

# Alliance Geotechnical

## Engineering | Environmental | Testing

### Preliminary Salinity Assessment

**Lot 1 and 2 in DP1232692, Lot 810, Portion of Lot 811, Lot 840, Lot 841, and Lot 842 in DP2475**

**135-165 Tenth Avenue and Portion of 140, 160 and 170 Eleventh Avenue, Austral, NSW**

Prepared for: Sydney Catholic Schools

Report Number: 6930-ER-1-2

Report Date: 9 April 2018

Manage the earth, reduce the risk



We give you the right information to make the right decisions

Alliance Geotechnical Pty Ltd

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## DOCUMENT CONTROL

Revision	Date	Author	Checked
Rev 0	9 April 2018	Jake Walker / Craig Cowper	Craig Cowper

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## 1. INTRODUCTION

### 1.1. Background

Alliance Geotechnical Pty Ltd (AG) was engaged by Sydney Catholic School, to undertake a, preliminary salinity assessment for 135-165 Tenth Avenue, Austral, NSW and portion of 140, 160 and 170 Eleventh Avenue, Austral, NSW (refer **Figure 1** with the 'site' boundaries outlined in **Figure 2**).

AG has the following project appreciation:

- the site is proposed for redevelopment, comprising child care centre, primary school, secondary school, and associated infrastructure (including car parking, paved areas and playing fields);
- previous contamination assessments undertaken by EIS have recommended additional site investigation work to quantitatively assess asbestos in soil risks at the site. This recommendation appears to have been based on the previous asbestos in soil assessment not being undertaken in accordance with current NSW EPA endorsed guidance for assessing asbestos in soils; and
- a preliminary assessment of salinity risks at the site is required.

### 1.2. Objectives

The objective of this assessment was to provide advice on salinity hazards for the site.

### 1.3. Scope of Work

The scope of works undertaken to address the assessment objectives, included:

- a desktop review;
- soil sampling;
- laboratory analysis; and
- data assessment and reporting.

## 2. SITE IDENTIFICATION

The site is registered as Lot 1 and 2 in DP1232692, Lot 810, portion of Lot 811, Lot 840, Lot 841, and Lot 842 in DP2475.

The approximate geographic coordinates of the middle of the site, inferred from Google Earth were 33°55'51.71"S and 150°48'28.44"E.

The locality of the site is set out in **Figure 1**.

The general layout of the site is set out in **Figure 2**.

The site covers an area of approximately 7.85 hectares.

A copy of a detail and level survey is presented in **Appendix A**.

### **3. GEOLOGY, TOPOGRAPHY, SALINITY MAP AND SURFACE WATER FLOW**

#### **3.1. Geology**

A review of the regional geological map of Penrith 1:100.000 (1991), indicates that the site is underlain by Bringelly Shale of the Wianamatta Group, which typically consists of shale, carbonaceous claystone, claystone, laminitic, fine to medium grained lithic sandstone, rare coal and tuff.

#### **3.2. Topography**

The regional topography is characterised by a hill slope that generally falls to the south and south-west towards Kemps Creek. The natural site topography has been altered to accommodate the existing residential building. The overall topography of the site falls to the north at slopes between 3-4°.

#### **3.3. Salinity Hazard Map**

The site is located within the area of Western Sydney included in the Salinity Potential Map 2002. Based upon interpretation from the geological formations and soil groups presented on the map, the site is located in a region of moderate salinity potential.

The moderate classification is attributed to scattered areas of scalding and indicator vegetation, in areas where concentrations have not been mapped. Saline areas may occur in this zone, which have not been identified or may occur if risk factors change adversely.

#### **3.4. Surface Water Flow**

Based on the site and surrounding topography, surface water flows would be expected to enter the street stormwater system flowing toward the south-west along Tenth Avenue. Kemps Creek is located approximately 300m to the south-west of the site.

## 4. SALINITY ASSESSMENT

### 4.1. Salinity Potential

The Department of Infrastructure, Planning and Natural Resources (DIPNR) *Salinity Potential in Western Sydney, 2002*, map was reviewed to provide an initial indication of the potential for salinity to be encountered on the site. The review indicated that the site was on the border of areas categorised as Moderate Salinity Potential.

The Moderate Salinity Potential category is defined as:

*Areas on Wianamatta Group Shales and Tertiary Alluvial Terraces. Scattered areas of scalding and indicator vegetation have been noted but no concentrations have been mapped. Saline areas may occur in this zone, which have not yet been identified or may occur if risk factors change adversely. The soils are moderate to well-drained due to their elevated position in the landscape.*

### 4.2. Salinity Processes in Western Sydney

The *Western Sydney Salinity Code of Practice* (WSROC, 2004) identifies four main salinity models in Western Sydney. Each process is required to be managed on its own merits.

#### 4.2.1. Localized Concentrations of Salinity

Salt concentrations become locally concentrated in low lying, poorly draining areas or locations where surface or sub-surface flow is blocked by an impervious barrier (such as a foundation). High water evaporation rates result in concentrated salt accumulation.

#### 4.2.2. Shale Soil Landscapes

Where duplex (texture contrast) soils exist (as is often the case on shale soil landscapes) water moves more easily through the topsoil than the sub-soil. This generally results in lateral movement of moisture across the top of the less permeable B-Horizon (generally clay). The surface expression of salinity occurs in areas where this water accumulates and seeps to the surface and where evaporation of this moisture causes salts to concentrate. This is common on lower slopes or breaks in slope (such as natural or artificial flats in a mid-slope).

#### 4.2.3. Deep Groundwater Salinity

More typical of the traditional rural model of salinity, this occurs where saline groundwater rises to a level where capillary action allows water and dissolved salts to reach the surface where they concentrate over time. Groundwater rises generally result from above average rainfall, over irrigation, construction of seepage / storm water infiltration pits and of course a reduction in deep rooting trees.

#### 4.2.4. Deeply Weathered Soil Landscape

Salinity in these locations is related to deeply weathered soil landscapes made up of fluvial gravel, sand and clay, typically with high sulfate levels. Salinity problems in these locations are often mid-slope due to perched saline water tables.

### 4.3. Salinity Assessment Criteria

#### 4.3.1. Soil Salinity

The criterion used to classify saline soil is presented in **Table 4.3.1.1**. Salinity ratings (ECe) are calculated by multiplying the electrical conductivity of a 1:5 soil: water extract by a factor dependant of soil texture ranging from 6 to 17 depending on soil type. Hazelton and Murphy (DLWC 1992) classify soil salinity on the basis of ECe, and describe the implications of the salinity classes on agriculture as follows:

**Table 4.3.1.1 Soil Salinity Classification**

Class	ECe (dS/m)	Implication
Non-Saline	<2	Salinity effects mostly negligible
Slightly Saline	2 – 4	Yields of sensitive crops affected
Moderately Saline	4 – 8	Yields of many crops affected
Very Saline	8 – 16	Only tolerant crops yield satisfactorily
Highly Saline	>16	Only a few very tolerant crops yield satisfactorily

#### 4.3.2. Aggressivity

The exposure classification or soil aggressivity levels for concrete and steel piles, developed from AS 2159 – 2009 Piling Design and Installation, are shown in **Tables 4.3.2.1 and 4.3.2.2**.

**Table 4.3.2.1 Exposure Classification for Concrete Piles**

Exposure Conditions			Exposure Classification (Aggressivity)
Sulphates (as SO <sub>3</sub> ) in soil (ppm)	pH	Chlorides in water (ppm)	Soil Conditions – B (low permeability soils (such as silts and clays) or all soils above groundwater)
<5 000	>5.5	<6 000	Non-aggressive
5 000 – 10 000	4.5 – 5.5	6 000 – 12 000	Mild
10 000 – 20 000	4 – 4.5	12 000 – 30 000	Moderate
>20 000	<4	>30 000	Severe

**Table 4.3.2.2 Exposure Classification for Steel Piles**

Exposure Conditions			Exposure Classification (Aggressivity)
pH	Chlorides (as Cl <sup>-</sup> ) in soil (ppm)	Resistivity (Ohm.cm)	Soil Conditions – B (low permeability soils (such as silts and clays) or all soils above groundwater)
>5	<5 000	>5 000	Non-aggressive
4 – 5	5 000 – 20 000	2 000 – 5 000	Non-aggressive
3 – 4	20 000 – 50 000	1 000 – 2 000	Mild
<3	>50 000	< 1 000	Moderate

#### 4.3.3. Sodicity

Sodic soils may be affected by very severe surface crusting, very low infiltration and hydraulic conductivity, very hard and dense subsoils, high susceptibility to gully erosion and tunnel erosion. Sodicity also affects the shrink – swell properties of a soil. The ratings of sodicity as shown in DLWC (2002) are in **Table 4.3.3.1**.

**Table 4.3.3.1 Sodicity Ratings**

ESP %	Rating
< 5	Non-sodic
5 – 15	Sodic
> 15	Highly sodic

#### 4.4. Salinity Assessment Sampling and Analysis

Table 1 in DLWC (2002) provides guidance on sampling point densities for preliminary salinity assessment, based on the size of the site and the proposed land use for the site.

For the purpose of this investigation, a sampling point density of approximately 2 per hectare has been adopted, and that samples should be collected generally from each soil horizon.

AG understands that soil samples collected for preliminary salinity assessment should be analysed for conductivity, sulfates, chlorides, pH, resistivity and exchangeable sodium percentage.

## 5. FIELDWORK

### 5.1. Soil Sampling

An underground service locating contractor was engaged to survey each sampling point for the presence of underground services.

Soil sampling was undertaken by AG on 23 March 2018. A total of 14 sampling points (BH1-BH14) were established generally on site (BH7 and BH8 were established just offsite, due to access constraints and/or presence of underground infrastructure).

Each sampling point was drilled using a track mounted drilling rig, fitted solid flight augers. Soil samples were collected directly from the solid flight augers.

Sample were then placed in laboratory supplied acid-rinsed glass jars (with Teflon lined lids). The jars and bags were labelled with the project number, sample identifier and date samples were collected on.

Each borehole was backfilled with excavated soils at the completion of the sampling task.

Each sampling point established was marked on a site plan. The locations of these sampling points are presented in **Figure 3**.

Observations were made of soils encountered during sampling work. These observations are presented in **Table 5.1**.

