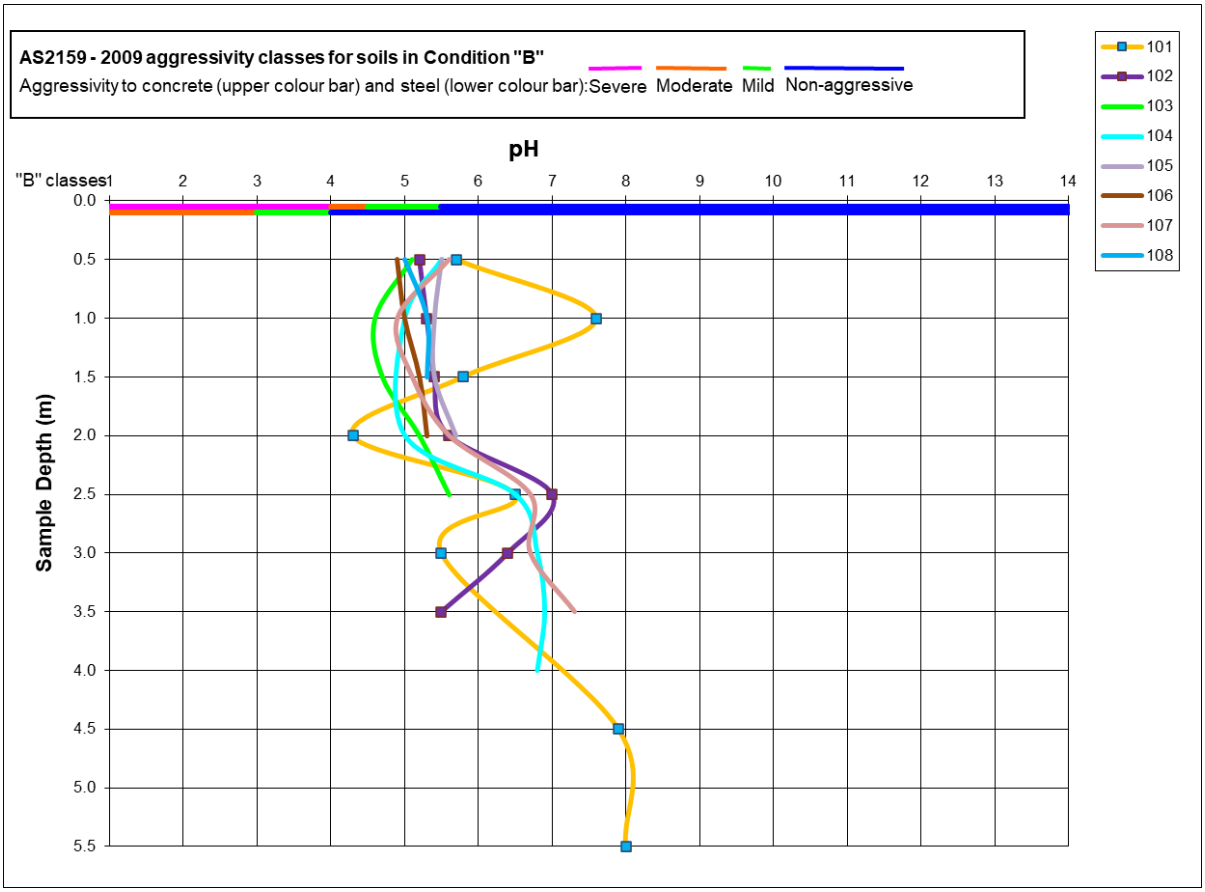



**Figure 1: Vertical pH Profiles and Aggressivity Classes**

Figure 1 shows that the site was underlain by soils which are non-aggressive to moderately aggressive to concrete foundations and concrete piles based on pH values. The summary table (Appendix C) indicates that 44% of all tested samples were non-aggressive to concrete, 53% were mildly aggressive to concrete and 2% (one sample) was moderately aggressive to concrete. The sample which tested as 'moderately aggressive' to concrete (pH 4.3, which is 0.2 below the threshold for mild aggressivity) was located in the north-western part of the site in a filled drainage depression (Bore 101 at a depth of 2.0 m, refer Drawing 1 in Appendix A). This part of the site is not expected to be developed.

Based on the results of the investigation (and the worst-case pH results for each borehole) the site is classified as '**mildly aggressive to concrete'** foundations and piles. It is noted that if any excavation is proposed below depths of 1.5 m in the vicinity of Borehole 101, a review of this classification will be required.

The pH profiles of Figure 1 indicate that the materials throughout the Site, at all investigated depths, are non-aggressive to steel. The chloride and resistivity concentration guidelines of AS2159:2009 support this non-aggressive classification.

Based on the results, the entire site is underlain by soils which are classified as '**non-aggressive to steel'**.

## 6.2 Salinity

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

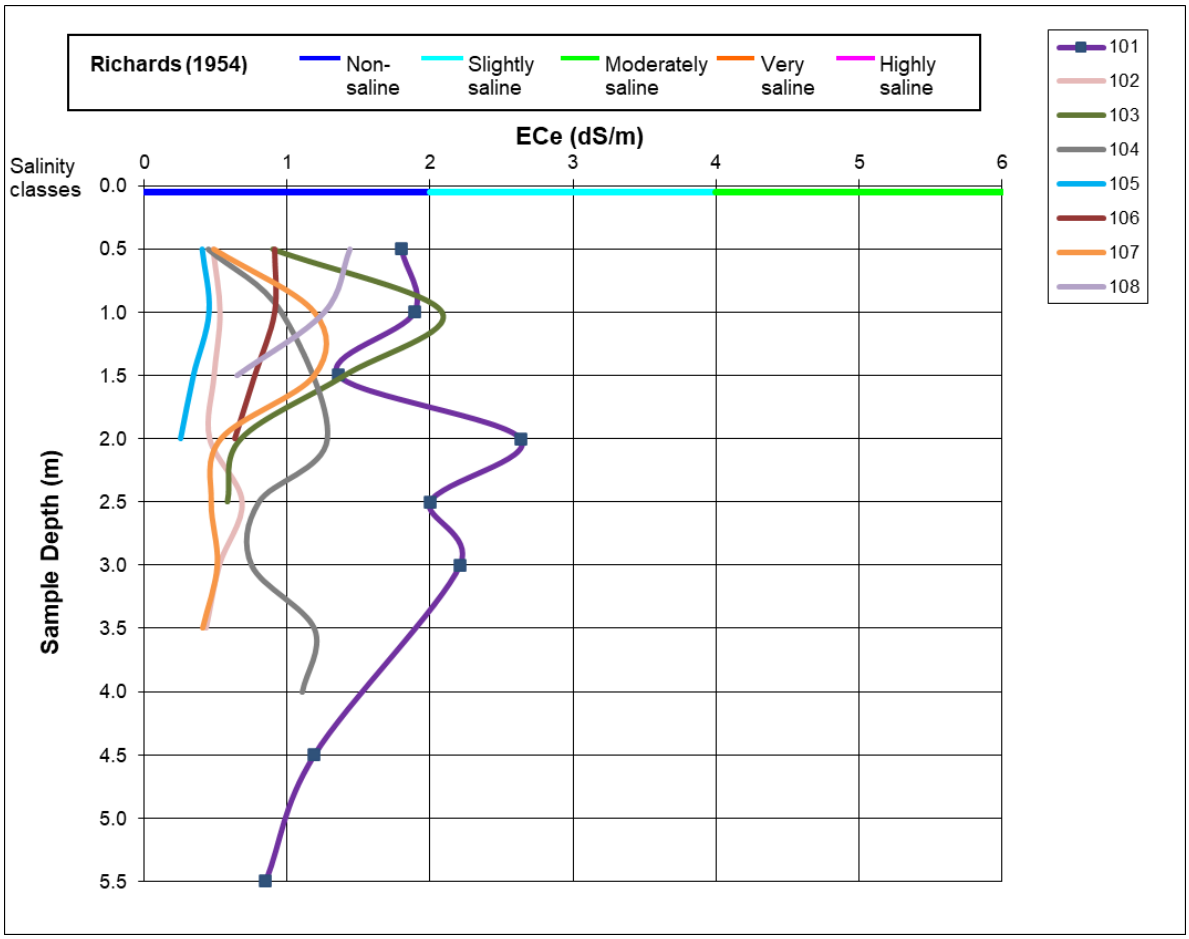



**Figure 2: Vertical Salinity Profiles and Salinity Classes**

The summary table (Appendix C) indicates that 91% of soil samples (41 samples) were non-saline and 9% (4 samples) were slightly saline.

Based on the results, the soils underlying the site are classified as **'non-saline to slightly saline'**.

## 6.3 Sodicity and Dispersibility

The sodicity tests reported in the Summary Table (Appendix C) show non-sodic to highly sodic soils, indicating potential for erodibility of soils left exposed.

Dispersion potentials, tested at depths of 0.5 – 1.0 m by the Emerson Crumb Test (refer Summary Table, Appendix D), were determined to be Class 3 to Class 5 (non-dispersive to dispersive). Given the Emerson Crumb results, it is likely soils at the site may have the potential to exhibit relatively poor drainage and water logging of soils which are not well-drained is likely to occur.

## 7. Conclusion

The mild aggressivity to concrete, presence of some slightly saline soils and the highly sodic soils are naturally occurring features of the local landscape and are not considered impediments to the proposed development.

Based on the results of the investigation, site specific management of saline soils is not required. All concrete and steel structures should be built in accordance with the durability requirements of AS2159:2009 and AS3600:2018.

## 8. References

AS 2159:2009, *Piling – Design and Installation*, Standards Australia

AS3600:2018, *Concrete Structures, Steel and Tendons,* Standards Australia

AS4058:2007, *Precast Concrete Pipes,* Standards Australia

GSNSW (2019), *NSW Seamless Geology.* Geological Survey NSW Web Map Service.

## 9. Limitations

Douglas Partners (DP) Pty Ltd has prepared this report for this proposed Budawang school relocation project at 17 Croobyar Road, Milton in accordance with DP's variation letter WOL200347 Variation 1 dated 26 October 2020 and acceptance received from Mr Ben Marshall of S.J.A Construction Services Pty Ltd dated 17 November 2020. The work was carried out under a modified SINSW consultancy agreement (*SINSW00964/20 Budawang SSP Geotech Consultancy* dated 28 September 2020. This report is provided for the exclusive use of School Infrastructure New South Wales (SINSW) for this project only and for the purposes as described in the report. It should not be used by or relied upon for other projects or purposes on the same or other site or by a third party. Any party so relying upon this report beyond its exclusive use and purpose as stated above, and without the express written consent of DP, does so entirely at its own risk and without recourse to DP for any loss or damage. In preparing this report DP has necessarily relied upon information provided by the client and/or their agents.

The results provided in the report are indicative of the sub-surface conditions on the site only at the specific sampling and/or testing locations, and then only to the depths investigated and at the time the work was carried out. Sub-surface conditions can change abruptly due to variable geological processes and also as a result of human influences. Such changes may occur after DP's field testing has been completed. DP's advice is based upon the conditions encountered during this investigation. The accuracy of the advice provided by DP in this report may be affected by undetected variations in ground conditions across the site between and beyond the sampling and/or testing locations.

The assessment of atypical safety hazards arising from this advice is restricted to the geotechnical components set out in this report and based on known project conditions and stated design advice and assumptions. While some recommendations for safe controls may be provided, detailed 'safety in design' assessment is outside the current scope of this report and requires additional project data and assessment.

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.

**Douglas Partners Pty Ltd**

# Appendix A

About This Report
Drawing 1
Master Plan, Project 190941, Drawing No. SSDA-2000 Issue D

# Symbols & Abbreviations



## 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 |

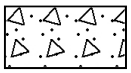
# *Symbols & Abbreviations*

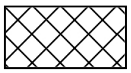
## Graphic Symbols for Soil and Rock

### General

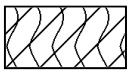

Asphalt

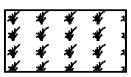

Road base

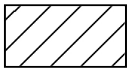

Concrete

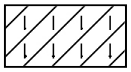

Filling

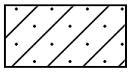
### Soils


Topsoil

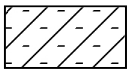

Peat

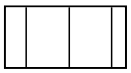

Clay

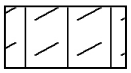

Silty clay

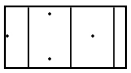

Sandy clay

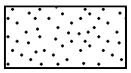

Gravelly clay

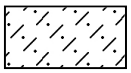

Shaly clay

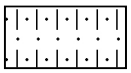

Silt


Clayey silt


Sandy silt

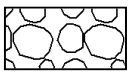

Sand

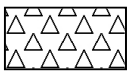

Clayey sand


Silty sand


Gravel

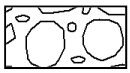

Sandy gravel


Cobbles, boulders

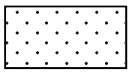

Talus

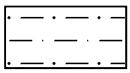
### Sedimentary Rocks

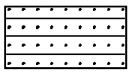

Boulder conglomerate

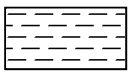

Conglomerate


Conglomeratic sandstone

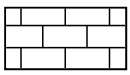

Sandstone


Siltstone

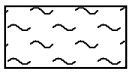

Laminite

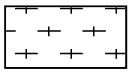

Mudstone, claystone, shale

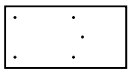

Coal


Limestone

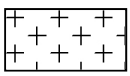
### Metamorphic Rocks

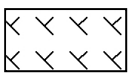

Slate, phyllite, schist

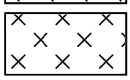

Gneiss

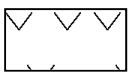

Quartzite

### Igneous Rocks

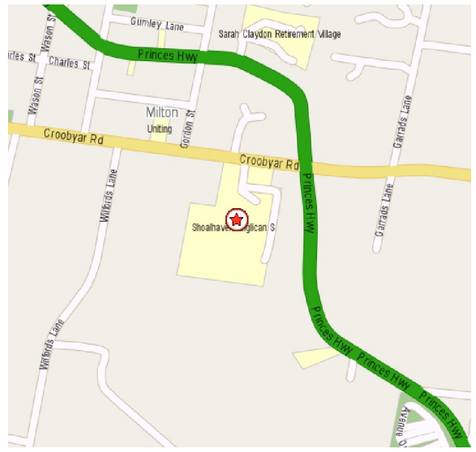

Granite


Dolerite, basalt, andesite


Dacite, epidote


Tuff, breccia


Porphyry


**Locality Plan**

## Legend

- Borehole Location
- Lot Boundary (Approx.)
- Proposed Pavement Area (T.B.C)
- Proposed Building (T.B.C)
- Approximate Proposed Development Boundary (T.B.C)
- Approximate Location of Existing Sewer Main

0 10 20 30 40 50 m

**Douglas Partners**
*Geotechnics / Environment / Groundwater*

| | | | |
|---|---|---|---|
| CLIENT: | School Infrastructure NSW (SINSW) Pty Ltd | | |
| OFFICE: | Wollongong | DRAWN BY: | DJM |
| SCALE: | 1:700 @ A3 | DATE: | 23/04/2021 |

TITLE: **Test Location Plan**
**Proposed Budawang School Relocation**
**17 Croobyar Road, Milton**

N

| | |
|---|---|
| PROJECT No: | 89390.03 |
| DRAWING No: | 1 |
| REVISION: | 2 |


1 SITE PLAN
1 : 250

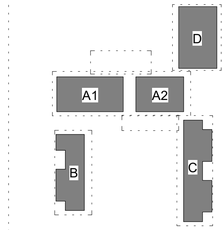
0m 2m 4m 8m 12m

## SITE PLAN LEGEND

- NEW LANDSCAPE
- NEW PATHWAYS
- NEW BUILDINGS
- ROADS
- PARKING SPACES
- BUDAWANG SCHOOL BOUNDARY
- EXISTING SEWERLINE
- EXISTING TREES
- PROPOSED TREES
- BOUNDARY TREES
- DOE OWNERSHIP
- LP LIGHT POLE

Amendments

| Issue | Description | Date |
|---|---|---|
| A | ISSUE FOR INFORMATION | 12/03/2021 |
| B | ISSUE FOR INFORMATION | 23/03/2021 |
| C | ISSUE FOR INFORMATION | 25/03/2021 |
| D | ISSUE FOR SSDA | 08/04/2021 |

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architecture interior design urban design landscape
nom architect M. Sheldon 3990

Project Title
BUDAWANG SCHOOL

Drawing Title
SITE PLAN

| | |
|---|---|
| Scale | 1 : 250 |
| Drawing Created (date) | 02/24/21 |
| Drawing Created (by) | TKD |
| Plotted and checked by | RF |
| Verified | RF |
| Approved | RK |

| Project No | Drawing No | Issue |
|---|---|---|
| 190941 | SSDA-2000 | D |



9/04/2021 12:36:00 AM

# Appendix B

Borehole Logs

# BOREHOLE LOG

**CLIENT:** School Infrastructure New South Wales (SINSW)
**PROJECT:** Proposed Budawang School Relocation
**LOCATION:** 17 Croobyar Road, Milton

**SURFACE LEVEL:** 48.0 AHD
**EASTING:** 267398
**NORTHING:** 6088349
**DIP/AZIMUTH:** 90°/--

**BORE No:** 101
**PROJECT No:** 89390.02
**DATE:** 13/10/2020
**SHEET** 1 OF 1

| RL | Depth (m) | Description of Strata | Graphic Log | Sampling & In Situ Testing: Type | Depth | Sample | Results & Comments | Water | Dynamic Penetrometer Test (blows per 150mm) |
|---|---|---|---|---|---|---|---|---|---|
| 48 | 0.1 | TOPSOIL/SILT (ML): low plasticity, dark brown, w<PL | | E | 0.1 | | PID = 0.9 | | |
| | | FILL/Silty GRAVEL (GP): medium gravel, brown and dark brown, dry | | D<br>E | 0.5 | | PID = 1.0 | | |
| 47 | 1.0 | CLAY (CH): high plasticity, dark brown, with silt, w>PL, firm | | D<br>E | 1.0 | | PID = 0.8 | | |
| | | | | D<br>E | 1.5 | | pp = 50<br>PID = 0.6 | | |
| 46 | 2 | | | D | 2.0 | | pp = 50 | | |
| | | -becoming grey mottled green and brown, trace sand below 2.2m | | D | 2.5 | | pp = 75 | | |
| 45 | 3 | -becoming stiff below 3.0m | | D | 3.0 | | pp = 100 | | |
| | 3.3 | Sandy CLAY (CI): medium plasticity, brown red, fine to medium sand, w>PL, very stiff | | | | | | ▽ | |
| 44 | 4 | | | D | 4.5 | | | | |
| 43 | 5 | | | | | | | | |
| | 5.5 | Bore discontinued at 5.5m<br>-limit of investigation | | D | 5.5 | | | | |

**RIG:** Kubota KX018-4 mini-excavator **DRILLER:** Clinton Taylor **LOGGED:** FH **CASING:** Uncased

**TYPE OF BORING:** Solid flight auger - TC bit

**WATER OBSERVATIONS:** Groundwater seepage at 3.5m

**REMARKS:** w =moisture content, PL = plastic limit

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

**SAMPLING & IN SITU TESTING LEGEND**

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

Douglas Partners
Geotechnics / Environment / Groundwater

# BOREHOLE LOG

**CLIENT:** School Infrastructure New South Wales (SINSW)
**PROJECT:** Proposed Budawang School Relocation
**LOCATION:** 17 Croobyar Road, Milton

**SURFACE LEVEL:** 50.7 AHD
**EASTING:** 267471
**NORTHING:** 6088360
**DIP/AZIMUTH:** 90°/--

**BORE No:** 102
**PROJECT No:** 89390.02
**DATE:** 13/10/2020
**SHEET** 1 OF 1

| RL | Depth (m) | Description of Strata | Graphic Log | Sampling & In Situ Testing: Type | Depth | Sample | Results & Comments | Water | Dynamic Penetrometer Test (blows per 150mm) |
|---|---|---|---|---|---|---|---|---|---|
| 50.7 | 0.15 | TOPSOIL/SILT (ML): low plasticity, dark brown, w<PL | | E | 0.1 | | PID = 1.5 | | |
| | | CLAY (CH): high plasticity, brown, w<PL, stiff | | D<br>E | 0.5 | | pp = 100-150<br>PID = 0.1 | | |
| | | -with fine to medium sand below 0.8m | | D<br>E | 1.0 | | pp = 150<br>PID = 0.3 | | |
| | | | | D<br>E | 1.5 | | PID = 0.2 | | |
| | 1.8 | Sandy CLAY (CI): medium plasticity, red brown, fine to medium sand, w~PL, stiff | | D | 2.0 | | | | |
| | | | | D | 2.5 | | | | |
| | | -very stiff to hard, below 3.0m | | D | 3.0 | | | | |
| | 3.5 | MONZONITE: medium grained, orange brown, with extremely weathered rock bands, very low strength, highly weathered | | D | 3.5 | | | | |
| | 4.0 | Bore discontinued at 4.0m<br>-refusal on very low strength monzonite | | D | 4.0 | | | | |

**RIG:** Kubota KX018-4 mini-excavator **DRILLER:** Clinton Taylor **LOGGED:** FH **CASING:** Uncased

**TYPE OF BORING:** Solid flight auger - TC bit

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** w =moisture content, PL = plastic limit

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

**SAMPLING & IN SITU TESTING LEGEND**

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

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# BOREHOLE LOG

**CLIENT:** School Infrastructure New South Wales (SINSW)
**PROJECT:** Proposed Budawang School Relocation
**LOCATION:** 17 Croobyar Road, Milton

**SURFACE LEVEL:** 48.3 AHD
**EASTING:** 267430
**NORTHING:** 6088321
**DIP/AZIMUTH:** 90°/--

**BORE No:** 103
**PROJECT No:** 89390.02
**DATE:** 13/10/2020
**SHEET** 1 OF 1

| RL | Depth (m) | Description of Strata | Graphic Log | Sampling & In Situ Testing: Type | Depth | Sample | Results & Comments | Water | Dynamic Penetrometer Test (blows per 1000mm) |
|---|---|---|---|---|---|---|---|---|---|
| 48 | 0.15 | TOPSOIL/SILT (ML): low plasticity, dark brown, w<PL | | E | 0.1 | | PID = 0.1 | | |
| | | CLAY (CH): high plasticity, brown, with silt, w<PL, stiff to very stiff | | D<br>E | 0.5 | | pp = 200<br>PID = 0.8 | | |
| | | | | B | | | | | |
| | 1 | | | D<br>E | 1.0 | | PID = 0.4 | | 1 |
| 47 | 1.3 | CLAY (CH): high plasticity, pale brown orange, with fine to medium sand, w>PL, stiff | | D<br>E | 1.5 | | pp = 150<br>PID = 0.6 | | |
| | 2 | | | D | 2.0 | | pp = 150-200 | | 2 |
| 46 | 2.2 | Sandy CLAY (CI): medium plasticity, brown orange, fine to medium sand, w>PL, stiff to very stiff | | D | 2.5 | | pp = 150-200 | | |
| | 2.9 | | | | | | | | |
| | 3 | 3.0 MONZONITE: medium grained, brown orange red, with extremely weathered rock bands, very low strength, highly weathered | | D | 3.0 | | | | 3 |
| 45 | | Bore discontinued at 3.0m<br>-refusal on very low strength monzonite | | | | | | | |
| | 4 | | | | | | | | 4 |
| 44 | | | | | | | | | |
| | 5 | | | | | | | | 5 |
| 43 | | | | | | | | | |

**RIG:** Kubota KX018-4 mini-excavator **DRILLER:** Clinton Taylor **LOGGED:** FH **CASING:** Uncased
**TYPE OF BORING:** Solid flight auger - TC bit
**WATER OBSERVATIONS:** No free groundwater observed
**REMARKS:** w =moisture content, PL = plastic limit

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

**SAMPLING & IN SITU TESTING LEGEND**

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

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# BOREHOLE LOG

**CLIENT:** School Infrastructure New South Wales (SINSW)
**PROJECT:** Proposed Budawang School Relocation
**LOCATION:** 17 Croobyar Road, Milton