**Table 5.1 Soil Observations**

ID	Depth (mbgs)	Observations
BH1	0.0-0.3	Silty CLAY, dark brown, some organics
	0.3-1.1	Silty CLAY, red-brown
	1.1-1.5	Silty CLAY, grey mottled brown/orange, trace shale
BH2	0.0-0.3	Silty CLAY, dark brown, trace sand
	0.3-1.5	Silty CLAY, orange / brown
BH3	0.0-0.1	FILL - Sandy GRAVEL, fine to medium, crushed rock
	0.1-0.2	Silty CLAY, dark brown
	0.2-1.5	Silty CLAY, pale brown, mottled grey/red, becoming grey, mottled pale brown, trace shale
BH4	0.0-0.2	Silty CLAY, dark brown
	0.2-1.5	Silty CLAY, orange / brown, becoming grey mottled orange/brown, trace shale
BH5	0.0-0.1	CLAY, brown, some organics
	0.1-1.5	Silty CLAY, pale brown to brown, with some siltstone gravels from 0.8m
BH6	0.0-0.1	CLAY, brown to dark brown, organics, some fine to medium grained sands
	0.1-1.5	CLAY, pale brown, some fine to medium grained sand, some siltstone gravels from 0.8m

<b>ID</b>	<b>Depth (mbgs)</b>	<b>Observations</b>
BH7	0.0-0.2	Silty CLAY, dark brown
	0.2-1.5	Silty CLAY, grey, mottled orange/brown
BH8	0.0-0.1	FILL - Sandy GRAVEL, grey
	0.1-1.1	CLAY, grey, mottled red
	1.1-1.5	Silty CLAY, pale grey, mottled pale red, trace ironstone
BH9	0.0-0.1	CLAY, brown, with organics
	0.1-1.5	CLAY, pale brown to brown, some fine to medium grained sand, trace ironstone gravels
BH10	0.0-0.2	CLAY, dark brown, with fine to medium grained sands and gravels, some organics
	0.2-1.5	CLAY, red/brown, mottled grey, some fine to medium grained sand
BH11	0.0-0.1	CLAY, brown to dark brown
	0.1-1.5	CLAY, brown to pale brown mottled grey, some fine to medium grained sand, becoming brown mottled grey/orange from 1.0m
BH12	0.0-0.25	CLAY, brown to orange, organics
	0.25-1.5	CLAY, brown to orange, mottled grey, becoming mottled red, then mottled grey
BH13	0.0-0.2	CLAY, brown to dark brown
	0.2-1.0	CLAY, red brown, some silt
	1.0-1.5	Silty CLAY, red brown to pale brown, trace fine to medium grained gravel, trace ironstone
BH14	0.0-0.15	CLAY, brown, organics
	0.15-1.5	CLAY, brown to dark brown, trace fine to medium grained sand, becoming mottled red brown from 1.0m



## 6. LABORATORY

The samples collected were transported to the analytical laboratory, using chain of custody (COC) protocols. A selection of these samples was scheduled for analysis.

A copy of the analytical laboratory certificates of analysis, is presented in **Appendix B**.

## 7. ASSESSMENT OF SOIL SALINITY LABORATORY RESULTS

### 7.1. Soil Salinity

The laboratory analytical results indicated that the soils assessed to a depth of 1.5m below ground surface, would classify as non-saline.

### 7.2. Aggressivity

The laboratory analytical results of the samples analysed, indicate that the exposure classification<sup>1</sup> of the soils assessed to a depth of 1.5m below ground surface would be:

- Concrete piles – non-aggressive; and
- Steel piles – moderate aggressivity in the vicinity of sampling points BH5 and BH9
- Steel piles – mild aggressivity in the vicinity of sampling points BH1, BH2, BH4, BH5, BH6, BH7, BH10, BH11, BH12, BH13 and BH14
- Steel piles – non-aggressive in the vicinity of sampling points BH3 and BH8.

### 7.3. Sodicity

The laboratory analytical results indicate that soils assessed to a depth of 1.5m below ground surface:

- in the vicinity of BH14 would rate as non-sodic;
- across the remainder of the site would rate as sodic to highly sodic.

Sodicity can be used as a measure for the erosion potential of soils. As the proposed development comprises covering a significant portion of the site with building footprints, hardstand driveways and roadways, erosion during operation of the new development, is considered unlikely to be a risk at the site.

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<sup>1</sup> Table 6.4.2 (C) and Table 6.5.2 (C) in AS 2159-2009 Piling – Design and Installation

## 8. CONCLUSIONS AND RECOMMENDATIONS

Based on AG's assessment of the desktop review information, fieldwork data and laboratory analytical data, in the context of the proposed land use setting, AG makes the following conclusions:

- Soils assessed onsite (to a depth of 1.5m below ground surface) are considered to be:
  - non-saline;
  - non-aggressive to concrete piles;
  - moderately aggressive to steel piles in the vicinity of sampling points BH5 and BH9;
  - mildly aggressive to steel piles in the vicinity of sampling points BH1, BH2, BH4, BH5, BH6, BH7, BH10, BH11, BH12, BH13 and BH14; and
  - non-aggressive to steel piles in the vicinity of sampling points BH3 and BH8.

This report, including its conclusions and recommendations, must be read in conjunction with the limitations presented in **Section 9**.

## 9. STATEMENT OF LIMITATIONS

The findings presented in this report are based on specific searches of relevant, government historical databases and anecdotal information that were made available during the course of this investigation. To the best of our knowledge, these observations represent a reasonable interpretation of the general condition of the site at the time of report completion.

This report has been prepared solely for the use of the client to whom it is addressed and no other party is entitled to rely on its findings.

No warranties are made as to the information provided in this report. All conclusions and recommendations made in this report are of the professional opinions of personnel involved with the project and while normal checking of the accuracy of data has been conducted, any circumstances outside the scope of this report or which are not made known to personnel and which may impact on those opinions is not the responsibility of Alliance Geotechnical Pty Ltd. Should information become available regarding conditions at the site including previously unknown sources of contamination, AG reserves the right to review the report in the context of the additional information.

This report must be reviewed in its entirety and in conjunction with the objectives, scope and terms applicable to AG's engagement. The report must not be used for any purpose other than the purpose specified at the time AG was engaged to prepare the report.

Logs, figures, and drawings are generated for this report based on individual AG consultant interpretations of nominated data, as well as observations made at the time site walkover/s were completed.

Data and/or information presented in this report must not be redrawn for its inclusion in other reports, plans or documents, nor should that data and/or information be separated from this report in any way.

Should additional information that may impact on the findings of this report be encountered or site conditions change, AG reserves the right to review and amend this report.

## **10. REFERENCES**

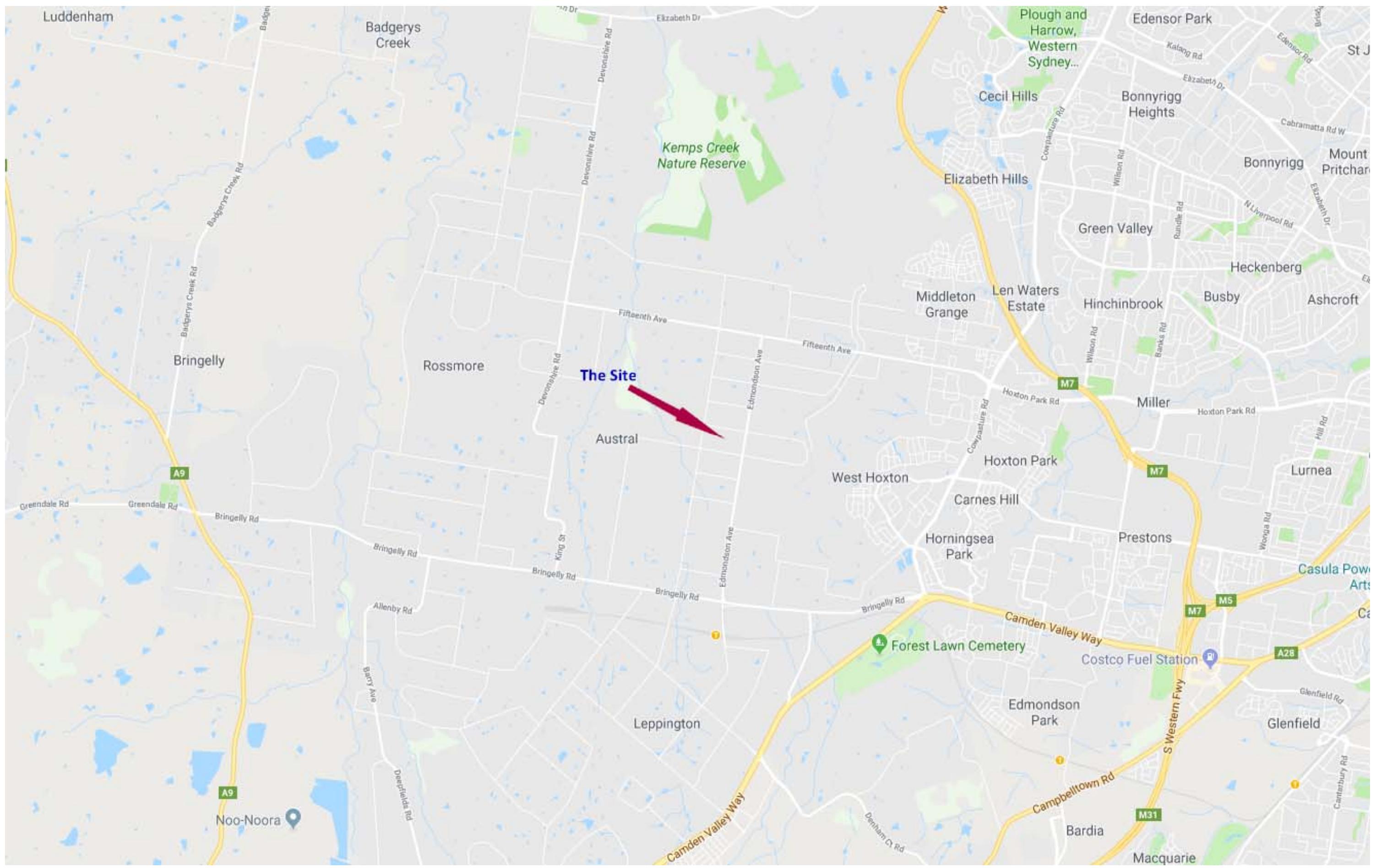
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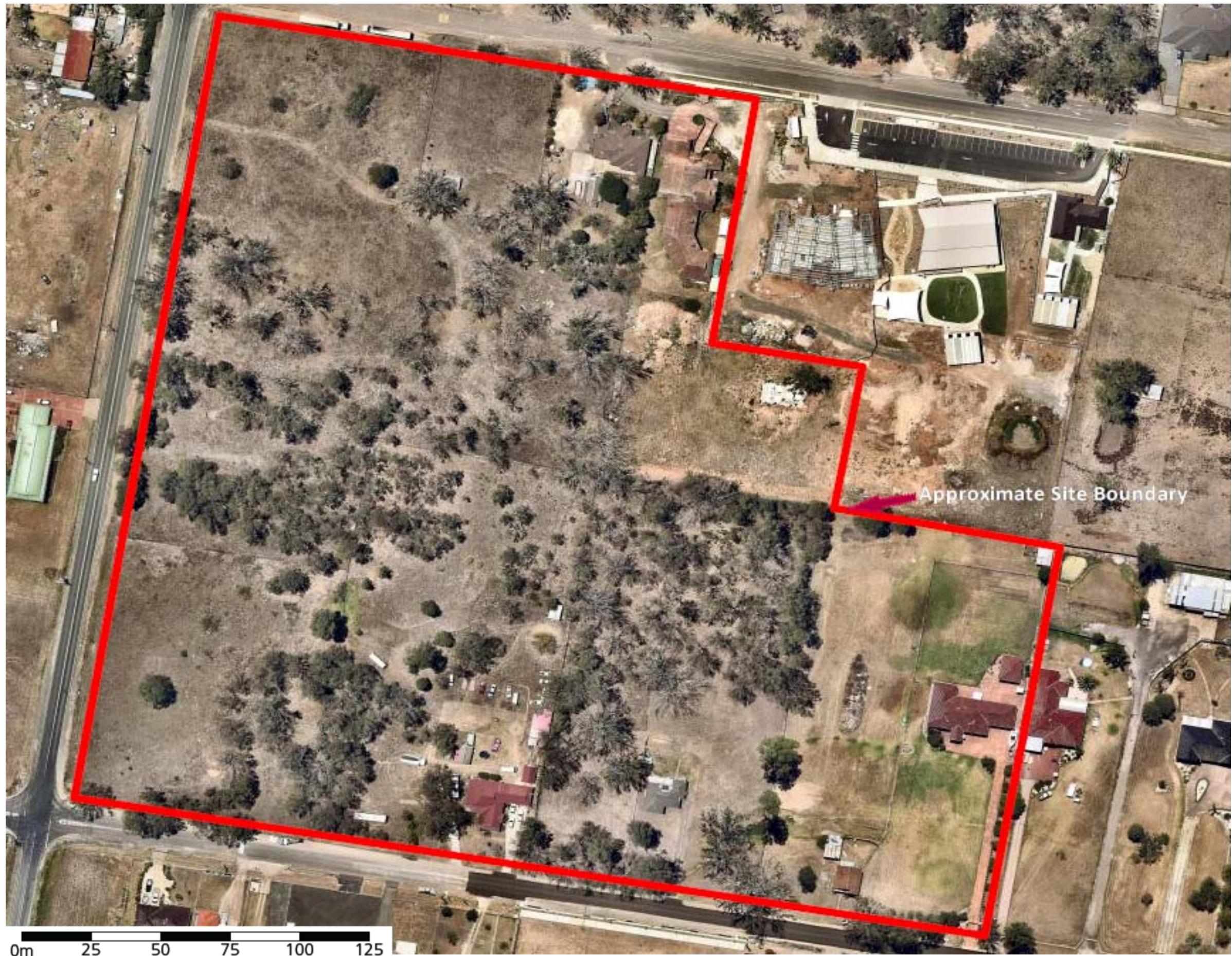
DIPNR (2002b), 'Guidelines to Accompany Map of Salinity Potential in Western Sydney, 2002'.