**SURFACE LEVEL:** 46.7 AHD
**EASTING:** 267375
**NORTHING:** 6088306
**DIP/AZIMUTH:** 90°/--

**BORE No:** 104
**PROJECT No:** 89390.02
**DATE:** 13/10/2020
**SHEET** 1 OF 1

| RL | Depth (m) | Description of Strata | Graphic Log | Sampling & In Situ Testing: Type | Depth | Sample | Results & Comments | Water | Dynamic Penetrometer Test (blows per 1000mm) |
|---|---|---|---|---|---|---|---|---|---|
| 46 | 0.1 | TOPSOIL/SILT (ML): low plasticity, dark brown, w~PL | | B | 0.1 | | PID = 0.4 | | |
| | | Sandy CLAY (CH): high plasticity, pale brown orange, fine to medium sand, w>Pl, stiff (possible fill) | | D<br>E | | | | | |
| | 0.5 | CLAY (CH): high plasticity, brown, w>Pl, stiff | | D<br>E | 0.5 | | PID = 0.4 | | |
| | | | | B | | | | | |
| | 1 | | | D<br>E | 1.0 | | PID = 0.3 | | 1 |
| | | -firm below 1.2m | | | | | | | |
| 45 | | | | D | 1.5 | | pp = 50-100 | | |
| | 2 | -stiff, with fine sand below 2.0m | | D | 2.0 | | pp = 75-100 | | 2 |
| | | | | D | 2.5 | | pp = 100 | | |
| 44 | 2.6 | Sandy CLAY (CI): medium plasticity, red brown, fine to medium sand, w>PL, stiff | | | | | | | |
| | 3 | | | D | 3.0 | | | | 3 |
| | | | | D | 3.5 | | | ▷ | |
| 43 | | -becoming very stiff to hard below 3.5m | | | | | | | |
| | 4 | 4.0 Bore discontinued at 4.0m<br>-refusal on hard sandy clay | | D | 4.0 | | | | 4 |
| 42 | 5 | | | | | | | | 5 |
| 41 | | | | | | | | | |

**RIG:** Kubota KX018-4 mini-excavator **DRILLER:** Clinton Taylor **LOGGED:** FH **CASING:** Uncased

**TYPE OF BORING:** Solid flight auger - TC bit

**WATER OBSERVATIONS:** Groundwater seepage at 3.4m

**REMARKS:** w =moisture content, PL = plastic limit

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

**SAMPLING & IN SITU TESTING LEGEND**

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

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# BOREHOLE LOG

**CLIENT:** School Infrastructure New South Wales (SINSW)
**PROJECT:** Proposed Budawang School Relocation
**LOCATION:** 17 Croobyar Road, Milton

**SURFACE LEVEL:** 51.4 AHD
**EASTING:** 267494
**NORTHING:** 6088304
**DIP/AZIMUTH:** 90°/--

**BORE No:** 105
**PROJECT No:** 89390.02
**DATE:** 13/10/2020
**SHEET** 1 OF 1

| RL | Depth (m) | Description of Strata | Graphic Log | Sampling & In Situ Testing: Type | Depth | Sample | Results & Comments | Water | Dynamic Penetrometer Test (blows per 150mm) |
|---|---|---|---|---|---|---|---|---|---|
| 51 | 0.1 | TOPSOIL/SILT (ML): low plasticity, dark brown, w<pl | | D | 0.1 | | PID = 1.1 | | |
| | | CLAY (CH): high plasticity, brown, trace fine to medium sand, w~PL, stiff | | E<br>B | 0.2 | | | | |
| | | | | D<br>E | 0.5 | | pp = 150<br>PID = 0.2 | | |
| 50 | 1 | | | D<br>E | 1.0 | | pp = 150-200<br>PID = 0.5 | | |
| | | | | D | 1.5 | | pp = 100-150 | | |
| | 1.9 | -becoming stiff to very stiff below 1.8m | | | | | | | |
| 49 | 2 | Sandy CLAY (CI): medium plasticity, fine to medium sand, w~PL, stiff | | D | 2.0 | | | | |
| | 2.5 | MONZONITE: medium grained, brown with pale grey, with extremely weathered rock bands, very low strength, highly weathered | | D | 2.5 | | | | |
| 48 | 2.9 | Bore discontinued at 2.9m<br>-refusal on very low strength monzonite | | | | | | | |
| 47 | 3 | | | | | | | | |
| 46 | 4 | | | | | | | | |
| | 5 | | | | | | | | |

**RIG:** Kubota KX018-4 mini-excavator **DRILLER:** Clinton Taylor **LOGGED:** FH **CASING:** Uncased

**TYPE OF BORING:** Solid flight auger - TC bit

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** w =moisture content, PL = plastic limit

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

**SAMPLING & IN SITU TESTING LEGEND**

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

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# BOREHOLE LOG

**CLIENT:** School Infrastructure New South Wales (SINSW)
**PROJECT:** Proposed Budawang School Relocation
**LOCATION:** 17 Croobyar Road, Milton

**SURFACE LEVEL:** 50.2 AHD
**EASTING:** 267460
**NORTHING:** 6088279
**DIP/AZIMUTH:** 90°/--

**BORE No:** 106
**PROJECT No:** 89390.02
**DATE:** 13/10/2020
**SHEET** 1 OF 1

| RL | Depth (m) | Description of Strata | Graphic Log | Sampling & In Situ Testing: Type | Depth | Sample | Results & Comments | Water | Dynamic Penetrometer Test (blows per 1000mm) |
|---|---|---|---|---|---|---|---|---|---|
| 50 | 0.15 | TOPSOIL /SILT (ML): low plasticity, dark brown, trace clay, w<PL | | E | 0.1 | | PID = 3.9 | | |
| | | CLAY (CH): high plasticity, brown, trace silt, w<PL, stiff | | | | | | | |
| | 0.5 | CLAY (CH): high plasticity, pale brown, trace fine to medium sand, w<PL, stiff to very stiff | | D<br>E | 0.5 | | pp = 150-200<br>PID = 0.2 | | |
| | 1 | | | D<br>E | 1.0 | | pp = 200<br>PID = 0.2 | | 1 |
| 49 | 1.2 | CLAY (CI): medium plasticity, pale orange brown, trace fine to medium sand, w<PL, very stiff | | D<br>E | 1.5 | | pp = 200-250<br>PID = 0.4 | | |
| | 2 | -with extremely weathered rock bands below 2m | | D | 2.0 | | | | 2 |
| 48 | 2.3 | MONZONITE: medium grained, brown orange, with extremely weathered bands, very low strength, highly weathered | | | | | | | |
| | 2.5 | Bore discontinued at 2.5m<br>-refusal on very low strength monzonite | | D | 2.5 | | | | |
| | 3 | | | | | | | | 3 |
| 47 | | | | | | | | | |
| | 4 | | | | | | | | 4 |
| 46 | | | | | | | | | |
| | 5 | | | | | | | | 5 |
| 45 | | | | | | | | | |

**RIG:** Kubota KX018-4 mini-excavator **DRILLER:** Clinton Taylor **LOGGED:** FH **CASING:** Uncased

**TYPE OF BORING:** Solid flight auger - TC bit

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** w =moisture content, PL = plastic limit

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

**SAMPLING & IN SITU TESTING LEGEND**

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

Douglas Partners
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# BOREHOLE LOG

**CLIENT:** School Infrastructure New South Wales (SINSW)
**PROJECT:** Proposed Budawang School Relocation
**LOCATION:** 17 Croobyar Road, Milton

**SURFACE LEVEL:** 48.0 AHD
**EASTING:** 267406
**NORTHING:** 6088243
**DIP/AZIMUTH:** 90°/--

**BORE No:** 107
**PROJECT No:** 89390.02
**DATE:** 13/10/2020
**SHEET** 1 OF 1

| RL | Depth (m) | Description of Strata | Graphic Log | Sampling & In Situ Testing: Type | Depth | Sample | Results & Comments | Water | Dynamic Penetrometer Test (blows per 150mm) |
|---|---|---|---|---|---|---|---|---|---|
| 48 | 0.2 | TOPSOIL/SILT (ML): low plasticity, dark brown, trace clay, w<PL | | E | 0.1 | | PID = 1.8 | | |
| | | CLAY (CH): high plasticity, dark brown, with silt, w<PL, stiff | | | | | | | |
| | 0.5 | CLAY (CH): high plasticity, pale orange brown, trace fine to medium sand, w~PL, stiff | | D<br>E | 0.5 | | pp = 200<br>PID = 18.2 | | |
| | | -w<PL, below 0.8m | | B | | | | | |
| 47 | 1 | | | D<br>E | 1.0 | | pp = 150<br>PID = 0.2 | | 1 |
| | | | | D<br>E | 1.5 | | pp = 100-150 | | |
| | 1.8 | Sandy CLAY (CI): medium plasticity, pale orange brown, fine to medium sand, w<Pl, stiff | | D | 2.0 | | pp = 100 | | |
| 46 | 2 | -becoming w>PL, below 2.2m | | | | | | | 2 |
| | | | | D | 2.5 | | | V | |
| 45 | 3 | | | D | 3.0 | | | | 3 |
| | | | | D | 3.5 | | | | |
| | 3.7 | Bore discontinued at 3.7m<br>-refusal on very low strength monzonite | | | | | | | |
| 44 | 4 | | | | | | | | 4 |
| 43 | 5 | | | | | | | | 5 |

**RIG:** Kubota KX018-4 mini-excavator **DRILLER:** Clinton Taylor **LOGGED:** FH **CASING:** Uncased

**TYPE OF BORING:** Solid flight auger - TC bit

**WATER OBSERVATIONS:** Groundwater seepage at 2.7m

**REMARKS:** w =moisture content, PL = plastic limit

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

**SAMPLING & IN SITU TESTING LEGEND**

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

Douglas Partners
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# BOREHOLE LOG

**CLIENT:** School Infrastructure New South Wales (SINSW)
**PROJECT:** Proposed Budawang School Relocation
**LOCATION:** 17 Croobyar Road, Milton

**SURFACE LEVEL:** 52.5 AHD
**EASTING:** 267490
**NORTHING:** 6088240
**DIP/AZIMUTH:** 90°/--

**BORE No:** 108
**PROJECT No:** 89390.02
**DATE:** 13/10/2020
**SHEET** 1 OF 1

| RL | Depth (m) | Description of Strata | Graphic Log | Sampling & In Situ Testing: Type | Depth | Sample | Results & Comments | Water | Dynamic Penetrometer Test (blows per 1000mm) |
|---|---|---|---|---|---|---|---|---|---|
| 52 | 0.2 | TOPSOIL/SILT (ML): low plasticity, dark brown, trace fine sand, w<PL | | D<br>E | 0.1 | | PID = 6.4 | | |
| | 0.6 | CLAY (CH):high plasticity, brown mottled dark brown, with silt, w<PL, stiff | | D<br>E | 0.5 | | pp = 150<br>PID =.6 | | |
| 51 | 1 | Sandy CLAY (CI): medium to high plasticity, brown, fine to medium sand, w<PL, stiff<br>-becoming very stiff, with extremely weathered rock bands below 1.3m | | D<br>E | 1.0 | | pp = 150 | | 1 |
| | | | | D<br>E | 1.5 | | | | |
| 50 | 1.9<br>2 | MONZONITE: medium grained, brown with grey, with extremely weathered bands, very low strength, highly weathered | | D | 2.0 | | | | 2 |
| | 2.2 | Bore discontinued at 2.2m<br>-refusal on very low strength monzonite | | | | | | | |
| 49 | 3 | | | | | | | | 3 |
| 48 | 4 | | | | | | | | 4 |
| 47 | 5 | | | | | | | | 5 |

Dynamic Penetrometer Test (blows per 1000mm): 5, 10, 15, 20

**RIG:** Kubota KX018-4 mini-excavator **DRILLER:** Clinton Taylor **LOGGED:** FH **CASING:** Uncased
**TYPE OF BORING:** Solid flight auger - TC bit
**WATER OBSERVATIONS:** No free groundwater observed
**REMARKS:** w =moisture content, PL = plastic limit