Western Sydney Regional Organisation of Councils Ltd (WSROC) 2004, 'Western Sydney Salinity Code of Practice, March 2003 (Amended January 2004)', Western Sydney Salinity Working Party.

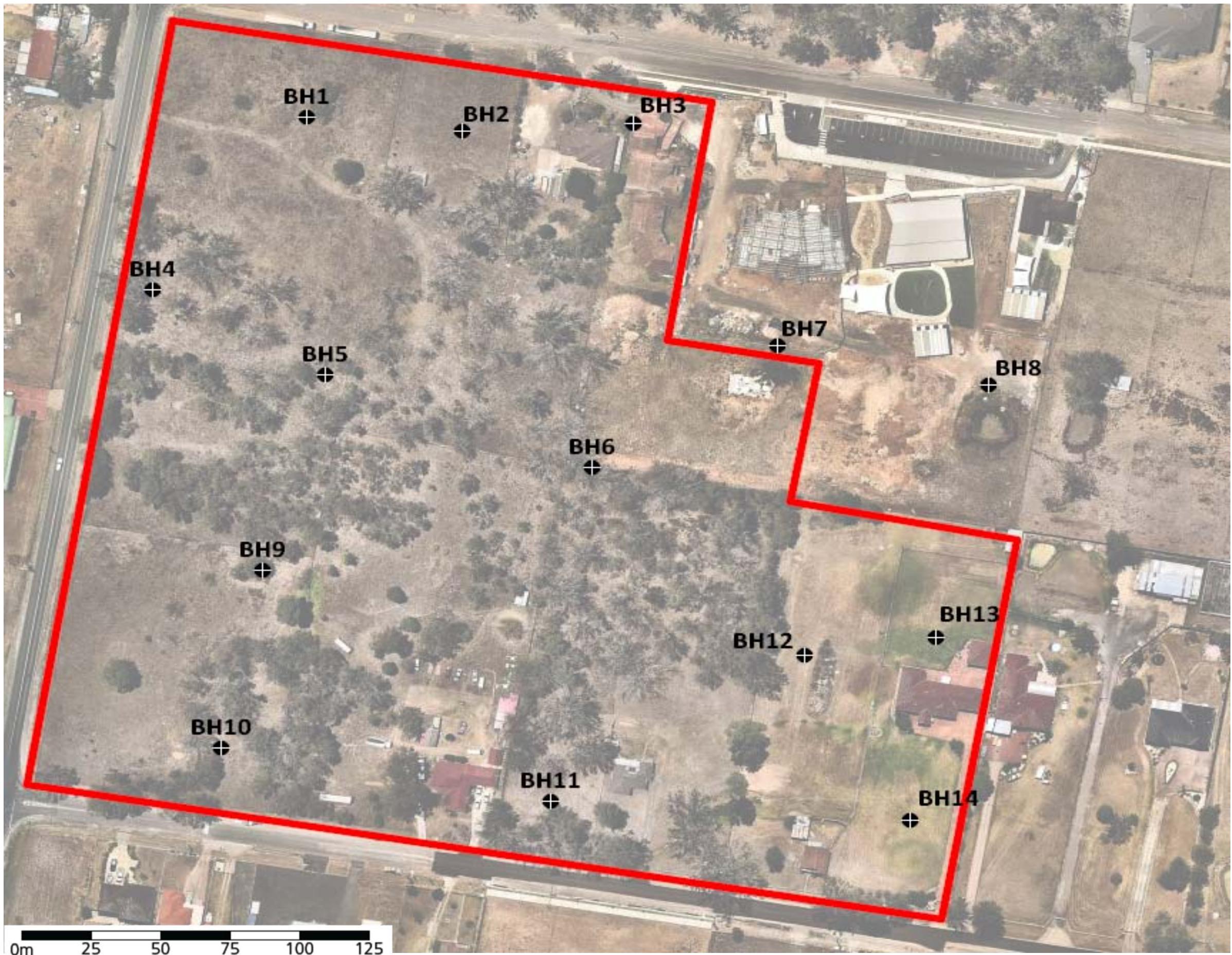
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**FIGURES**





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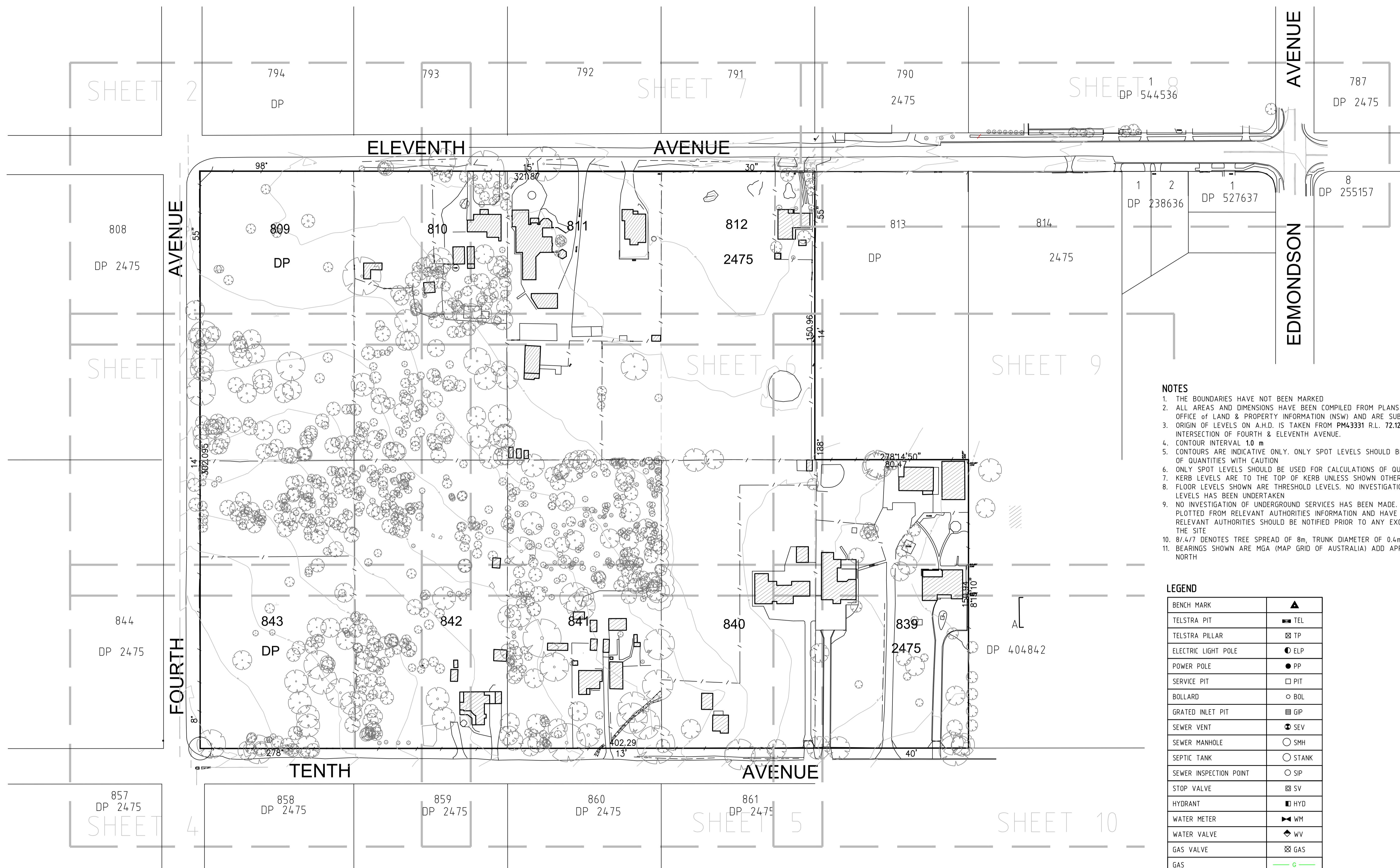


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**APPENDIX A**

**SURVEY**

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APPROX



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-	-	-	-	B	16/02/16	ADDITIONAL DETAIL & LEVELS ADDED	42607
-	-	-	-	A	08/12/15	PART OF LOT 812 ADDED TO DETAIL	42606
E	21/06/17	ADDITIONAL DETAIL & LEVELS ADDED - TENTH AVENUE	41240-011	Revision	Date	Description	Reference

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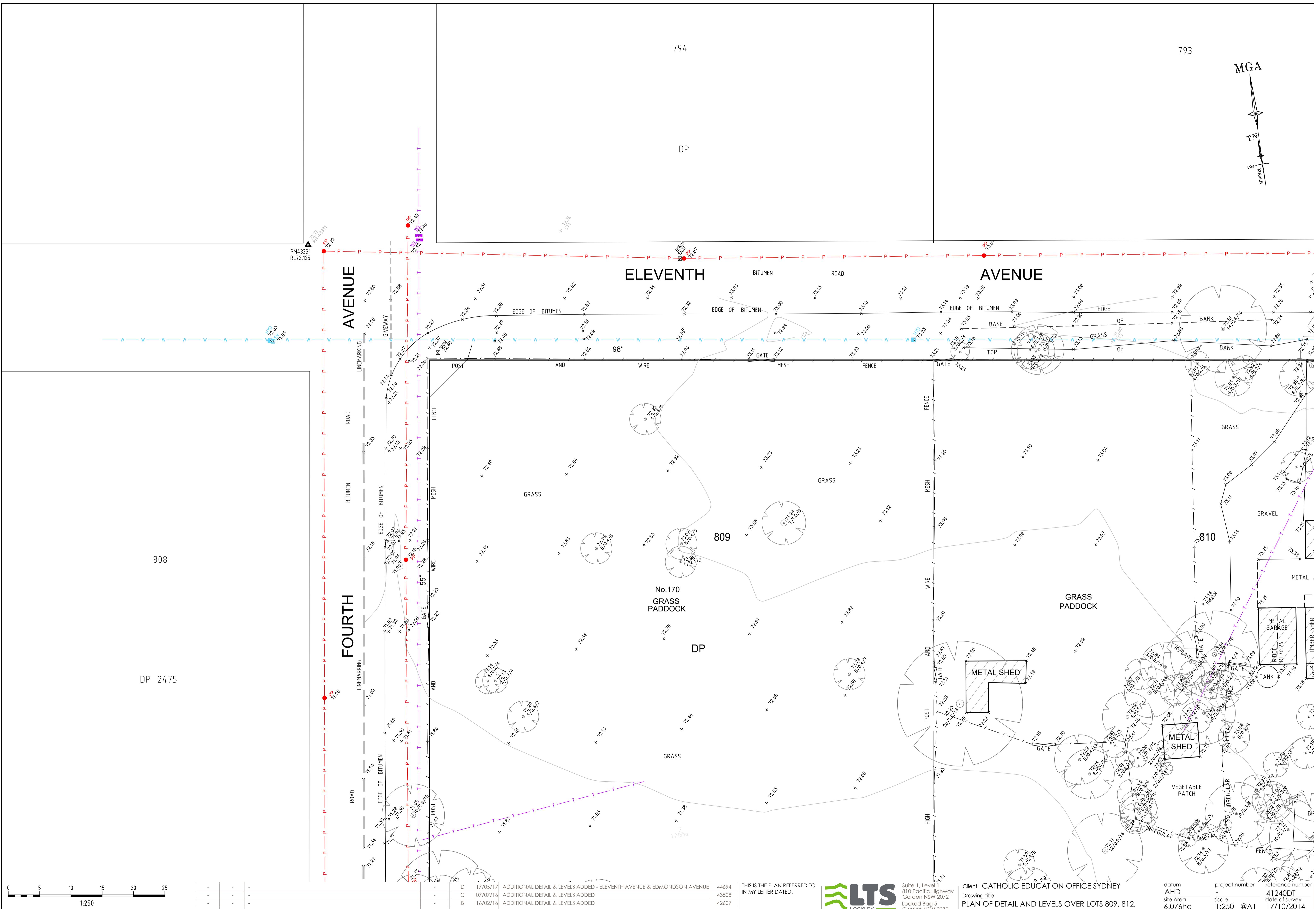
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www.lts.com.au