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

**SAMPLING & IN SITU TESTING LEGEND**

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

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# Appendix C

Summary Table

| Test Bore or Pit | Sample Depth | pH | Chloride Concentration | Sulphate Concentration | Resistivity | Soil Condition | Sample Aggressivity Class | | | | | 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 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 | | | [Na/CEC] | | | (from Emerson Class) | (for detailed soil logs see Report Appendix) | | [Lab.] | [M x $EC_{1:5}$] | (Based on sample ECe) |
| | (m bgl) | (pH units) | (mg/kg) | (mg/kg) | Ω.cm | [AS2159-2009] | [AS2159-2009] | | | | | (meq/100g) | (meq/100g) | (%) | [after DLWC] | | [AS1289.3.8.1] | [after DLWC] | [after DLWC] | (microS/cm) | (deciS/m) | [Richards 1954] |
| 101 | 0.5 | 5.7 | 51 | 35 | 5000 | B | Non-Aggressive | Non-Aggressive | Non-Aggressive | Non-Aggressive | Non-Aggressive | 0.1 | 18 | 1 | Non-Sodic | 5 | No | Clay loam | 9 | 200 | 1.8 | Non-Saline |
| | 1.0 | 7.6 | | | 4762 | B | Non-Aggressive | | Non-Aggressive | | Non-Aggressive | | | | | | | Clay loam | 9 | 210 | 1.9 | Non-Saline |
| | 1.5 | 5.8 | | | 5882 | B | Non-Aggressive | | Non-Aggressive | | Non-Aggressive | | | | | | | Light medium clay | 8 | 170 | 1.4 | Non-Saline |
| | 2.0 | 4.3 | 150 | 350 | 3226 | B | Moderate | Non-Aggressive | Non-Aggressive | Non-Aggressive | Non-Aggressive | | | | | | | Light clay | 8.5 | 310 | 2.6 | Slightly Saline |
| | 2.5 | 6.5 | | | 4000 | B | Non-Aggressive | | Non-Aggressive | | Non-Aggressive | | | | | | | Light medium clay | 8 | 250 | 2.0 | Slightly Saline |
| | 3.0 | 5.5 | | | 3846 | B | Mild | | Non-Aggressive | | Non-Aggressive | | | | | | | Light clay | 8.5 | 260 | 2.2 | Slightly Saline |
| | 4.5 | 7.9 | | | 7143 | B | Non-Aggressive | | Non-Aggressive | | Non-Aggressive | | | | | | | Light clay | 8.5 | 140 | 1.2 | Non-Saline |
| | 5.5 | 8 | | | 10000 | B | Non-Aggressive | | Non-Aggressive | | Non-Aggressive | | | | | | | Light clay | 8.5 | 100 | 0.9 | Non-Saline |
| 102 | 0.5 | 5.2 | 40 | 36 | 14493 | B | Mild | Non-Aggressive | Non-Aggressive | Non-Aggressive | Non-Aggressive | | | | | | | Medium clay | 7 | 69 | 0.5 | Non-Saline |
| | 1.0 | 5.3 | | | 13158 | B | Mild | | Non-Aggressive | | Non-Aggressive | | | | | | | Medium clay | 7 | 76 | 0.5 | Non-Saline |
| | 1.5 | 5.4 | | | 14286 | B | Mild | | Non-Aggressive | | Non-Aggressive | | | | | | | Medium clay | 7 | 70 | 0.5 | Non-Saline |
| | 2.0 | 5.6 | | | 19608 | B | Non-Aggressive | | Non-Aggressive | | Non-Aggressive | | | | | | | Clay loam | 9 | 51 | 0.5 | Non-Saline |
| | 2.5 | 7 | 10 | 10 | 11628 | B | Non-Aggressive | Non-Aggressive | Non-Aggressive | Non-Aggressive | Non-Aggressive | | | | | | | Light medium clay | 8 | 86 | 0.7 | Non-Saline |
| | 3.0 | 6.4 | | | 15152 | B | Non-Aggressive | | Non-Aggressive | | Non-Aggressive | | | | | | | Light medium clay | 8 | 66 | 0.5 | Non-Saline |
| | 3.5 | 5.5 | | | 16129 | B | Mild | | Non-Aggressive | | Non-Aggressive | | | | | | | Medium clay | 7 | 62 | 0.4 | Non-Saline |
| 103 | 0.5 | 5.1 | | | 10000 | B | Mild | | Non-Aggressive | | Non-Aggressive | | | | | | | Clay loam | 9 | 100 | 0.9 | Non-Saline |
| | 1.0 | 4.6 | | | 3846 | B | Mild | | Non-Aggressive | | Non-Aggressive | | | | | | | Light medium clay | 8 | 260 | 2.1 | Slightly Saline |
| | 1.5 | 4.7 | | | 5000 | B | Mild | | Non-Aggressive | | Non-Aggressive | | | | | | | Medium clay | 7 | 200 | 1.4 | Non-Saline |
| | 2.0 | 5.2 | | | 10309 | B | Mild | | Non-Aggressive | | Non-Aggressive | | | | | | | Medium clay | 7 | 97 | 0.7 | Non-Saline |
| | 2.5 | 5.6 | | | 13699 | B | Non-Aggressive | | Non-Aggressive | | Non-Aggressive | | | | | | | Light medium clay | 8 | 73 | 0.6 | Non-Saline |
| 104 | 0.5 | 5.5 | 10 | 58 | 15625 | B | Mild | Non-Aggressive | Non-Aggressive | Non-Aggressive | Non-Aggressive | 0.83 | 14 | 6 | Sodic | 3 | Dispersive | Medium clay | 7 | 64 | 0.4 | Non-Saline |
| | 1.0 | 5 | | | 8333 | B | Mild | | Non-Aggressive | | Non-Aggressive | | | | | | | Light medium clay | 8 | 120 | 1.0 | Non-Saline |
| | 2.0 | 5 | 43 | 140 | 6250 | B | Mild | Non-Aggressive | Non-Aggressive | Non-Aggressive | Non-Aggressive | | | | | | | Light medium clay | 8 | 160 | 1.3 | Non-Saline |
| | 2.5 | 6.5 | | | 10000 | B | Non-Aggressive | | Non-Aggressive | | Non-Aggressive | | | | | | | Light medium clay | 8 | 100 | 0.8 | Non-Saline |
| | 3.0 | 6.8 | | | 10638 | B | Non-Aggressive | | Non-Aggressive | | Non-Aggressive | | | | | | | Light medium clay | 8 | 94 | 0.8 | Non-Saline |
| | 3.5 | 6.9 | | | 7143 | B | Non-Aggressive | | Non-Aggressive | | Non-Aggressive | | | | | | | Light clay | 8.5 | 140 | 1.2 | Non-Saline |
| | 4.0 | 6.8 | | | 7692 | B | Non-Aggressive | | Non-Aggressive | | Non-Aggressive | | | | | | | Light clay | 8.5 | 130 | 1.1 | Non-Saline |
| 105 | 0.5 | 5.5 | | | 17241 | B | Mild | | Non-Aggressive | | Non-Aggressive | | | | | | | Medium clay | 7 | 58 | 0.4 | Non-Saline |
| | 1.0 | 5.4 | 22 | 58 | 15385 | B | Mild | Non-Aggressive | Non-Aggressive | Non-Aggressive | Non-Aggressive | 1.9 | 12 | 16 | Highly Sodic | 5 | No | Medium clay | 7 | 65 | 0.5 | Non-Saline |
| | 1.5 | 5.4 | | | 20408 | B | Mild | | Non-Aggressive | | Non-Aggressive | | | | | | | Medium clay | 7 | 49 | 0.3 | Non-Saline |
| | 2.0 | 5.7 | | | 27778 | B | Non-Aggressive | | Non-Aggressive | | Non-Aggressive | | | | | | | Medium clay | 7 | 36 | 0.3 | Non-Saline |
| 106 | 0.5 | 4.9 | | | 7692 | B | Mild | | Non-Aggressive | | Non-Aggressive | | | | | | | Medium clay | 7 | 130 | 0.9 | Non-Saline |
| | 1.0 | 5 | | | 7692 | B | Mild | | Non-Aggressive | | Non-Aggressive | | | | | | | Medium clay | 7 | 130 | 0.9 | Non-Saline |
| | 1.5 | 5.2 | | | 9091 | B | Mild | | Non-Aggressive | | Non-Aggressive | | | | | | | Medium clay | 7 | 110 | 0.8 | Non-Saline |
| | 2.0 | 5.3 | | | 11111 | B | Mild | | Non-Aggressive | | Non-Aggressive | | | | | | | Medium clay | 7 | 90 | 0.6 | Non-Saline |
| 107 | 0.5 | 5.6 | 20 | 24 | 18519 | B | Non-Aggressive | Non-Aggressive | Non-Aggressive | Non-Aggressive | Non-Aggressive | 0.67 | 11 | 6 | Sodic | 3 | Dispersive | Clay loam | 9 | 54 | 0.5 | Non-Saline |
| | 1.0 | 4.9 | | | 5882 | B | Mild | | Non-Aggressive | | Non-Aggressive | | | | | | | Medium clay | 7 | 170 | 1.2 | Non-Saline |
| | 1.5 | 5.1 | | | 5882 | B | Mild | | Non-Aggressive | | Non-Aggressive | | | | | | | Medium clay | 7 | 170 | 1.2 | Non-Saline |
| | 2.0 | 5.6 | 43 | 22 | 14925 | B | Non-Aggressive | Non-Aggressive | Non-Aggressive | Non-Aggressive | Non-Aggressive | | | | | | | Light medium clay | 8 | 67 | 0.5 | Non-Saline |
| | 2.5 | 6.7 | | | 18182 | B | Non-Aggressive | | Non-Aggressive | | Non-Aggressive | | | | | | | Light clay | 8.5 | 55 | 0.5 | Non-Saline |
| | 3.0 | 6.7 | | | 16667 | B | Non-Aggressive | | Non-Aggressive | | Non-Aggressive | | | | | | | Light clay | 8.5 | 60 | 0.5 | Non-Saline |
| | 3.5 | 7.3 | | | 20833 | B | Non-Aggressive | | Non-Aggressive | | Non-Aggressive | | | | | | | Light clay | 8.5 | 48 | 0.4 | Non-Saline |
| 108 | 0.5 | 5 | | | 6250 | B | Mild | | Non-Aggressive | | Non-Aggressive | | | | | | | Clay loam | 9 | 160 | 1.4 | Non-Saline |
| | 1.0 | 5.3 | 54 | 100 | 7143 | B | Mild | Non-Aggressive | Non-Aggressive | Non-Aggressive | Non-Aggressive | 1.3 | 13 | 10 | Sodic | 3 | Dispersive | Clay loam | 9 | 140 | 1.3 | Non-Saline |
| | 1.5 | 5.3 | | | 10753 | B | Mild | | Non-Aggressive | | Non-Aggressive | | | | | | | Medium clay | 7 | 93 | 0.7 | Non-Saline |

| Aggressivity Flags |
|---|
| Very Severe |
| Severe |
| Moderate |
| Mild |
| Non |

| Salinity Flags |
|---|
| Very |
| Highly |
| Moderately |
| Slightly |
| Non |

# Appendix D

Laboratory Analytical Reports

**Douglas Partners**
Geotechnics / Environment / Groundwater

# CHAIN OF CUSTODY DESPATCH SHEET

| | | | | | |
|---|---|---|---|---|---|
| **Project No:** | 89390.03 | **Suburb:** | Milton | **To:** | Envirolab Services |
| **Project Name:** | Proposed SSP | **Order Number** | 89390.03 | | Ashley Street, Chatswood |
| **Project Manager:** | David Metcalf | **Sampler:** | Fiona Henry | **Attn:** | Simon Song |
| **Emails:** | kenton.horsley@douglaspartners.com.au david.metcalf@douglaspartners.com.au | | | **Phone:** | 99106200 |
| **Date Required:** | Standard | | | **Email:** | Samplereceipt@envirolabservices.com.au |
| **Prior Storage:** | Fridge | Do samples contain 'potential' HBM? | NO | | |

| Sample ID | Lab ID | Date Sampled | Sample Type (S - soil W - water) | Container Type (G - glass P - plastic) | Analytes: EC | pH | Textural Class | Chlorides | Sulfates | Sodicity | Emmerson Disperibility | | | Notes/preservation |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 101 / 0.5 | 1 | 13/10/20 | S | G | X | X | X | X | X | X | X | | | Sample stored at ALS - Job No. 253914 |
| 101 / 1.0 | 2 | 13/10/20 | S | G | X | X | X | | | | | | | |
| 101 / 1.5 | 3 | 13/10/20 | S | G | X | X | X | | | | | | | |
| 101 / 2.0 | 4 | 13/10/20 | S | P | X | X | X | X | X | | | | | |
| 101 / 2.5 | 5 | 13/10/20 | S | P | X | X | X | | | | | | | |
| 101 / 3.0 | 6 | 13/10/20 | S | P | X | X | X | | | | | | | |
| 101 / 4.5 | 7 | 13/10/20 | S | P | X | X | X | | | | | | | |
| 101 / 5.5 | 8 | 13/10/20 | S | P | X | X | X | | | | | | | |
| 102 / 0.5 | 9 | 13/10/20 | S | G | X | X | X | X | X | | | | | Testing for EC, Cl, SO4 and pH previously completed under ELS Job No. 253917 |
| 102 / 1.0 | 10 | 13/10/20 | S | G | X | X | X | | | | | | | |
| 102 / 1.5 | 11 | 13/10/20 | S | G | X | X | X | | | | | | | |
| 102 / 2.0 | 12 | 13/10/20 | S | P | X | X | X | | | | | | | |
| 102 / 2.5 | 13 | 13/10/20 | S | P | X | X | X | X | X | | | | | |
| 102 / 3.0 | 14 | 13/10/20 | S | P | X | X | X | | | | | | | |
| 102 / 3.5 | 15 | 13/10/20 | S | P | X | X | X | | | | | | | |
| **PQL (S) mg/kg** | | | | | | | | | | | | | | **ANZECC PQLs req'd for all water analytes** ☐ |

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

Job No: 256161
Date Received: 18/11/20
Time Received: 1720
Received By: JO
Temp: Cool/Ambient
Cooling: Ice/Icepack
Security: Intact/Broken/None

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

**Metals to Analyse: 8HM unless specified here:**

**Lab Report/Reference No:** 256161

**Total number of samples in container:** **Relinquished by:** DJM **Transported to laboratory by:**

**Send Results to:** Douglas Partners Pty Ltd **Address** 1 / 1 Luso Drive, Unanderra NSW 2526 **Phone:** 4271 1836 **Fax:**

**Signed:** **Received by:** Jason Day ELS SYD **Date & Time:** 18/11/20 1720

12.3°C

**Douglas Partners**
Geotechnics | Environment | Groundwater

# CHAIN OF CUSTODY DESPATCH SHEET

| | | | | | |
|---|---|---|---|---|---|
| **Project No:** | 89390.03 | **Suburb:** | Milton | **To:** | Envirolab Services |
| **Project Name:** | Proposed SSP | **Order Number** | 89390.03 | | Ashley Street, Chatswood |
| **Project Manager:** | David Metcalf | **Sampler:** | Fiona Henry | **Attn:** | Simon Song |
| **Emails:** | kenton.horsley@douglaspartners.com.au david.metcalf@douglaspartners.com.au | | | **Phone:** | 99106200 |
| **Date Required:** | Standard | | | **Email:** | Samplereceipt@envirolabservices.com.au |
| **Prior Storage:** | Fridge | Do samples contain 'potential' HBM? | NO | | |

| Sample ID | Lab ID | Sampling Date | Sample Type (S - soil, W - water) | Container Type (G - glass, P - plastic) | Analytes: EC | pH | Textural Class | Chlorides | Sulfates | Sodicity | Emmerson Disperibility | | | Notes/preservation |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 103 / 0.5 | 16 | 13/10/20 | S | P | X | X | X | | | | | | | |
| 103 / 1.0 | 17 | 13/10/20 | S | P | X | X | X | | | | | | | |
| 103 / 1.5 | 18 | 13/10/20 | S | G | X | X | X | | | | | | | |
| 103 / 2.0 | 19 | 13/10/20 | S | G | X | X | X | | | | | | | |
| 103 / 2.5 | 20 | 13/10/20 | S | G | X | X | X | | | | | | | |
| 104 / 0.5 | 21 | 13/10/20 | S | G | X | X | X | X | X | X | X | | | Testing for EC, Cl, SO4 and pH previously completed under ELS Job No. 253917 |
| 104 / 1.0 | 22 | 13/10/20 | S | G | X | X | X | | | | | | | |
| 104 / 2.0 | 23 | 13/10/20 | S | P | X | X | X | X | X | | | | | |
| 104 / 2.5 | 24 | 13/10/20 | S | P | X | X | X | | | | | | | |
| 104 / 3.0 | 25 | 13/10/20 | S | P | X | X | X | | | | | | | |
| 104 / 3.5 | 26 | 13/10/20 | S | P | X | X | X | | | | | | | |
| 104 / 4.0 | 27 | 13/10/20 | S | P | X | X | X | | | | | | | |
| 105 / 0.5 | 28 | 13/10/20 | S | P | X | X | X | | | | | | | |
| 105 / 1.0 | 29 | 13/10/20 | S | P | X | X | X | X | X | X | X | | | Testing for EC, Cl, SO4 and pH previously completed under ELS Job No. 253917 |
| 105 / 1.5 | 30 | 13/10/20 | S | G | X | X | X | | | | | | | |
| **PQL (S) mg/kg** | | | | | | | | | | | | | **ANZECC PQLs req'd for all water analytes** ☐ | |

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

**Metals to Analyse: 8HM unless specified here:**

**Lab Report/Reference No:** 256161

| | | | |
|---|---|---|---|
| **Total number of samples in container:** | **Relinquished by:** DJM | **Transported to laboratory by:** | |
| **Send Results to:** Douglas Partners Pty Ltd | **Address** | **Phone:** 4271 1836 | **Fax:** |
| **Signed:** | **Received by:** Jason Day ELS SYD | **Date & Time:** 18/11/20 | 1720 |

**Douglas Partners**
Geotechnics / Environment / Groundwater

# CHAIN OF CUSTODY DESPATCH SHEET

| | | | | | |
|---|---|---|---|---|---|
| **Project No:** | 89390.03 | **Suburb:** | Milton | **To:** | Envirolab Services |
| **Project Name:** | Proposed SSP | **Order Number** | 89390.03 | | Ashley Street, Chatswood |
| **Project Manager:** | David Metcalf | **Sampler:** | Fiona Henry | **Attn:** | Simon Song |
| **Emails:** | kenton.horsley@douglaspartners.com,au david.metcalf@douglaspartners.com.au | | | **Phone:** | 99106200 |
| **Date Required:** | Standard | | | **Email:** | Samplereceipt@envirolabservices.com.au |
| **Prior Storage:** | Fridge | Do samples contain 'potential' HBM? | NO | | |

| Sample ID | Lab ID | Sampling Date | Sample Type (S - soil, W - water) | Container Type (G - glass, P - plastic) | Analytes: EC | pH | Textural Class | Chlorides | Sulfates | Sodicity | Emmerson Disperibility | | | Notes/preservation |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 105 / 2.0 | 31 | 13/10/20 | S | G | X | X | X | | | | | | | |
| 106 / 0.5 | 32 | 13/10/20 | S | G | X | X | X | | | | | | | |
| 106 / 1.0 | 33 | 13/10/20 | S | P | X | X | X | | | | | | | |
| 106 / 1.5 | 34 | 13/10/20 | S | P | X | X | X | | | | | | | |
| 106 / 2.0 | 35 | 13/10/20 | S | G | X | X | X | | | | | | | |
| 107 / 0.5 | 36 | 13/10/20 | S | G | X | X | X | X | X | X | X | | | Sample stored at ALS - Job No. 253914 |
| 107 / 1.0 | 37 | 13/10/20 | S | G | X | X | X | | | | | | | |
| 107 / 1.5 | 38 | 13/10/20 | S | P | X | X | X | | | | | | | |
| 107 / 2.0 | 39 | 13/10/20 | S | P | X | X | X | X | X | | | | | |
| 107 / 2.5 | 40 | 13/10/20 | S | P | X | X | X | | | | | | | |
| 107 / 3.0 | 41 | 13/10/20 | S | P | X | X | X | | | | | | | |
| 107 / 3.5 | 42 | 13/10/20 | S | P | X | X | X | | | | | | | |
| 108 / 0.5 | 43 | 13/10/20 | S | G | X | X | X | | | | | | | |
| 108 / 1.0 | 44 | 13/10/20 | S | G | X | X | X | X | X | X | X | | | Testing for EC, Cl, SO4 and pH previously completed under ELS Job No. 253917 |
| 108 / 1.5 | 45 | 13/10/20 | S | P | X | X | X | | | | | | | |
| **PQL (S) mg/kg** | | | | | | | | | | | | | **ANZECC PQLs req'd for all water analytes** ☐ | |

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

**Metals to Analyse: 8HM unless specified here:**

**Lab Report/Reference No:** 256161

**Total number of samples in container:** **Relinquished by:** DJM **Transported to laboratory by:**

**Send Results to:** Douglas Partners Pty Ltd **Address:** 1 / 1 Luso Drive, Unanderra NSW 2526 **Phone:** 4271 1836 **Fax:**

**Signed:** **Received by:** Jason Day DD ELS SYD **Date & Time:** 18/11/20 1720

| | | | | |
|---|---|---|---|---|
| Extra | 46 | 104/3.5 | S | P |
| | 47 | 104/4.0 | S | P |

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

# SAMPLE RECEIPT ADVICE

## Client Details

| | |
|---|---|
| **Client** | Douglas Partners Unanderra |
| **Attention** | David Metcalf |

## Sample Login Details

| | |
|---|---|
| **Your reference** | 89390.03, Milton |
| **Envirolab Reference** | 256161 |
| **Date Sample Received** | 19/11/2020 |
| **Date Instructions Received** | 19/11/2020 |
| **Date Results Expected to be Reported** | 26/11/2020 |

## Sample Condition

| | |
|---|---|
| **Samples received in appropriate condition for analysis** | Holding time exceedance |
| **No. of Samples Provided** | 47 Soil |
| **Turnaround Time Requested** | Standard |
| **Temperature on Receipt (°C)** | 12.3 |
| **Cooling Method** | None |
| **Sampling Date Provided** | YES |

## Comments

Holding time exceedance - pH, EC, chloride, sulphate

Please contact the laboratory within 24 hours if you wish to cancel the aformentioned testing. Otherwise testing will proceed as per the COC and hence invoice accordingly.

Please direct any queries to:

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

*Analysis Underway, details on the following page:*

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

| Sample ID | Misc Inorg - Soil | Texture and Salinity* | ESP/CEC | On Hold |
|---|---|---|---|---|
| 101 / 0.5 | ✓ | ✓ | ✓ | |
| 101 / 1.0 | ✓ | ✓ | | |
| 101 / 1.5 | ✓ | ✓ | | |
| 101 / 2.0 | ✓ | ✓ | | |
| 101 / 2.5 | ✓ | ✓ | | |
| 101 / 3.0 | ✓ | ✓ | | |
| 101 / 4.5 | ✓ | ✓ | | |
| 101 / 5.5 | ✓ | ✓ | | |
| 102 / 0.5 | ✓ | ✓ | | |
| 102 / 1.0 | ✓ | ✓ | | |
| 102 / 1.5 | ✓ | ✓ | | |
| 102 / 2.0 | ✓ | ✓ | | |
| 102 / 2.5 | ✓ | ✓ | | |
| 102 / 3.0 | ✓ | ✓ | | |
| 102 / 3.5 | ✓ | ✓ | | |
| 103 / 0.5 | ✓ | ✓ | | |
| 103 / 1.0 | ✓ | ✓ | | |
| 103 / 1.5 | ✓ | ✓ | | |
| 103 / 2.0 | ✓ | ✓ | | |
| 103 / 2.5 | ✓ | ✓ | | |
| 104 / 0.5 | ✓ | ✓ | ✓ | |
| 104 / 1.0 | ✓ | ✓ | | |
| 104 / 2.0 | ✓ | ✓ | | |
| 104 / 2.5 | ✓ | ✓ | | |
| 104 / 3.0 | ✓ | ✓ | | |
| 104 / 3.5 | ✓ | ✓ | | |
| 104 / 4.0 | ✓ | ✓ | | |
| 105 / 0.5 | ✓ | ✓ | | |
| 105 / 1.0 | ✓ | ✓ | ✓ | |
| 105 / 1.5 | ✓ | ✓ | | |
| 105 / 2.0 | ✓ | ✓ | | |
| 106 / 0.5 | ✓ | ✓ | | |

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www.envirolab.com.au

| Sample ID | Misc Inorg - Soil | Texture and Salinity* | ESP/CEC | On Hold |
|---|---|---|---|---|
| 106 / 1.0 | ✓ | ✓ | | |
| 106 / 1.5 | ✓ | ✓ | | |
| 106 / 2.0 | ✓ | ✓ | | |
| 107 / 0.5 | ✓ | ✓ | ✓ | |
| 107 / 1.0 | ✓ | ✓ | | |
| 107 / 1.5 | ✓ | ✓ | | |
| 107 / 2.0 | ✓ | ✓ | | |
| 107 / 2.5 | ✓ | ✓ | | |
| 107 / 3.0 | ✓ | ✓ | | |
| 107 / 3.5 | ✓ | ✓ | | |
| 108 / 0.5 | ✓ | ✓ | | |
| 108 / 1.0 | ✓ | ✓ | ✓ | |
| 108 / 1.5 | ✓ | ✓ | | |
| 104/3.5 Extra bag | | | | ✓ |
| 104/4.0 Extra bag | | | | ✓ |