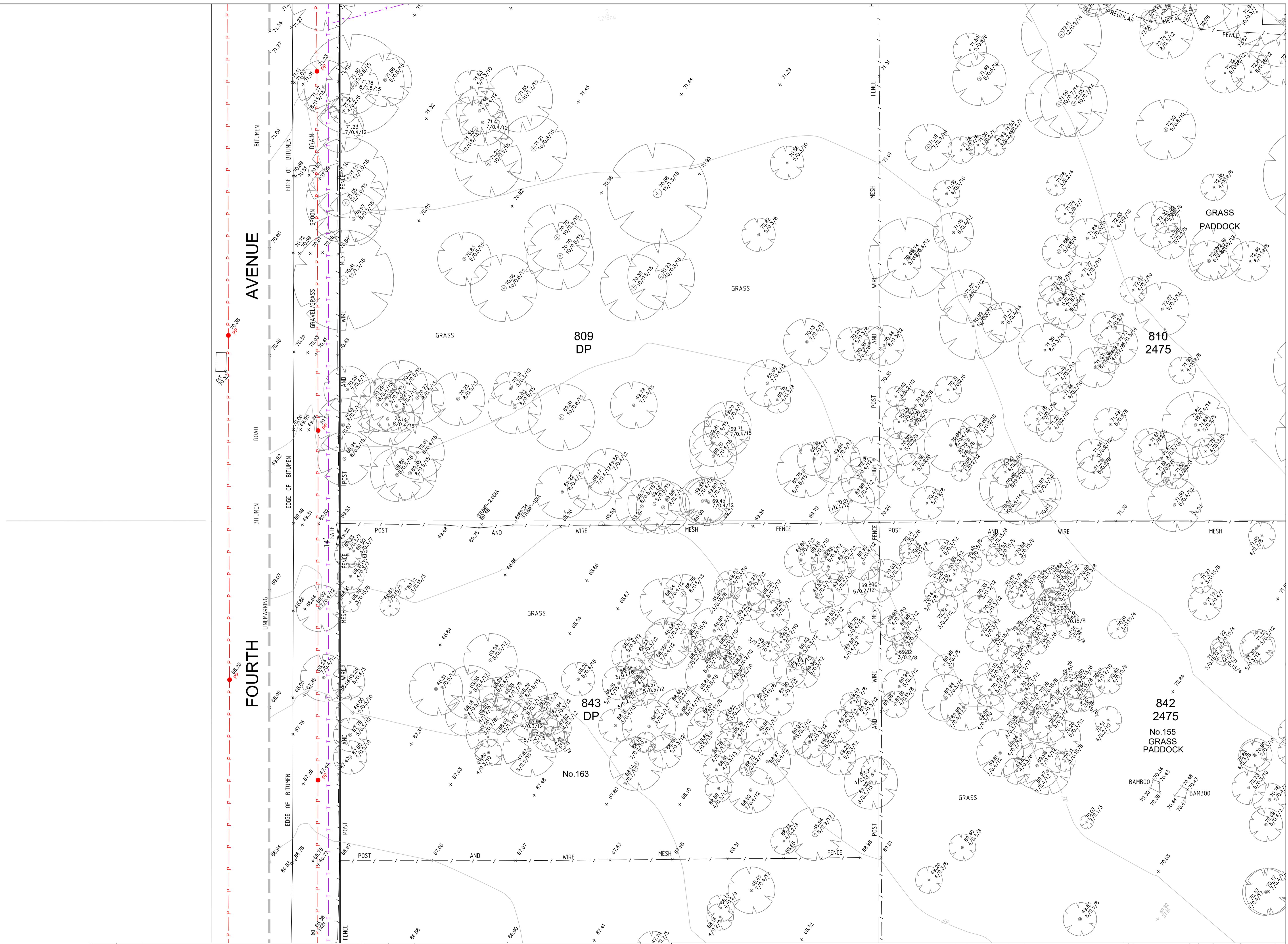


Suite 1, Level 1  
810 Pacific Highway  
Gordon NSW 2072  
Locked Bag 5  
P 1300 587 000  
F 02 9499 7760

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Drawing title  
PLAN OF DETAIL AND LEVELS OVER LOTS 809, 812,  
841-843 DP 2475 KNOWN AS No.145-165 TENTH AVENUE  
AND No.146-170 ELEVENTH AVENUE, AUSTRAL

datum AHD  
site Area 6.076ha  
scale 1:1000 @A1  
date of survey 17/10/2014  
LGA LIVERPOOL  
project number 41240DT  
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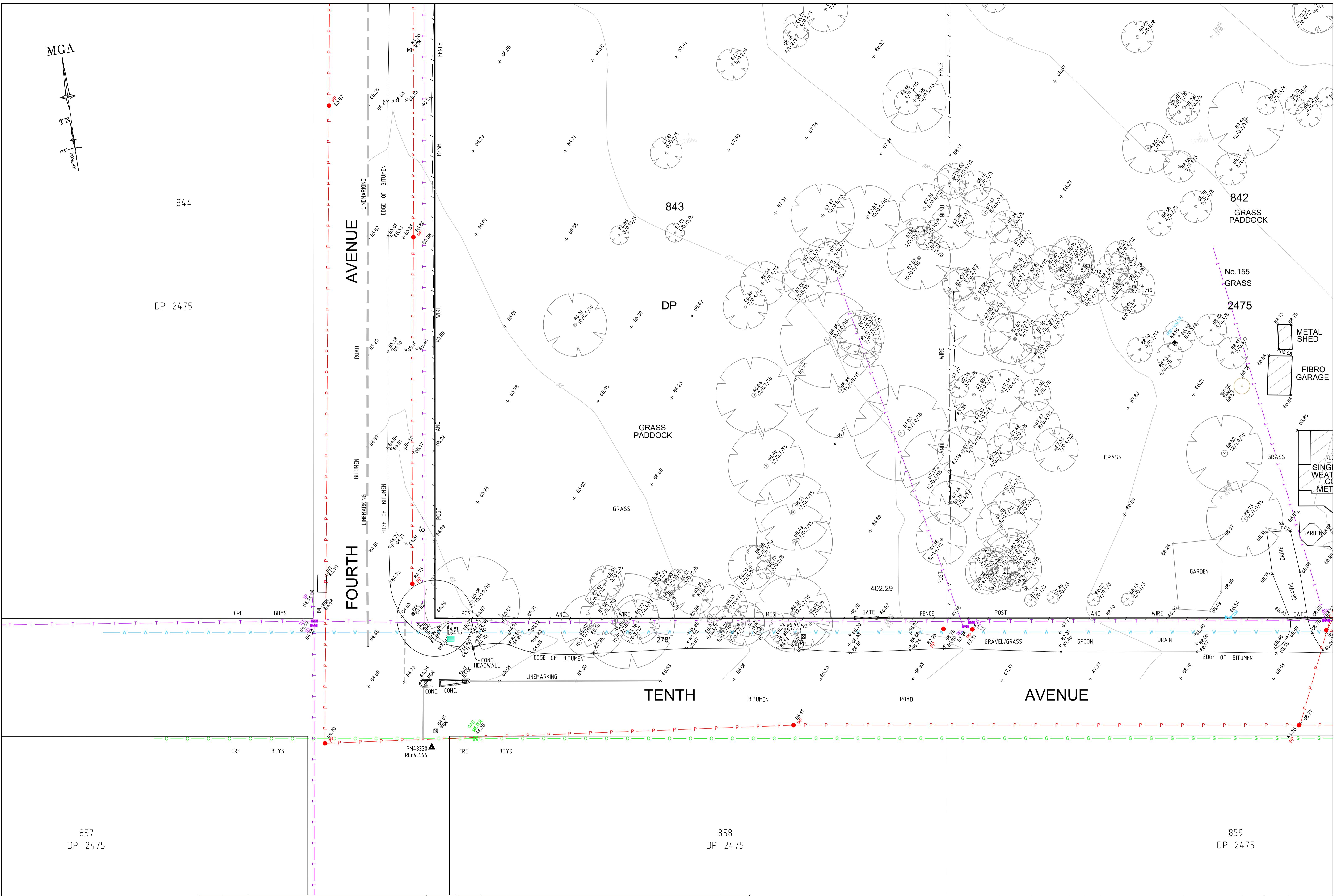
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C	07/07/16	ADDITIONAL DETAIL & LEVELS ADDED
B	16/02/16	ADDITIONAL DETAIL & LEVELS ADDED
A	08/12/15	PART OF LOT 812 ADDED TO DETAIL