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

## Additional Info

| |
|---|
| Sample storage - Waters are routinely disposed of approximately 1 month and soils approximately 2 months from receipt. |
| Requests for longer term sample storage must be received in writing. |
| Please contact the laboratory immediately if observed settled sediment present in water samples is to be included in the extraction and/or analysis (exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS analysis where solids are included by default. |
| TAT for Micro is dependent on incubation. This varies from 3 to 6 days. |

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www.envirolab.com.au

# CERTIFICATE OF ANALYSIS 256161

## Client Details

| | |
|---|---|
| **Client** | Douglas Partners Unanderra |
| **Attention** | David Metcalf |
| **Address** | Unit 1, 1 Luso Drive, Unanderra, NSW, 2526 |

## Sample Details

| | |
|---|---|
| **Your Reference** | **89390.03, Milton** |
| **Number of Samples** | 47 Soil |
| **Date samples received** | 19/11/2020 |
| **Date completed instructions received** | 19/11/2020 |

## 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** | 26/11/2020 |
| **Date of Issue** | 26/11/2020 |

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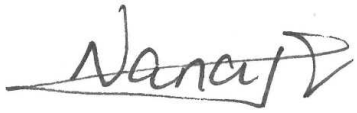
Accredited for compliance with ISO/IEC 17025 - Testing. **Tests not covered by NATA are denoted with ***

**Results Approved By**
Diego Bigolin, Team Leader, Inorganics
Jaimie Loa-Kum-Cheung, Metals Supervisor
Nick Sarlamis, Inorganics Supervisor

**Authorised By**



Nancy Zhang, Laboratory Manager

| Misc Inorg - Soil | | | | | | |
|---|---|---|---|---|---|---|
| Our Reference | | 256161-1 | 256161-2 | 256161-3 | 256161-4 | 256161-5 |
| Your Reference | UNITS | 101 / 0.5 | 101 / 1.0 | 101 / 1.5 | 101 / 2.0 | 101 / 2.5 |
| Date Sampled | | 13/10/2020 | 13/10/2020 | 13/10/2020 | 13/10/2020 | 13/10/2020 |
| Type of sample | | Soil | Soil | Soil | Soil | Soil |
| Date prepared | - | 20/11/2020 | 20/11/2020 | 20/11/2020 | 20/11/2020 | 20/11/2020 |
| Date analysed | - | 20/11/2020 | 20/11/2020 | 20/11/2020 | 20/11/2020 | 20/11/2020 |
| pH 1:5 soil:water | pH Units | 5.7 | 7.6 | 5.8 | 4.3 | 6.5 |
| Chloride, Cl 1:5 soil:water | mg/kg | 51 | [NA] | [NA] | 150 | [NA] |
| Sulphate, SO4 1:5 soil:water | mg/kg | 35 | [NA] | [NA] | 350 | [NA] |
| Emerson Aggregate test | - | 5.0 | [NA] | [NA] | [NA] | [NA] |

| Misc Inorg - Soil | | | | | | |
|---|---|---|---|---|---|---|
| Our Reference | | 256161-6 | 256161-7 | 256161-8 | 256161-9 | 256161-10 |
| Your Reference | UNITS | 101 / 3.0 | 101 / 4.5 | 101 / 5.5 | 102 / 0.5 | 102 / 1.0 |
| Date Sampled | | 13/10/2020 | 13/10/2020 | 13/10/2020 | 13/10/2020 | 13/10/2020 |
| Type of sample | | Soil | Soil | Soil | Soil | Soil |
| Date prepared | - | 20/11/2020 | 20/11/2020 | 20/11/2020 | 20/11/2020 | 20/11/2020 |
| Date analysed | - | 20/11/2020 | 20/11/2020 | 20/11/2020 | 20/11/2020 | 20/11/2020 |
| pH 1:5 soil:water | pH Units | 5.5 | 7.9 | 8.0 | 5.2 | 5.3 |
| Chloride, Cl 1:5 soil:water | mg/kg | [NA] | [NA] | [NA] | 40 | [NA] |
| Sulphate, SO4 1:5 soil:water | mg/kg | [NA] | [NA] | [NA] | 36 | [NA] |

| Misc Inorg - Soil | | | | | | |
|---|---|---|---|---|---|---|
| Our Reference | | 256161-11 | 256161-12 | 256161-13 | 256161-14 | 256161-15 |
| Your Reference | UNITS | 102 / 1.5 | 102 / 2.0 | 102 / 2.5 | 102 / 3.0 | 102 / 3.5 |
| Date Sampled | | 13/10/2020 | 13/10/2020 | 13/10/2020 | 13/10/2020 | 13/10/2020 |
| Type of sample | | Soil | Soil | Soil | Soil | Soil |
| Date prepared | - | 20/11/2020 | 20/11/2020 | 20/11/2020 | 20/11/2020 | 20/11/2020 |
| Date analysed | - | 20/11/2020 | 20/11/2020 | 20/11/2020 | 20/11/2020 | 20/11/2020 |
| pH 1:5 soil:water | pH Units | 5.4 | 5.6 | 7.0 | 6.4 | 5.5 |
| Chloride, Cl 1:5 soil:water | mg/kg | [NA] | [NA] | 10 | [NA] | [NA] |
| Sulphate, SO4 1:5 soil:water | mg/kg | [NA] | [NA] | 10 | [NA] | [NA] |

| Misc Inorg - Soil | | | | | | |
|---|---|---|---|---|---|---|
| Our Reference | | 256161-16 | 256161-17 | 256161-18 | 256161-19 | 256161-20 |
| Your Reference | UNITS | 103 / 0.5 | 103 / 1.0 | 103 / 1.5 | 103 / 2.0 | 103 / 2.5 |
| Date Sampled | | 13/10/2020 | 13/10/2020 | 13/10/2020 | 13/10/2020 | 13/10/2020 |
| Type of sample | | Soil | Soil | Soil | Soil | Soil |
| Date prepared | - | 20/11/2020 | 20/11/2020 | 20/11/2020 | 20/11/2020 | 20/11/2020 |
| Date analysed | - | 20/11/2020 | 20/11/2020 | 20/11/2020 | 20/11/2020 | 20/11/2020 |
| pH 1:5 soil:water | pH Units | 5.1 | 4.6 | 4.7 | 5.2 | 5.6 |

| Misc Inorg - Soil | | | | | | |
|---|---|---|---|---|---|---|
| Our Reference | | 256161-21 | 256161-22 | 256161-23 | 256161-24 | 256161-25 |
| Your Reference | UNITS | 104 / 0.5 | 104 / 1.0 | 104 / 2.0 | 104 / 2.5 | 104 / 3.0 |
| Date Sampled | | 13/10/2020 | 13/10/2020 | 13/10/2020 | 13/10/2020 | 13/10/2020 |
| Type of sample | | Soil | Soil | Soil | Soil | Soil |
| Date prepared | - | 20/11/2020 | 20/11/2020 | 20/11/2020 | 20/11/2020 | 20/11/2020 |
| Date analysed | - | 20/11/2020 | 20/11/2020 | 20/11/2020 | 20/11/2020 | 20/11/2020 |
| pH 1:5 soil:water | pH Units | 5.5 | 5.0 | 5.0 | 6.5 | 6.8 |
| Chloride, Cl 1:5 soil:water | mg/kg | <10 | [NA] | 43 | [NA] | [NA] |
| Sulphate, SO4 1:5 soil:water | mg/kg | 58 | [NA] | 140 | [NA] | [NA] |
| Emerson Aggregate test | - | 3b | [NA] | [NA] | [NA] | [NA] |

| Misc Inorg - Soil | | | | | | |
|---|---|---|---|---|---|---|
| Our Reference | | 256161-26 | 256161-27 | 256161-28 | 256161-29 | 256161-30 |
| Your Reference | UNITS | 104 / 3.5 | 104 / 4.0 | 105 / 0.5 | 105 / 1.0 | 105 / 1.5 |
| Date Sampled | | 13/10/2020 | 13/10/2020 | 13/10/2020 | 13/10/2020 | 13/10/2020 |
| Type of sample | | Soil | Soil | Soil | Soil | Soil |
| Date prepared | - | 20/11/2020 | 20/11/2020 | 20/11/2020 | 20/11/2020 | 20/11/2020 |
| Date analysed | - | 20/11/2020 | 20/11/2020 | 20/11/2020 | 20/11/2020 | 20/11/2020 |
| pH 1:5 soil:water | pH Units | 6.9 | 6.8 | 5.5 | 5.4 | 5.4 |
| Chloride, Cl 1:5 soil:water | mg/kg | [NA] | [NA] | [NA] | 22 | [NA] |
| Sulphate, SO4 1:5 soil:water | mg/kg | [NA] | [NA] | [NA] | 58 | [NA] |
| Emerson Aggregate test | - | [NA] | [NA] | [NA] | 5.0 | [NA] |

| Misc Inorg - Soil | | | | | | |
|---|---|---|---|---|---|---|
| Our Reference | | 256161-31 | 256161-32 | 256161-33 | 256161-34 | 256161-35 |
| Your Reference | UNITS | 105 / 2.0 | 106 / 0.5 | 106 / 1.0 | 106 / 1.5 | 106 / 2.0 |
| Date Sampled | | 13/10/2020 | 13/10/2020 | 13/10/2020 | 13/10/2020 | 13/10/2020 |
| Type of sample | | Soil | Soil | Soil | Soil | Soil |
| Date prepared | - | 20/11/2020 | 20/11/2020 | 20/11/2020 | 20/11/2020 | 20/11/2020 |
| Date analysed | - | 20/11/2020 | 20/11/2020 | 20/11/2020 | 20/11/2020 | 20/11/2020 |
| pH 1:5 soil:water | pH Units | 5.7 | 4.9 | 5.0 | 5.2 | 5.3 |

| Misc Inorg - Soil | | | | | | |
|---|---|---|---|---|---|---|
| Our Reference | | 256161-36 | 256161-37 | 256161-38 | 256161-39 | 256161-40 |
| Your Reference | UNITS | 107 / 0.5 | 107 / 1.0 | 107 / 1.5 | 107 / 2.0 | 107 / 2.5 |
| Date Sampled | | 13/10/2020 | 13/10/2020 | 13/10/2020 | 13/10/2020 | 13/10/2020 |
| Type of sample | | Soil | Soil | Soil | Soil | Soil |
| Date prepared | - | 20/11/2020 | 20/11/2020 | 20/11/2020 | 20/11/2020 | 20/11/2020 |
| Date analysed | - | 20/11/2020 | 20/11/2020 | 20/11/2020 | 20/11/2020 | 20/11/2020 |
| pH 1:5 soil:water | pH Units | 5.6 | 4.9 | 5.1 | 5.6 | 6.7 |
| Chloride, Cl 1:5 soil:water | mg/kg | 20 | [NA] | [NA] | 43 | [NA] |
| Sulphate, SO4 1:5 soil:water | mg/kg | 24 | [NA] | [NA] | 22 | [NA] |
| Emerson Aggregate test | - | 3b | [NA] | [NA] | [NA] | [NA] |

| Misc Inorg - Soil | | | | | | |
|---|---|---|---|---|---|---|
| Our Reference | | 256161-41 | 256161-42 | 256161-43 | 256161-44 | 256161-45 |
| Your Reference | UNITS | 107 / 3.0 | 107 / 3.5 | 108 / 0.5 | 108 / 1.0 | 108 / 1.5 |
| Date Sampled | | 13/10/2020 | 13/10/2020 | 13/10/2020 | 13/10/2020 | 13/10/2020 |
| Type of sample | | Soil | Soil | Soil | Soil | Soil |
| Date prepared | - | 20/11/2020 | 20/11/2020 | 20/11/2020 | 20/11/2020 | 20/11/2020 |
| Date analysed | - | 20/11/2020 | 20/11/2020 | 20/11/2020 | 20/11/2020 | 20/11/2020 |
| pH 1:5 soil:water | pH Units | 6.7 | 7.3 | 5.0 | 5.3 | 5.3 |
| Chloride, Cl 1:5 soil:water | mg/kg | [NA] | [NA] | [NA] | 54 | [NA] |
| Sulphate, SO4 1:5 soil:water | mg/kg | [NA] | [NA] | [NA] | 100 | [NA] |
| Emerson Aggregate test | - | [NA] | [NA] | [NA] | 3b | [NA] |

| Texture and Salinity* | | | | | | |
|---|---|---|---|---|---|---|
| Our Reference | | 256161-1 | 256161-2 | 256161-3 | 256161-4 | 256161-5 |
| Your Reference | UNITS | 101 / 0.5 | 101 / 1.0 | 101 / 1.5 | 101 / 2.0 | 101 / 2.5 |
| Date Sampled | | 13/10/2020 | 13/10/2020 | 13/10/2020 | 13/10/2020 | 13/10/2020 |
| Type of sample | | Soil | Soil | Soil | Soil | Soil |
| Date prepared | - | 20/11/2020 | 20/11/2020 | 20/11/2020 | 20/11/2020 | 20/11/2020 |
| Date analysed | - | 20/11/2020 | 20/11/2020 | 20/11/2020 | 20/11/2020 | 20/11/2020 |
| Electrical Conductivity 1:5 soil:water | µS/cm | 200 | 210 | 170 | 310 | 250 |
| Texture Value | - | 9.0 | 9.0 | 8.0 | 8.5 | 8.0 |
| Texture | - | CLAY LOAM | CLAY LOAM | LIGHT MEDIUM CLAY | LIGHT CLAY | LIGHT MEDIUM CLAY |
| ECe | dS/m | <2 | <2 | <2 | 2.6 | 2.0 |
| Class | - | NON SALINE | NON SALINE | NON SALINE | SLIGHTLY SALINE | SLIGHTLY SALINE |

| Texture and Salinity* | | | | | | |
|---|---|---|---|---|---|---|
| Our Reference | | 256161-6 | 256161-7 | 256161-8 | 256161-9 | 256161-10 |
| Your Reference | UNITS | 101 / 3.0 | 101 / 4.5 | 101 / 5.5 | 102 / 0.5 | 102 / 1.0 |
| Date Sampled | | 13/10/2020 | 13/10/2020 | 13/10/2020 | 13/10/2020 | 13/10/2020 |
| Type of sample | | Soil | Soil | Soil | Soil | Soil |
| Date prepared | - | 20/11/2020 | 20/11/2020 | 20/11/2020 | 20/11/2020 | 20/11/2020 |
| Date analysed | - | 20/11/2020 | 20/11/2020 | 20/11/2020 | 20/11/2020 | 20/11/2020 |
| Electrical Conductivity 1:5 soil:water | µS/cm | 260 | 140 | 100 | 69 | 76 |
| Texture Value | - | 8.5 | 8.5 | 8.5 | 7.0 | 7.0 |
| Texture | - | LIGHT CLAY | LIGHT CLAY | LIGHT CLAY | MEDIUM CLAY | MEDIUM CLAY |
| ECe | dS/m | 2.2 | <2 | <2 | <2 | <2 |
| Class | - | SLIGHTLY SALINE | NON SALINE | NON SALINE | NON SALINE | NON SALINE |

| Texture and Salinity* | | | | | | |
|---|---|---|---|---|---|---|
| Our Reference | | 256161-11 | 256161-12 | 256161-13 | 256161-14 | 256161-15 |
| Your Reference | UNITS | 102 / 1.5 | 102 / 2.0 | 102 / 2.5 | 102 / 3.0 | 102 / 3.5 |
| Date Sampled | | 13/10/2020 | 13/10/2020 | 13/10/2020 | 13/10/2020 | 13/10/2020 |
| Type of sample | | Soil | Soil | Soil | Soil | Soil |
| Date prepared | - | 20/11/2020 | 20/11/2020 | 20/11/2020 | 20/11/2020 | 20/11/2020 |
| Date analysed | - | 20/11/2020 | 20/11/2020 | 20/11/2020 | 20/11/2020 | 20/11/2020 |
| Electrical Conductivity 1:5 soil:water | µS/cm | 70 | 51 | 86 | 66 | 62 |
| Texture Value | - | 7.0 | 9.0 | 8.0 | 8.0 | 7.0 |
| Texture | - | MEDIUM CLAY | CLAY LOAM | LIGHT MEDIUM CLAY | LIGHT MEDIUM CLAY | MEDIUM CLAY |
| ECe | dS/m | <2 | <2 | <2 | <2 | <2 |
| Class | - | NON SALINE | NON SALINE | NON SALINE | NON SALINE | NON SALINE |

| Texture and Salinity* | | | | | | |
|---|---|---|---|---|---|---|
| Our Reference | | 256161-16 | 256161-17 | 256161-18 | 256161-19 | 256161-20 |
| Your Reference | UNITS | 103 / 0.5 | 103 / 1.0 | 103 / 1.5 | 103 / 2.0 | 103 / 2.5 |
| Date Sampled | | 13/10/2020 | 13/10/2020 | 13/10/2020 | 13/10/2020 | 13/10/2020 |
| Type of sample | | Soil | Soil | Soil | Soil | Soil |
| Date prepared | - | 20/11/2020 | 20/11/2020 | 20/11/2020 | 20/11/2020 | 20/11/2020 |
| Date analysed | - | 20/11/2020 | 20/11/2020 | 20/11/2020 | 20/11/2020 | 20/11/2020 |
| Electrical Conductivity 1:5 soil:water | µS/cm | 100 | 260 | 200 | 97 | 73 |
| Texture Value | - | 9.0 | 8.0 | 7.0 | 7.0 | 8.0 |
| Texture | - | CLAY LOAM | LIGHT MEDIUM CLAY | MEDIUM CLAY | MEDIUM CLAY | LIGHT MEDIUM CLAY |
| ECe | dS/m | <2 | 2.1 | <2 | <2 | <2 |
| Class | - | NON SALINE | SLIGHTLY SALINE | NON SALINE | NON SALINE | NON SALINE |

| Texture and Salinity* | | | | | | |
|---|---|---|---|---|---|---|
| Our Reference | | 256161-21 | 256161-22 | 256161-23 | 256161-24 | 256161-25 |
| Your Reference | UNITS | 104 / 0.5 | 104 / 1.0 | 104 / 2.0 | 104 / 2.5 | 104 / 3.0 |
| Date Sampled | | 13/10/2020 | 13/10/2020 | 13/10/2020 | 13/10/2020 | 13/10/2020 |
| Type of sample | | Soil | Soil | Soil | Soil | Soil |
| Date prepared | - | 20/11/2020 | 20/11/2020 | 20/11/2020 | 20/11/2020 | 20/11/2020 |
| Date analysed | - | 20/11/2020 | 20/11/2020 | 20/11/2020 | 20/11/2020 | 20/11/2020 |
| Electrical Conductivity 1:5 soil:water | µS/cm | 64 | 120 | 160 | 100 | 94 |
| Texture Value | - | 7.0 | 8.0 | 8.0 | 8.0 | 8.0 |
| Texture | - | MEDIUM CLAY | LIGHT MEDIUM CLAY | LIGHT MEDIUM CLAY | LIGHT MEDIUM CLAY | LIGHT MEDIUM CLAY |
| ECe | dS/m | <2 | <2 | <2 | <2 | <2 |
| Class | - | NON SALINE | NON SALINE | NON SALINE | NON SALINE | NON SALINE |

| Texture and Salinity* | | | | | | |
|---|---|---|---|---|---|---|
| Our Reference | | 256161-26 | 256161-27 | 256161-28 | 256161-29 | 256161-30 |
| Your Reference | UNITS | 104 / 3.5 | 104 / 4.0 | 105 / 0.5 | 105 / 1.0 | 105 / 1.5 |
| Date Sampled | | 13/10/2020 | 13/10/2020 | 13/10/2020 | 13/10/2020 | 13/10/2020 |
| Type of sample | | Soil | Soil | Soil | Soil | Soil |
| Date prepared | - | 20/11/2020 | 20/11/2020 | 20/11/2020 | 20/11/2020 | 20/11/2020 |
| Date analysed | - | 20/11/2020 | 20/11/2020 | 20/11/2020 | 20/11/2020 | 20/11/2020 |
| Electrical Conductivity 1:5 soil:water | µS/cm | 140 | 130 | 58 | 65 | 49 |
| Texture Value | - | 8.5 | 8.5 | 7.0 | 7.0 | 7.0 |
| Texture | - | LIGHT CLAY | LIGHT CLAY | MEDIUM CLAY | MEDIUM CLAY | MEDIUM CLAY |
| ECe | dS/m | <2 | <2 | <2 | <2 | <2 |
| Class | - | NON SALINE | NON SALINE | NON SALINE | NON SALINE | NON SALINE |

| Texture and Salinity* | | | | | | |
|---|---|---|---|---|---|---|
| Our Reference | | 256161-31 | 256161-32 | 256161-33 | 256161-34 | 256161-35 |
| Your Reference | UNITS | 105 / 2.0 | 106 / 0.5 | 106 / 1.0 | 106 / 1.5 | 106 / 2.0 |
| Date Sampled | | 13/10/2020 | 13/10/2020 | 13/10/2020 | 13/10/2020 | 13/10/2020 |
| Type of sample | | Soil | Soil | Soil | Soil | Soil |
| Date prepared | - | 20/11/2020 | 20/11/2020 | 20/11/2020 | 20/11/2020 | 20/11/2020 |
| Date analysed | - | 20/11/2020 | 20/11/2020 | 20/11/2020 | 20/11/2020 | 20/11/2020 |
| Electrical Conductivity 1:5 soil:water | µS/cm | 36 | 130 | 130 | 110 | 90 |
| Texture Value | - | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 |
| Texture | - | MEDIUM CLAY | MEDIUM CLAY | MEDIUM CLAY | MEDIUM CLAY | MEDIUM CLAY |
| ECe | dS/m | <2 | <2 | <2 | <2 | <2 |
| Class | - | NON SALINE | NON SALINE | NON SALINE | NON SALINE | NON SALINE |

| Texture and Salinity* | | | | | | |
|---|---|---|---|---|---|---|
| Our Reference | | 256161-36 | 256161-37 | 256161-38 | 256161-39 | 256161-40 |
| Your Reference | UNITS | 107 / 0.5 | 107 / 1.0 | 107 / 1.5 | 107 / 2.0 | 107 / 2.5 |
| Date Sampled | | 13/10/2020 | 13/10/2020 | 13/10/2020 | 13/10/2020 | 13/10/2020 |
| Type of sample | | Soil | Soil | Soil | Soil | Soil |
| Date prepared | - | 20/11/2020 | 20/11/2020 | 20/11/2020 | 20/11/2020 | 20/11/2020 |
| Date analysed | - | 20/11/2020 | 20/11/2020 | 20/11/2020 | 20/11/2020 | 20/11/2020 |
| Electrical Conductivity 1:5 soil:water | µS/cm | 54 | 170 | 170 | 67 | 55 |
| Texture Value | - | 9.0 | 7.0 | 7.0 | 8.0 | 8.5 |
| Texture | - | CLAY LOAM | MEDIUM CLAY | MEDIUM CLAY | LIGHT MEDIUM CLAY | LIGHT CLAY |
| ECe | dS/m | <2 | <2 | <2 | <2 | <2 |
| Class | - | NON SALINE | NON SALINE | NON SALINE | NON SALINE | NON SALINE |

| Texture and Salinity* | | | | | | |
|---|---|---|---|---|---|---|
| Our Reference | | 256161-41 | 256161-42 | 256161-43 | 256161-44 | 256161-45 |
| Your Reference | UNITS | 107 / 3.0 | 107 / 3.5 | 108 / 0.5 | 108 / 1.0 | 108 / 1.5 |
| Date Sampled | | 13/10/2020 | 13/10/2020 | 13/10/2020 | 13/10/2020 | 13/10/2020 |
| Type of sample | | Soil | Soil | Soil | Soil | Soil |
| Date prepared | - | 20/11/2020 | 20/11/2020 | 20/11/2020 | 20/11/2020 | 20/11/2020 |
| Date analysed | - | 20/11/2020 | 20/11/2020 | 20/11/2020 | 20/11/2020 | 20/11/2020 |
| Electrical Conductivity 1:5 soil:water | µS/cm | 60 | 48 | 160 | 140 | 93 |
| Texture Value | - | 8.5 | 8.5 | 9.0 | 9.0 | 7.0 |
| Texture | - | LIGHT CLAY | LIGHT CLAY | CLAY LOAM | CLAY LOAM | MEDIUM CLAY |
| ECe | dS/m | <2 | <2 | <2 | <2 | <2 |
| Class | - | NON SALINE | NON SALINE | NON SALINE | NON SALINE | NON SALINE |