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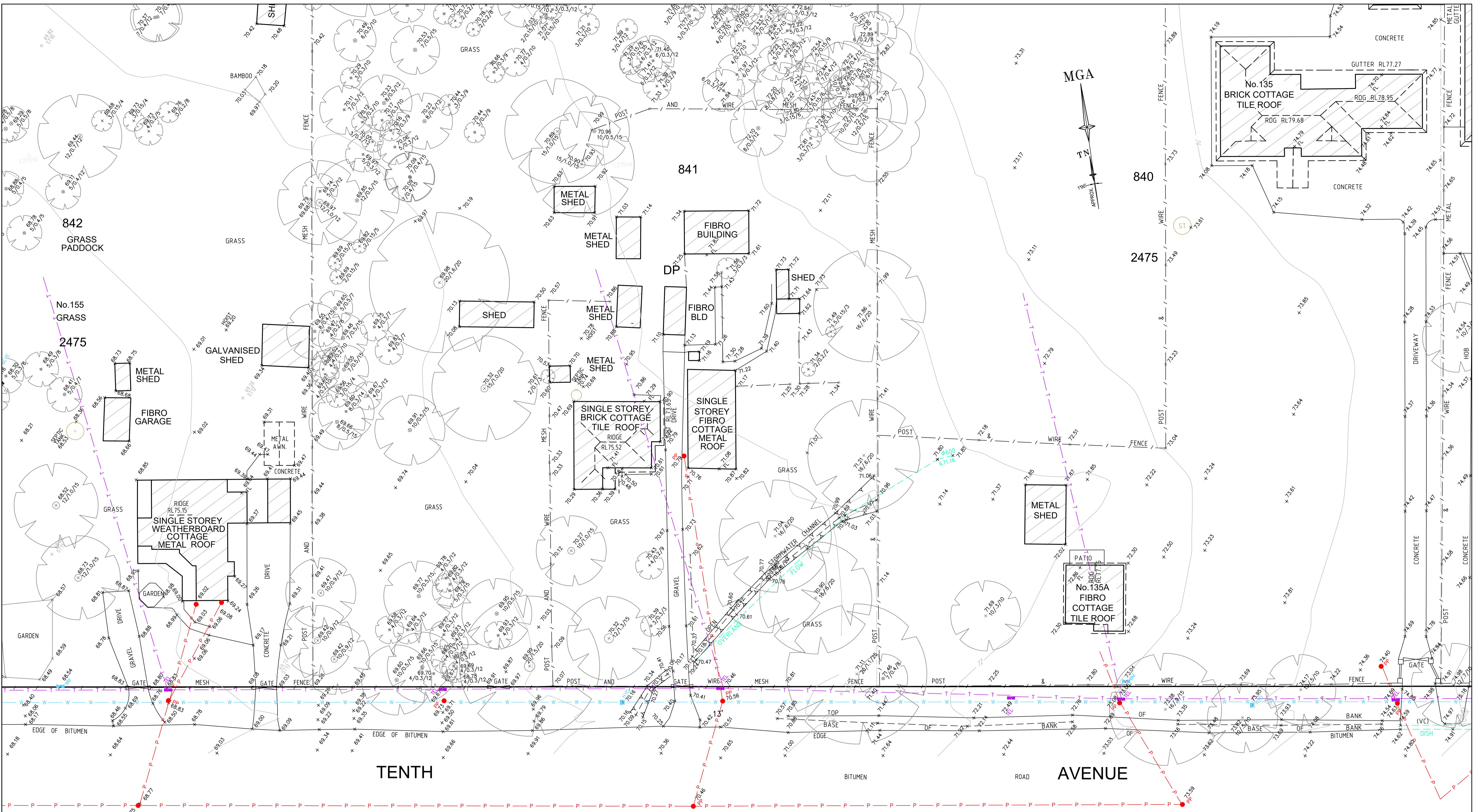


**LTS**  
CKLEY Surveyors NSW  
**Suite 1, Level 1  
810 Pacific Highway  
Gordon NSW 2072  
Locked Bag 5  
Gordon NSW 2072  
P 1300 587 000**

**Client CATHOLIC EDUCATION OFFICE SYDNEY  
Drawing title  
PLAN OF DETAIL AND LEVELS OVER LOTS 809, 812,  
841-843 DP 2475 KNOWN AS No.145-165 TENTH AVENUE**

**datum  
AHD  
site Area  
6.076h  
LGA**

project number reference number  
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scale date of survey  
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SEE SHEET 1 FOR LEGEND AND NOTES

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-	-	-	C	07/07/17	ADDITIONAL DETAIL & LEVELS ADDED	43508	
-	-	-	B	16/02/16	ADDITIONAL DETAIL & LEVELS ADDED	42607	
-	-	-	A	08/12/15	PART OF LOT 812 ADDED TO DETAIL	42606	
E	21/06/17	ADDITIONAL DETAIL & LEVELS ADDED - TENTH AVENUE	41240-011				
Revision	Date	Description	Reference	Revision	Date	Description	Reference

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Registered Surveyor NSW www.lts.com.au	Suite 1, Level 1 810 Pacific Highway Gordon NSW 2072 Locked Bag 5 P 1300 587 000 F 02 9499 7760	Project number	41240DT

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site Area 6.076ha date of survey 17/10/2014  
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project number 41240DT  
date of survey 17/10/2014  
LGA LIVERPOOL  
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SEE SHEET 1 FOR LEGEND AND NOTES

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-	B	16/02/16	ADDITIONAL DETAIL & LEVELS ADDED
41240-011	A	08/12/15	PART OF LOT 812 ADDED TO DETAIL

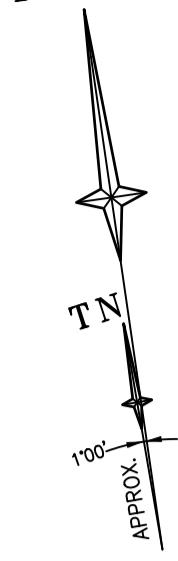
110.	110.
	THIS IS THE PLAN REFERENCED IN MY LETTER DATED:
	44694
	43508
	42607
	42606



**CATHOLIC EDUCATION OFFICE SYDNEY**  
Client CATHOLIC EDUCATION OFFICE SYDNEY  
Drawing title  
**PLAN OF DETAIL AND LEVELS OVER LOTS 809, 812,  
841-843 DP 2475 KNOWN AS No.145-165 TENTH AVENUE  
AND No.146-170 ELEVENTH AVENUE, AUSTRALIA**

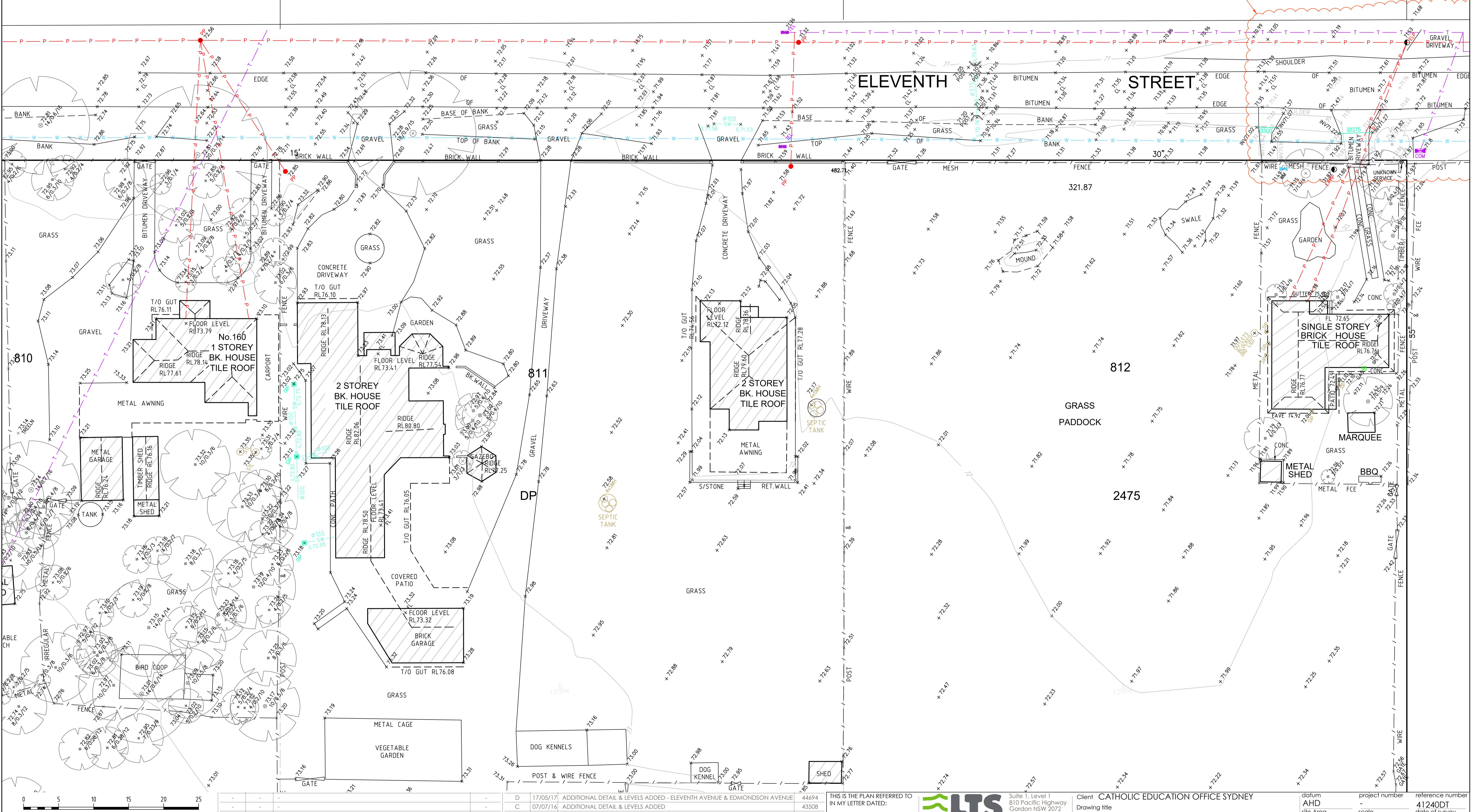
datum project number reference number  
AHD - 41240DT  
site Area scale date of survey  
6.076ha 1:250 @A1 17/10/2014  
LGA SHEET  
LIVERPOOL 05 11 SHEETS | 6

MGA



ORIGINAL DETAIL & LEVEL  
DATA AS PER ISSUE 'C'  
ALTERED IN THIS AREA  
DUE TO THE CONSTRUCTION  
ACTIVITY

# ELEVENTH STREET



SEE SHEET 1 FOR LEGEND AND NOTES

0 5 10 15 20 25  
1:250

Revision	Date	Description	Reference

Revision	Date	Description	Reference

Revision	Date	Description	Reference

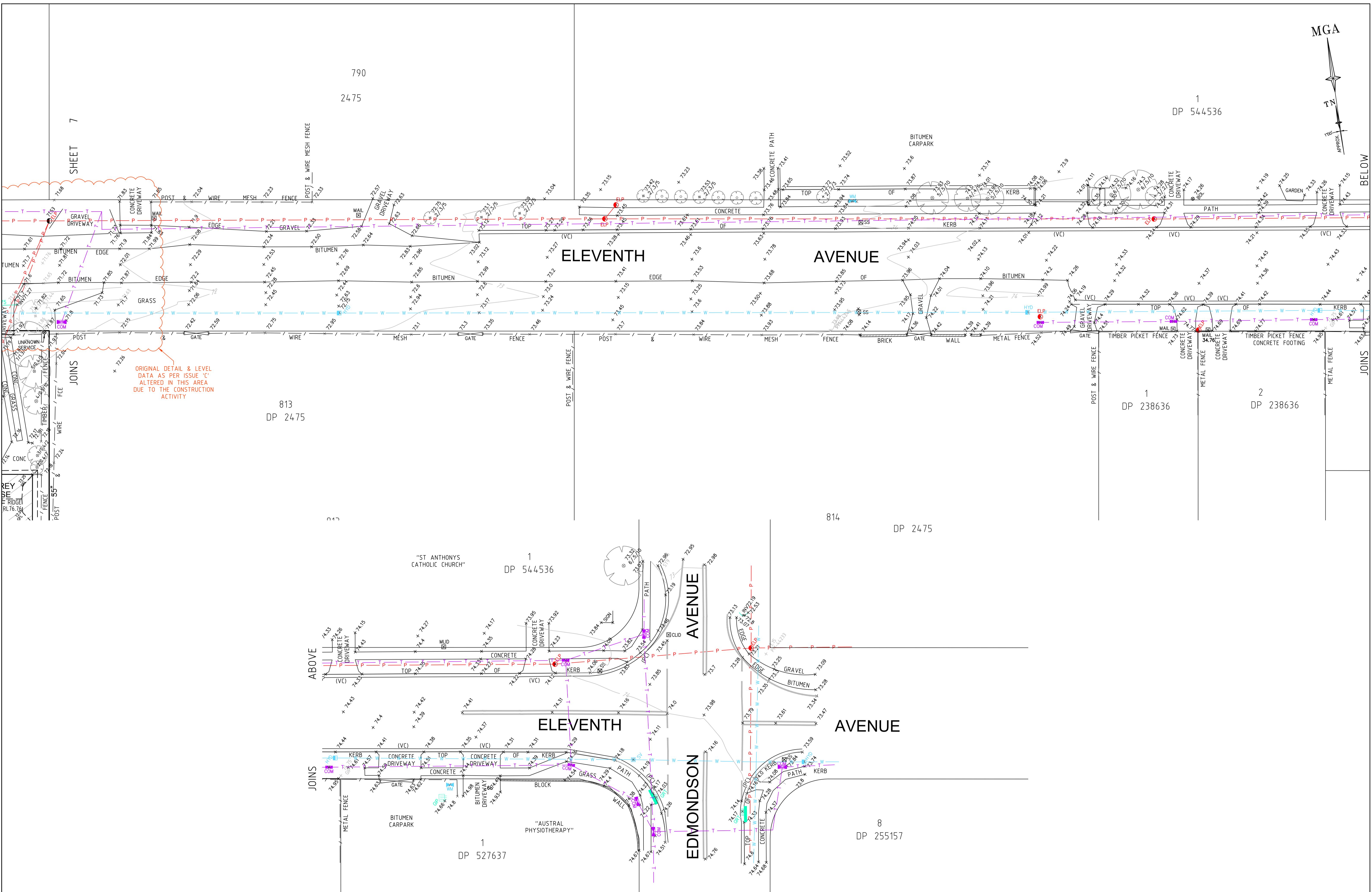
LTS  
LOCKLEY  
Registered Surveyors NSW  
www.lts.com.au

Suite 1, Level 1  
810 Pacific Highway  
Gordon NSW 2072  
Locked Bag 5  
P 1300 587 000  
F 02 9499 7760

Client CATHOLIC EDUCATION OFFICE SYDNEY  
datum AHD  
site Area 6.076ha  
scale 1:250 @A1  
date of survey 17/10/2014  
LGA LIVERPOOL

project number 41240DT  
reference number 41240DT  
date 17/10/2014

sheet 11  
of 7



SEE SHEET 1 FOR LEGEND AND NOTES

Revision	Date	Description	Reference	Revision	Date	Description	Reference
-	-	-	-	D	17/05/17	ADDITIONAL DETAIL & LEVELS ADDED - ELEVENTH AVENUE & EDMONDSON AVENUE	44694
-	-	-	-	C	07/07/16	ADDITIONAL DETAIL & LEVELS ADDED	43508
-	-	-	-	B	16/02/16	ADDITIONAL DETAIL & LEVELS ADDED	42607
-	-	-	-	A	08/12/15	PART OF LOT 812 ADDED TO DETAIL	42606
E	21/06/17	ADDITIONAL DETAIL & LEVELS ADDED - TENTH AVENUE	41240-011				

THIS IS THE PLAN REFERRED TO  
IN MY LETTER DATED:  
Registered Surveyor NSW  
www.lts.com.au

LTS  
LOCKLEY  
Suite 1, Level 1  
810 Pacific Highway  
Gordon NSW 2072  
Locked Bag 5  
Gordon NSW 2072  
P 1300 587 000  
F 02 9499 7760

Client CATHOLIC EDUCATION OFFICE SYDNEY  
datum AHD  
site Area 6.076ha  
scale 1:250 @A1  
date of survey 17/10/2014  
LGA LIVERPOOL  
project number 41240DT  
reference number 11  
SHEET OF 11 SHEETS

MGA  
TN  
APPROX  
100'

BELLOW

18





SEE SHEET 1 FOR LEGEND AND NOTES

Revision	Date	Description	Reference	
-	-	D 17/05/17 ADDITIONAL DETAIL & LEVELS ADDED - ELEVENTH AVENUE & EDMONDSON AVENUE	44694	
-	-	C 07/07/16 ADDITIONAL DETAIL & LEVELS ADDED	43508	
-	-	B 16/02/16 ADDITIONAL DETAIL & LEVELS ADDED	42607	
E 21/06/17	ADDITIONAL DETAIL & LEVELS ADDED - TENTH AVENUE	41240-011	A 08/12/15 PART OF LOT 812 ADDED TO DETAIL	42606

Revision	Date	Description	Reference
		THIS IS THE PLAN REFERRED TO IN MY LETTER DATED: 17/10/2014	
		Client CATHOLIC EDUCATION OFFICE SYDNEY	
		datum AHD	project number 41240DT
		site Area 6.076ha	date of survey 17/10/2014
		LGA LIVERPOOL	scale 1:250 @A1
		Registered Surveyor NSW	sheet 11 of 10

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**APPENDIX B**

**LABORATORY**



## ANALYTICAL REPORT



Accreditation No. 2562

### CLIENT DETAILS

Contact **Craig Cowper**  
Client **ALLIANCE GEOTECHNICAL PTY LTD**  
Address **10 Welder Road  
Seven Hills  
NSW 2147**  
  
Telephone **0407 989 885**  
Facsimile **02 9675 1888**  
Email **c.cowper@allgeo.com.au**  
  
Project **6930 - Austral**  
Order Number **P990**  
Samples **42**

### LABORATORY DETAILS

Manager **Huong Crawford**  
Laboratory **SGS Alexandria Environmental**  
Address **Unit 16, 33 Maddox St  
Alexandria NSW 2015**  
  
Telephone **+61 2 8594 0400**  
Facsimile **+61 2 8594 0499**  
Email **au.environmental.sydney@sgs.com**  
  
**SE177214 R0**  
**26 Mar 2018**  
**04 Apr 2018**

### COMMENTS

Accredited for compliance with ISO/IEC 17025 - Testing. NATA accredited laboratory 2562(4354).

### SIGNATORIES

Bennet Lo  
Senior Organic Chemist/Metals Chemis

Shane McDermott  
Inorganic/Metals Chemist



## ANALYTICAL REPORT

SE177214 R0

Parameter	Units	LOR	Sample Number	SE177214.001	SE177214.002	SE177214.003	SE177214.004
			Sample Matrix	Soil	Soil	Soil	Soil
			Sample Date	23 Mar 2018	23 Mar 2018	23 Mar 2018	23 Mar 2018
			Sample Name	BH1-0.5	BH1-1.0	BH1-1.5	BH2-0.5

**pH in soil (1:5) Method: AN101 Tested: 27/3/2018**

pH	pH Units	0.1	7.1	6.2	6.4	7.4
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**Conductivity and TDS by Calculation - Soil Method: AN106 Tested: 27/3/2018**

Conductivity of Extract (1:5 dry sample basis)	µS/cm	1	110	420	540	65
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**Soluble Anions (1:5) in Soil by Ion Chromatography Method: AN245 Tested: 28/3/2018**

Chloride	mg/kg	0.25	42	290	410	25
Sulfate	mg/kg	5	100	400	540	29

**Exchangeable Cations and Cation Exchange Capacity (CEC/ESP/SAR) Method: AN122 Tested: 28/3/2018**

Exchangeable Sodium, Na	mg/kg	2	260	480	570	290
Exchangeable Sodium, Na	meq/100g	0.01	1.2	2.1	2.5	1.3
Exchangeable Sodium Percentage*	%	0.1	6.8	13.0	16.4	8.7

**Moisture Content Method: AN002 Tested: 28/3/2018**

% Moisture	%w/w	0.5	12	12	10	12
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## ANALYTICAL REPORT

SE177214 R0

Parameter	Units	LOR	Sample Number	SE177214.005	SE177214.006	SE177214.007	SE177214.008
			Sample Matrix	Soil	Soil	Soil	Soil
			Sample Date	23 Mar 2018	23 Mar 2018	23 Mar 2018	23 Mar 2018
			Sample Name	BH2-1.0	BH2-1.5	BH3-0.5	BH3-1.0

**pH in soil (1:5) Method: AN101 Tested: 27/3/2018**

pH	pH Units	0.1	6.2	7.0	6.1	6.3
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**Conductivity and TDS by Calculation - Soil Method: AN106 Tested: 27/3/2018**

Conductivity of Extract (1:5 dry sample basis)	µS/cm	1	380	240	490	510
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**Soluble Anions (1:5) in Soil by Ion Chromatography Method: AN245 Tested: 28/3/2018**

Chloride	mg/kg	0.25	290	240	420	500
Sulfate	mg/kg	5	310	120	270	240

**Exchangeable Cations and Cation Exchange Capacity (CEC/ESP/SAR) Method: AN122 Tested: 28/3/2018**

Exchangeable Sodium, Na	mg/kg	2	530	950	340	500
Exchangeable Sodium, Na	meq/100g	0.01	2.3	4.1	1.5	2.2
Exchangeable Sodium Percentage*	%	0.1	16.4	27.3	9.9	12.4

**Moisture Content Method: AN002 Tested: 28/3/2018**

% Moisture	%w/w	0.5	12	7.0	15	15
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## ANALYTICAL REPORT

SE177214 R0

Sample Number	SE177214.009	Sample Matrix	Soil	SE177214.010	Soil	SE177214.011	Soil
Sample Date	23 Mar 2018	Sample Name	BH3-1.5	23 Mar 2018	BH4-0.5	23 Mar 2018	BH4-1.0
							BH4-1.5

Parameter	Units	LOR
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**pH in soil (1:5) Method: AN101 Tested: 27/3/2018**

pH	pH Units	0.1	6.9	5.5	8.0	7.2
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**Conductivity and TDS by Calculation - Soil Method: AN106 Tested: 27/3/2018**

Conductivity of Extract (1:5 dry sample basis)	µS/cm	1	460	530	910	880
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**Soluble Anions (1:5) in Soil by Ion Chromatography Method: AN245 Tested: 28/3/2018**

Chloride	mg/kg	0.25	550	610	550	500
Sulfate	mg/kg	5	160	180	610	530

**Exchangeable Cations and Cation Exchange Capacity (CEC/ESP/SAR) Method: AN122 Tested: 28/3/2018**

Exchangeable Sodium, Na	mg/kg	2	440	340	530	630
Exchangeable Sodium, Na	meq/100g	0.01	1.9	1.5	2.3	2.7
Exchangeable Sodium Percentage*	%	0.1	19.3	10.3	10.6	13.1

**Moisture Content Method: AN002 Tested: 28/3/2018**

% Moisture	%w/w	0.5	11	13	18	18
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## ANALYTICAL REPORT

SE177214 R0

Parameter	Units	LOR	Sample Number	Sample Matrix	Sample Date	Sample Name	Sample Number	Sample Matrix	Sample Date	Sample Name	Sample Number	Sample Matrix	Sample Date	Sample Name
			SE177214.013	Soil	23 Mar 2018	BH5-0.5	SE177214.014	Soil	23 Mar 2018	BH5-1.0	SE177214.015	Soil	23 Mar 2018	BH5-1.5

**pH in soil (1:5) Method: AN101 Tested: 27/3/2018**

pH	pH Units	0.1	7.2	7.6	7.8	6.3
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**Conductivity and TDS by Calculation - Soil Method: AN106 Tested: 27/3/2018**

Conductivity of Extract (1:5 dry sample basis)	µS/cm	1	190	170	180	420
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**Soluble Anions (1:5) in Soil by Ion Chromatography Method: AN245 Tested: 28/3/2018**

Chloride	mg/kg	0.25	230	190	210	490
Sulfate	mg/kg	5	43	28	31	130

**Exchangeable Cations and Cation Exchange Capacity (CEC/ESP/SAR) Method: AN122 Tested: 28/3/2018**

Exchangeable Sodium, Na	mg/kg	2	760	720	750	450
Exchangeable Sodium, Na	meq/100g	0.01	3.3	3.1	3.2	2.0
Exchangeable Sodium Percentage*	%	0.1	22.4	22.5	23.2	23.7