| ESP/CEC | | | | | | |
|---|---|---|---|---|---|---|
| Our Reference | | 256161-1 | 256161-21 | 256161-29 | 256161-36 | 256161-44 |
| Your Reference | UNITS | 101 / 0.5 | 104 / 0.5 | 105 / 1.0 | 107 / 0.5 | 108 / 1.0 |
| Date Sampled | | 13/10/2020 | 13/10/2020 | 13/10/2020 | 13/10/2020 | 13/10/2020 |
| Type of sample | | Soil | Soil | Soil | Soil | Soil |
| Date prepared | - | 25/11/2020 | 25/11/2020 | 25/11/2020 | 25/11/2020 | 25/11/2020 |
| Date analysed | - | 25/11/2020 | 25/11/2020 | 25/11/2020 | 25/11/2020 | 25/11/2020 |
| Exchangeable Ca | meq/100g | 9.7 | 4.1 | 0.2 | 3.7 | 3.2 |
| Exchangeable K | meq/100g | 2.6 | 0.5 | 0.3 | 0.5 | 0.5 |
| Exchangeable Mg | meq/100g | 6.0 | 8.6 | 9.2 | 6.1 | 8.0 |
| Exchangeable Na | meq/100g | <0.1 | 0.83 | 1.9 | 0.67 | 1.3 |
| Cation Exchange Capacity | meq/100g | 18 | 14 | 12 | 11 | 13 |
| ESP | % | <1 | 6 | 16 | 6 | 10 |

| Method ID | Methodology Summary |
|---|---|
| **Ext-037** | Analysed by Sydney Environmental & Soil Laboratory |
| **Inorg-001** | pH - Measured using pH meter and electrode in accordance with APHA latest edition, 4500-H+. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times. |
| **Inorg-002** | Conductivity and Salinity - measured using a conductivity cell at 25°C in accordance with APHA latest edition 2510 and Rayment & Lyons. |
| **Inorg-081** | Anions - a range of Anions are determined by Ion Chromatography, in accordance with APHA latest edition, 4110-B. Waters samples are filtered on receipt prior to analysis.<br>Alternatively determined by colourimetry/turbidity using Discrete Analyser. |
| **INORG-123** | Determined using a "Texture by Feel" method. |
| **Metals-020** | Determination of exchangeable cations and cation exchange capacity in soils using 1M Ammonium Chloride exchange and ICP-AES analytical finish. |

| QUALITY CONTROL: Misc Inorg - Soil | | | | | | Duplicate | | | Spike Recovery % | |
|---|---|---|---|---|---|---|---|---|---|---|
| Test Description | Units | PQL | Method | Blank | # | Base | Dup. | RPD | LCS-1 | 256161-4 |
| Date prepared | - | | | 20/11/2020 | 1 | 20/11/2020 | 20/11/2020 | | 20/11/2020 | 20/11/2020 |
| Date analysed | - | | | 20/11/2020 | 1 | 20/11/2020 | 20/11/2020 | | 20/11/2020 | 20/11/2020 |
| pH 1:5 soil:water | pH Units | | Inorg-001 | [NT] | 1 | 5.7 | [NT] | | 102 | [NT] |
| Chloride, Cl 1:5 soil:water | mg/kg | 10 | Inorg-081 | <10 | 1 | 51 | 49 | 4 | 96 | 105 |
| Sulphate, SO4 1:5 soil:water | mg/kg | 10 | Inorg-081 | <10 | 1 | 35 | 32 | 9 | 97 | # |
| Emerson Aggregate test | - | 0 | Ext-037 | <0 | 1 | 5.0 | [NT] | | [NT] | [NT] |

| QUALITY CONTROL: Misc Inorg - Soil | | | | | | Duplicate | | | Spike Recovery % | |
|---|---|---|---|---|---|---|---|---|---|---|
| Test Description | Units | PQL | Method | Blank | # | Base | Dup. | RPD | LCS-2 | 256161-21 |
| Date prepared | - | | | [NT] | 2 | 20/11/2020 | 20/11/2020 | | 20/11/2020 | 20/11/2020 |
| Date analysed | - | | | [NT] | 2 | 20/11/2020 | 20/11/2020 | | 20/11/2020 | 20/11/2020 |
| pH 1:5 soil:water | pH Units | | Inorg-001 | [NT] | 2 | 7.6 | 7.6 | 0 | 101 | [NT] |
| Chloride, Cl 1:5 soil:water | mg/kg | 10 | Inorg-081 | [NT] | [NT] | [NT] | [NT] | [NT] | [NT] | 84 |
| Sulphate, SO4 1:5 soil:water | mg/kg | 10 | Inorg-081 | [NT] | [NT] | [NT] | [NT] | [NT] | [NT] | 106 |

| QUALITY CONTROL: Misc Inorg - Soil | | | | | | Duplicate | | | Spike Recovery % | |
|---|---|---|---|---|---|---|---|---|---|---|
| Test Description | Units | PQL | Method | Blank | # | Base | Dup. | RPD | LCS-3 | [NT] |
| Date prepared | - | | | [NT] | 11 | 20/11/2020 | 20/11/2020 | | 20/11/2020 | [NT] |
| Date analysed | - | | | [NT] | 11 | 20/11/2020 | 20/11/2020 | | 20/11/2020 | [NT] |
| pH 1:5 soil:water | pH Units | | Inorg-001 | [NT] | 11 | 5.4 | 5.3 | 2 | 102 | [NT] |

| QUALITY CONTROL: Misc Inorg - Soil | | | | | | Duplicate | | | Spike Recovery % | |
|---|---|---|---|---|---|---|---|---|---|---|
| Test Description | Units | PQL | Method | Blank | # | Base | Dup. | RPD | [NT] | [NT] |
| Date prepared | - | | | [NT] | 20 | 20/11/2020 | 20/11/2020 | | [NT] | [NT] |
| Date analysed | - | | | [NT] | 20 | 20/11/2020 | 20/11/2020 | | [NT] | [NT] |
| pH 1:5 soil:water | pH Units | | Inorg-001 | [NT] | 20 | 5.6 | 5.5 | 2 | [NT] | [NT] |

| QUALITY CONTROL: Misc Inorg - Soil | | | | | | Duplicate | | | Spike Recovery % | |
|---|---|---|---|---|---|---|---|---|---|---|
| Test Description | Units | PQL | Method | Blank | # | Base | Dup. | RPD | [NT] | [NT] |
| Date prepared | - | | | [NT] | 30 | 20/11/2020 | 20/11/2020 | | [NT] | [NT] |
| Date analysed | - | | | [NT] | 30 | 20/11/2020 | 20/11/2020 | | [NT] | [NT] |
| pH 1:5 soil:water | pH Units | | Inorg-001 | [NT] | 30 | 5.4 | 5.5 | 2 | [NT] | [NT] |

| QUALITY CONTROL: Misc Inorg - Soil | | | | | | Duplicate | | | Spike Recovery % | |
|---|---|---|---|---|---|---|---|---|---|---|
| Test Description | Units | PQL | Method | Blank | # | Base | Dup. | RPD | [NT] | [NT] |
| Date prepared | - | | | [NT] | 40 | 20/11/2020 | 20/11/2020 | | [NT] | [NT] |
| Date analysed | - | | | [NT] | 40 | 20/11/2020 | 20/11/2020 | | [NT] | [NT] |
| pH 1:5 soil:water | pH Units | | Inorg-001 | [NT] | 40 | 6.7 | 6.7 | 0 | [NT] | [NT] |

| QUALITY CONTROL: Texture and Salinity* | | | | | | Duplicate | | | Spike Recovery % | |
|---|---|---|---|---|---|---|---|---|---|---|
| Test Description | Units | PQL | Method | Blank | # | Base | Dup. | RPD | LCS-1 | [NT] |
| Date prepared | - | | | 20/11/2020 | 2 | 20/11/2020 | 20/11/2020 | | 20/11/2020 | [NT] |
| Date analysed | - | | | 20/11/2020 | 2 | 20/11/2020 | 20/11/2020 | | 20/11/2020 | [NT] |
| Electrical Conductivity 1:5 soil:water | µS/cm | 1 | Inorg-002 | <1 | 2 | 210 | 190 | 10 | 103 | [NT] |
| Texture Value | - | | INORG-123 | [NT] | 2 | 9.0 | 9.0 | 0 | [NT] | [NT] |

| QUALITY CONTROL: Texture and Salinity* | | | | | | Duplicate | | | Spike Recovery % | |
|---|---|---|---|---|---|---|---|---|---|---|
| Test Description | Units | PQL | Method | Blank | # | Base | Dup. | RPD | LCS-2 | [NT] |
| Date prepared | - | | | [NT] | 11 | 20/11/2020 | 20/11/2020 | | 20/11/2020 | [NT] |
| Date analysed | - | | | [NT] | 11 | 20/11/2020 | 20/11/2020 | | 20/11/2020 | [NT] |
| Electrical Conductivity 1:5 soil:water | µS/cm | 1 | Inorg-002 | [NT] | 11 | 70 | 72 | 3 | 101 | [NT] |
| Texture Value | - | | INORG-123 | [NT] | 11 | 7.0 | 7.0 | 0 | [NT] | [NT] |

| QUALITY CONTROL: Texture and Salinity* | | | | | | Duplicate | | | Spike Recovery % | |
|---|---|---|---|---|---|---|---|---|---|---|
| Test Description | Units | PQL | Method | Blank | # | Base | Dup. | RPD | LCS-3 | [NT] |
| Date prepared | - | | | [NT] | 20 | 20/11/2020 | 20/11/2020 | | 20/11/2020 | [NT] |
| Date analysed | - | | | [NT] | 20 | 20/11/2020 | 20/11/2020 | | 20/11/2020 | [NT] |
| Electrical Conductivity 1:5 soil:water | µS/cm | 1 | Inorg-002 | [NT] | 20 | 73 | 72 | 1 | 100 | [NT] |
| Texture Value | - | | INORG-123 | [NT] | 20 | 8.0 | 8.0 | 0 | [NT] | [NT] |

| QUALITY CONTROL: Texture and Salinity* | | | | | | Duplicate | | | Spike Recovery % | |
|---|---|---|---|---|---|---|---|---|---|---|
| Test Description | Units | PQL | Method | Blank | # | Base | Dup. | RPD | [NT] | [NT] |
| Date prepared | - | | | [NT] | 30 | 20/11/2020 | 20/11/2020 | | [NT] | [NT] |
| Date analysed | - | | | [NT] | 30 | 20/11/2020 | 20/11/2020 | | [NT] | [NT] |
| Electrical Conductivity 1:5 soil:water | µS/cm | 1 | Inorg-002 | [NT] | 30 | 49 | 43 | 13 | [NT] | [NT] |
| Texture Value | - | | INORG-123 | [NT] | 30 | 7.0 | 7.0 | 0 | [NT] | [NT] |

| QUALITY CONTROL: Texture and Salinity* | | | | | | Duplicate | | | Spike Recovery % | |
|---|---|---|---|---|---|---|---|---|---|---|
| Test Description | Units | PQL | Method | Blank | # | Base | Dup. | RPD | [NT] | [NT] |
| Date prepared | - | | | [NT] | 40 | 20/11/2020 | 20/11/2020 | | [NT] | [NT] |
| Date analysed | - | | | [NT] | 40 | 20/11/2020 | 20/11/2020 | | [NT] | [NT] |
| Electrical Conductivity 1:5 soil:water | µS/cm | 1 | Inorg-002 | [NT] | 40 | 55 | 59 | 7 | [NT] | [NT] |
| Texture Value | - | | INORG-123 | [NT] | 40 | 8.5 | 8.5 | 0 | [NT] | [NT] |

| QUALITY CONTROL: ESP/CEC | | | | | | Duplicate | | | Spike Recovery % | |
|---|---|---|---|---|---|---|---|---|---|---|
| Test Description | Units | PQL | Method | Blank | # | Base | Dup. | RPD | LCS-1 | [NT] |
| Date prepared | - | | | 25/11/2020 | [NT] | [NT] | [NT] | [NT] | 25/11/2020 | [NT] |
| Date analysed | - | | | 25/11/2020 | [NT] | [NT] | [NT] | [NT] | 25/11/2020 | [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] | 108 | [NT] |
| Exchangeable Mg | meq/100g | 0.1 | Metals-020 | <0.1 | [NT] | [NT] | [NT] | [NT] | 97 | [NT] |
| Exchangeable Na | meq/100g | 0.1 | Metals-020 | <0.1 | [NT] | [NT] | [NT] | [NT] | 103 | [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

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

Emerson class EW report 201414
3b = moderate to slight dispersion of the remould.