**Moisture Content Method: AN002 Tested: 28/3/2018**

% Moisture	%w/w	0.5	6.8	6.6	6.0	6.5
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## ANALYTICAL REPORT

SE177214 R0

Parameter	Units	LOR	Sample Number	SE177214.017	SE177214.018	SE177214.019	SE177214.020
			Sample Matrix	Soil	Soil	Soil	Soil
			Sample Date	23 Mar 2018	23 Mar 2018	23 Mar 2018	23 Mar 2018
			Sample Name	BH6-1.0	BH6-1.5	BH7-0.5	BH7-1.0

**pH in soil (1:5) Method: AN101 Tested: 27/3/2018**

pH	pH Units	0.1	6.3	6.4	5.9	5.8
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**Conductivity and TDS by Calculation - Soil Method: AN106 Tested: 27/3/2018**

Conductivity of Extract (1:5 dry sample basis)	µS/cm	1	370	390	280	640
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**Soluble Anions (1:5) in Soil by Ion Chromatography Method: AN245 Tested: 28/3/2018**

Chloride	mg/kg	0.25	430	430	210	710
Sulfate	mg/kg	5	130	170	260	370

**Exchangeable Cations and Cation Exchange Capacity (CEC/ESP/SAR) Method: AN122 Tested: 28/3/2018**

Exchangeable Sodium, Na	mg/kg	2	460	400	430	770
Exchangeable Sodium, Na	meq/100g	0.01	2.0	1.7	1.9	3.3
Exchangeable Sodium Percentage*	%	0.1	23.6	21.6	11.0	17.9

**Moisture Content Method: AN002 Tested: 28/3/2018**

% Moisture	%w/w	0.5	6.7	5.7	14	17
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## ANALYTICAL REPORT

SE177214 R0

Parameter	Units	LOR	Sample Number	SE177214.021	SE177214.022	SE177214.023	SE177214.024
			Sample Matrix	Soil	Soil	Soil	Soil
			Sample Date	23 Mar 2018	23 Mar 2018	23 Mar 2018	23 Mar 2018
			Sample Name	BH7-1.5	BH8-0.5	BH8-1.0	BH8-1.5

**pH in soil (1:5) Method: AN101 Tested: 28/3/2018**

pH	pH Units	0.1	5.7	6.8	5.6	7.0
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**Conductivity and TDS by Calculation - Soil Method: AN106 Tested: 28/3/2018**

Conductivity of Extract (1:5 dry sample basis)	µS/cm	1	770	440	510	590
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**Soluble Anions (1:5) in Soil by Ion Chromatography Method: AN245 Tested: 29/3/2018**

Chloride	mg/kg	0.25	870	290	460	380
Sulfate	mg/kg	5	340	330	300	480

**Exchangeable Cations and Cation Exchange Capacity (CEC/ESP/SAR) Method: AN122 Tested: 28/3/2018**

Exchangeable Sodium, Na	mg/kg	2	790	380	730	490
Exchangeable Sodium, Na	meq/100g	0.01	3.4	1.7	3.2	2.1
Exchangeable Sodium Percentage*	%	0.1	19.6	9.9	17.7	12.8

**Moisture Content Method: AN002 Tested: 28/3/2018**

% Moisture	%w/w	0.5	17	21	18	19
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## ANALYTICAL REPORT

SE177214 R0

Parameter	Units	LOR	Sample Number	SE177214.025	SE177214.026	SE177214.027	SE177214.028
			Sample Matrix	Soil	Soil	Soil	Soil
			Sample Date	23 Mar 2018	23 Mar 2018	23 Mar 2018	23 Mar 2018
			Sample Name	BH9-0.5	BH9-1.0	BH9-1.5	BH10-0.5

**pH in soil (1:5) Method: AN101 Tested: 28/3/2018**

pH	pH Units	0.1	7.8	8.3	8.3	5.6
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**Conductivity and TDS by Calculation - Soil Method: AN106 Tested: 28/3/2018**

Conductivity of Extract (1:5 dry sample basis)	µS/cm	1	130	150	250	750
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**Soluble Anions (1:5) in Soil by Ion Chromatography Method: AN245 Tested: 29/3/2018**

Chloride	mg/kg	0.25	140	170	310	820
Sulfate	mg/kg	5	23	17	30	220

**Exchangeable Cations and Cation Exchange Capacity (CEC/ESP/SAR) Method: AN122 Tested: 28/3/2018**

Exchangeable Sodium, Na	mg/kg	2	640	720	920	600
Exchangeable Sodium, Na	meq/100g	0.01	2.8	3.1	4.0	2.6
Exchangeable Sodium Percentage*	%	0.1	22.3	22.9	22.9	19.3

**Moisture Content Method: AN002 Tested: 28/3/2018**

% Moisture	%w/w	0.5	6.0	6.4	8.1	14
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## ANALYTICAL REPORT

SE177214 R0

Parameter	Units	LOR	Sample Number	SE177214.029	SE177214.030	SE177214.031	SE177214.032
			Sample Matrix	Soil	Soil	Soil	Soil
			Sample Date	23 Mar 2018	23 Mar 2018	23 Mar 2018	23 Mar 2018
			Sample Name	BH10-1.0	BH10-1.5	BH11-0.5	BH11-1.0

**pH in soil (1:5) Method: AN101 Tested: 28/3/2018**

pH	pH Units	0.1	5.6	5.7	5.9	5.8
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**Conductivity and TDS by Calculation - Soil Method: AN106 Tested: 28/3/2018**

Conductivity of Extract (1:5 dry sample basis)	µS/cm	1	930	1100	910	1300
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**Soluble Anions (1:5) in Soil by Ion Chromatography Method: AN245 Tested: 29/3/2018**

Chloride	mg/kg	0.25	1100	1500	1300	1800
Sulfate	mg/kg	5	300	450	67	120

**Exchangeable Cations and Cation Exchange Capacity (CEC/ESP/SAR) Method: AN122 Tested: 28/3/2018**

Exchangeable Sodium, Na	mg/kg	2	780	700	410	620
Exchangeable Sodium, Na	meq/100g	0.01	3.4	3.0	1.8	2.7
Exchangeable Sodium Percentage*	%	0.1	23.3	23.0	12.1	15.1

**Moisture Content Method: AN002 Tested: 28/3/2018**

% Moisture	%w/w	0.5	13	12	13	16
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## ANALYTICAL REPORT

SE177214 R0

Sample Number	SE177214.033	Sample Matrix	Soil	Sample Date	23 Mar 2018	Sample Name	BH11-1.5	SE177214.034	Soil	SE177214.035	Soil	SE177214.036	Soil

Parameter	Units	LOR
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**pH in soil (1:5) Method: AN101 Tested: 28/3/2018**

pH	pH Units	0.1	6.1	6.0	5.2	5.1
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**Conductivity and TDS by Calculation - Soil Method: AN106 Tested: 28/3/2018**

Conductivity of Extract (1:5 dry sample basis)	µS/cm	1	1100	77	660	720
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**Soluble Anions (1:5) in Soil by Ion Chromatography Method: AN245 Tested: 29/3/2018**

Chloride	mg/kg	0.25	1600	31	680	2100
Sulfate	mg/kg	5	83	87	400	1100

**Exchangeable Cations and Cation Exchange Capacity (CEC/ESP/SAR) Method: AN122 Tested: 28/3/2018**

Exchangeable Sodium, Na	mg/kg	2	680	200	320	450
Exchangeable Sodium, Na	meq/100g	0.01	2.9	0.89	1.4	2.0
Exchangeable Sodium Percentage*	%	0.1	18.7	8.3	11.6	14.9

**Moisture Content Method: AN002 Tested: 28/3/2018**

% Moisture	%w/w	0.5	11	11	14	13
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## ANALYTICAL REPORT

SE177214 R0

Parameter	Units	LOR	Sample Number	SE177214.037	SE177214.038	SE177214.039	SE177214.040
			Sample Matrix	Soil	Soil	Soil	Soil
			Sample Date	23 Mar 2018	23 Mar 2018	23 Mar 2018	23 Mar 2018
			Sample Name	BH13-0.5	BH13-1.0	BH13-1.5	BH14-0.5

**pH in soil (1:5) Method: AN101 Tested: 28/3/2018**

pH	pH Units	0.1	5.4	5.3	5.6	7.3
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**Conductivity and TDS by Calculation - Soil Method: AN106 Tested: 28/3/2018**

Conductivity of Extract (1:5 dry sample basis)	µS/cm	1	360	430	530	190
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**Soluble Anions (1:5) in Soil by Ion Chromatography Method: AN245 Tested: 29/3/2018**

Chloride	mg/kg	0.25	270	400	520	6.0
Sulfate	mg/kg	5	260	250	360	290

**Exchangeable Cations and Cation Exchange Capacity (CEC/ESP/SAR) Method: AN122 Tested: 28/3/2018**

Exchangeable Sodium, Na	mg/kg	2	1200	1400	1100	83
Exchangeable Sodium, Na	meq/100g	0.01	5.0	6.0	4.6	0.36
Exchangeable Sodium Percentage*	%	0.1	22.0	23.9	24.5	1.9

**Moisture Content Method: AN002 Tested: 28/3/2018**

% Moisture	%w/w	0.5	17	18	16	9.7
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## ANALYTICAL REPORT

SE177214 R0

Sample Number	SE177214.041	SE177214.042
Sample Matrix	Soil	Soil
Sample Date	23 Mar 2018	23 Mar 2018
Sample Name	BH14-1.0	BH14-1.5

Parameter	Units	LOR
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**pH in soil (1:5) Method: AN101 Tested: 28/3/2018**

pH	pH Units	0.1	7.3	7.0
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**Conductivity and TDS by Calculation - Soil Method: AN106 Tested: 28/3/2018**

Conductivity of Extract (1:5 dry sample basis)	µS/cm	1	170	240
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**Soluble Anions (1:5) in Soil by Ion Chromatography Method: AN245 Tested: 29/3/2018**

Chloride	mg/kg	0.25	4.0	7.9
Sulfate	mg/kg	5	270	470

**Exchangeable Cations and Cation Exchange Capacity (CEC/ESP/SAR) Method: AN122 Tested: 28/3/2018**

Exchangeable Sodium, Na	mg/kg	2	96	140
Exchangeable Sodium, Na	meq/100g	0.01	0.42	0.63
Exchangeable Sodium Percentage*	%	0.1	2.4	3.8

**Moisture Content Method: AN002 Tested: 28/3/2018**

% Moisture	%w/w	0.5	10	10
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MB blank results are compared to the Limit of Reporting

LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared to the amount of analyte spiked into the sample.

DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula : *the absolute difference of the two results divided by the average of the two results as a percentage*. Where the DUP RPD is 'NA', the results are less than the LOR and thus the RPD is not applicable.

**Conductivity and TDS by Calculation - Soil   Method: ME-(AU)-[ENV]AN106**

Parameter	QC Reference	Units	LOR	DUP %RPD	LCS %Recovery
Conductivity of Extract (1:5 dry sample basis)	LB144429	µS/cm	1	1 - 19%	102%
	LB144493	µS/cm	1	2 - 4%	105%

**Exchangeable Cations and Cation Exchange Capacity (CEC/ESP/SAR)   Method: ME-(AU)-[ENV]AN122**

Parameter	QC Reference	Units	LOR	MB	LCS %Recovery
Exchangeable Sodium, Na	LB144555	mg/kg	2	<0.01	115%
	LB144556	mg/kg	2		115%
Exchangeable Sodium, Na	LB144555	meq/100g	0.01	<0.01	NA
	LB144556	meq/100g	0.01		NA
Exchangeable Sodium Percentage*	LB144555	%	0.1	<0.01	NA
	LB144556	%	0.1		NA

**Moisture Content   Method: ME-(AU)-[ENV]AN002**

Parameter	QC Reference	Units	LOR	DUP %RPD
% Moisture	LB144542	%w/w	0.5	0 - 3%

**pH in soil (1:5)   Method: ME-(AU)-[ENV]AN101**

Parameter	QC Reference	Units	LOR	DUP %RPD	LCS %Recovery
pH	LB144429	pH Units	0.1	1 - 2%	101%
	LB144493	pH Units	0.1	1%	101%

**Soluble Anions (1:5) in Soil by Ion Chromatography   Method: ME-(AU)-[ENV]AN245**

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Chloride	LB144534	mg/kg	0.25	<0.25	5 - 20%	98%
	LB144600	mg/kg	0.25	<0.25	2 - 13%	98%
Sulfate	LB144534	mg/kg	5	<5.0	6 - 37%	96%
	LB144600	mg/kg	5	<5.0	0 - 6%	96%

**METHOD****METHODOLOGY SUMMARY**

AN002

The test is carried out by drying (at either 40°C or 105°C) a known mass of sample in a weighed evaporating basin. After fully dry the sample is re-weighed. Samples such as sludge and sediment having high percentages of moisture will take some time in a drying oven for complete removal of water.

AN101

pH in Soil Sludge Sediment and Water: pH is measured electrometrically using a combination electrode and is calibrated against 3 buffers purchased commercially. For soils, sediments and sludges, an extract with water (or 0.01M CaCl<sub>2</sub>) is made at a ratio of 1:5 and the pH determined and reported on the extract. Reference APHA 4500-H<sub>+</sub>.

AN106

Conductivity and TDS by Calculation: Conductivity is measured by meter with temperature compensation and is calibrated against a standard solution of potassium chloride. Conductivity is generally reported as µhos/cm or µS/cm @ 25°C. For soils, an extract with water is made at a ratio of 1:5 and the EC determined and reported on the extract, or calculated back to the as-received sample. Salinity can be estimated from conductivity using a conversion factor, which for natural waters, is in the range 0.55 to 0.75. Reference APHA 2510 B.

AN122

Exchangeable Cations, CEC and ESP: Soil sample is extracted in 1M Ammonium Acetate at pH=7 (or 1M Ammonium Chloride at pH=7) with cations (Na, K, Ca & Mg) then determined by ICP OES/ICP MS and reported as Exchangeable Cations. For saline soils, these results can be corrected for water soluble cations and reported as Exchangeable cations in meq/100g or soil can be pre-treated (aqueous ethanol/aqueous glycerol) prior to extraction. Cation Exchange Capacity (CEC) is the sum of the exchangeable cations in meq/100g.

AN122

The Exchangeable Sodium Percentage (ESP) is calculated as the exchangeable sodium divided by the CEC (all in meq/100g) times 100.

ESP can be used to categorise the sodicity of the soil as below:

ESP < 6%	non-sodic
ESP 6-15%	sodic
ESP >15%	strongly sodic

Method is referenced to Rayment and Lyons, 2011, sections 15D3 and 15N1.-

AN245

Anions by Ion Chromatography: A water sample is injected into an eluent stream that passes through the ion chromatographic system where the anions of interest ie Br, Cl, NO<sub>2</sub>, NO<sub>3</sub> and SO<sub>4</sub> are separated on their relative affinities for the active sites on the column packing material. Changes to the conductivity and the UV-visible absorbance of the eluent enable identification and quantitation of the anions based on their retention time and peak height or area. APHA 4110 B

## FOOTNOTES

IS Insufficient sample for analysis.  
LNR Sample listed, but not received.  
\* NATA accreditation does not cover the performance of this service.  
\*\* Indicative data, theoretical holding time exceeded.

LOR Limit of Reporting  
↑ Raised or Lowered Limit of Reporting  
QFH QC result is above the upper tolerance  
QFL QC result is below the lower tolerance  
- The sample was not analysed for this analyte  
NVL Not Validated

Samples analysed as received.

Solid samples expressed on a dry weight basis.

Where "Total" analyte groups are reported (for example, Total PAHs, Total OC Pesticides) the total will be calculated as the sum of the individual analytes, with those analytes that are reported as <LOR being assumed to be zero. The summed (Total) limit of reporting is calculated by summing the individual analyte LORs and dividing by two. For example, where 16 individual analytes are being summed and each has an LOR of 0.1 mg/kg, the "Totals" LOR will be 1.6 / 2 (0.8 mg/kg). Where only 2 analytes are being summed, the "Total" LOR will be the sum of those two LORs.

Some totals may not appear to add up because the total is rounded after adding up the raw values.

If reported, measurement uncertainty follows the ± sign after the analytical result and is expressed as the expanded uncertainty calculated using a coverage factor of 2, providing a level of confidence of approximately 95%, unless stated otherwise in the comments section of this report.

Results reported for samples tested under test methods with codes starting with ARS-SOP, radionuclide or gross radioactivity concentrations are expressed in becquerel (Bq) per unit of mass or volume or per wipe as stated on the report. Becquerel is the SI unit for activity and equals one nuclear transformation per second.

Note that in terms of units of radioactivity:

- a. 1 Bq is equivalent to 27 pCi
- b. 37 MBq is equivalent to 1 mCi

For results reported for samples tested under test methods with codes starting with ARS-SOP, less than (<) values indicate the detection limit for each radionuclide or parameter for the measurement system used. The respective detection limits have been calculated in accordance with ISO 11929.

The QC criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here : <http://www.sgs.com.au/~media/Local/Australia/Documents/Technical%20Documents/MP-AU-ENV-QU-022%20QA%20QC%20Plan.pdf>

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## STATEMENT OF QA/QC PERFORMANCE

SE177214 R0

### CLIENT DETAILS

Contact Craig Cowper  
Client ALLIANCE GEOTECHNICAL PTY LTD  
Address 10 Welder Road  
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Facsimile 02 9675 1888  
Email c.cowper@allgeo.com.au  
  
Project **6930 - Austral**  
Order Number **P990**  
Samples **42**

### LABORATORY DETAILS

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Email au.environmental.sydney@sgs.com  
  
SGS Reference **SE177214 R0**  
Date Received 26 Mar 2018  
Date Reported 04 Apr 2018

### COMMENTS

All the laboratory data for each environmental matrix was compared to SGS' stated Data Quality Objectives (DQO). Comments arising from the comparison were made and are reported below.

The data relating to sampling was taken from the Chain of Custody document and was supplied by the Client.  
This QA/QC Statement must be read in conjunction with the referenced Analytical Report.  
The Statement and the Analytical Report must not be reproduced except in full.

All Data Quality Objectives were met with the exception of the following:

Duplicate	Soluble Anions (1:5) in Soil by Ion Chromatography	1 item
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### SAMPLE SUMMARY

Samples clearly labelled	Yes	Complete documentation received	Yes
Sample container provider	SGS	Sample cooling method	Ice Bricks
Samples received in correct containers	Yes	Sample counts by matrix	42 Soil
Date documentation received	26/3/2018	Type of documentation received	COC
Samples received in good order	Yes	Samples received without headspace	Yes
Sample temperature upon receipt	5.2°C	Sufficient sample for analysis	Yes
Turnaround time requested	Standard		

SGS holding time criteria are drawn from current regulations and are highly dependent on sample container preservation as specified in the SGS "Field Sampling Guide for Containers and Holding Time" (ref: GU-(AU)-ENV.001). Soil samples guidelines are derived from NEPM "Schedule B(3) Guideline on Laboratory Analysis of Potentially Contaminated Soils". Water sample guidelines are derived from "AS/NZS 5667.1 : 1998 Water Quality - sampling part 1" and APHA "Standard Methods for the Examination of Water and Wastewater" 21st edition 2005.

Extraction and analysis holding time due dates listed are calculated from the date sampled, although holding times may be extended after laboratory extraction for some analytes. The due dates are the suggested dates that samples may be held before extraction or analysis and still be considered valid.

Extraction and analysis dates are shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria. If the sampled date is not supplied then compliance with criteria cannot be determined. If the received date is after one or both due dates then holding time will fail by default.

#### Conductivity and TDS by Calculation - Soil

Method: ME-(AU)-[ENV]AN106

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH1-0.5	SE177214.001	LB144429	23 Mar 2018	26 Mar 2018	30 Mar 2018	27 Mar 2018	30 Mar 2018	29 Mar 2018
BH1-1.0	SE177214.002	LB144429	23 Mar 2018	26 Mar 2018	30 Mar 2018	27 Mar 2018	30 Mar 2018	29 Mar 2018
BH1-1.5	SE177214.003	LB144429	23 Mar 2018	26 Mar 2018	30 Mar 2018	27 Mar 2018	30 Mar 2018	29 Mar 2018
BH2-0.5	SE177214.004	LB144429	23 Mar 2018	26 Mar 2018	30 Mar 2018	27 Mar 2018	30 Mar 2018	29 Mar 2018
BH2-1.0	SE177214.005	LB144429	23 Mar 2018	26 Mar 2018	30 Mar 2018	27 Mar 2018	30 Mar 2018	29 Mar 2018
BH2-1.5	SE177214.006	LB144429	23 Mar 2018	26 Mar 2018	30 Mar 2018	27 Mar 2018	30 Mar 2018	29 Mar 2018
BH3-0.5	SE177214.007	LB144429	23 Mar 2018	26 Mar 2018	30 Mar 2018	27 Mar 2018	30 Mar 2018	29 Mar 2018
BH3-1.0	SE177214.008	LB144429	23 Mar 2018	26 Mar 2018	30 Mar 2018	27 Mar 2018	30 Mar 2018	29 Mar 2018
BH3-1.5	SE177214.009	LB144429	23 Mar 2018	26 Mar 2018	30 Mar 2018	27 Mar 2018	30 Mar 2018	29 Mar 2018
BH4-0.5	SE177214.010	LB144429	23 Mar 2018	26 Mar 2018	30 Mar 2018	27 Mar 2018	30 Mar 2018	29 Mar 2018
BH4-1.0	SE177214.011	LB144429	23 Mar 2018	26 Mar 2018	30 Mar 2018	27 Mar 2018	30 Mar 2018	29 Mar 2018
BH4-1.5	SE177214.012	LB144429	23 Mar 2018	26 Mar 2018	30 Mar 2018	27 Mar 2018	30 Mar 2018	29 Mar 2018
BH5-0.5	SE177214.013	LB144429	23 Mar 2018	26 Mar 2018	30 Mar 2018	27 Mar 2018	30 Mar 2018	29 Mar 2018
BH5-1.0	SE177214.014	LB144429	23 Mar 2018	26 Mar 2018	30 Mar 2018	27 Mar 2018	30 Mar 2018	29 Mar 2018
BH5-1.5	SE177214.015	LB144429	23 Mar 2018	26 Mar 2018	30 Mar 2018	27 Mar 2018	30 Mar 2018	29 Mar 2018
BH6-0.5	SE177214.016	LB144429	23 Mar 2018	26 Mar 2018	30 Mar 2018	27 Mar 2018	30 Mar 2018	29 Mar 2018
BH6-1.0	SE177214.017	LB144429	23 Mar 2018	26 Mar 2018	30 Mar 2018	27 Mar 2018	30 Mar 2018	29 Mar 2018
BH6-1.5	SE177214.018	LB144429	23 Mar 2018	26 Mar 2018	30 Mar 2018	27 Mar 2018	30 Mar 2018	29 Mar 2018
BH7-0.5	SE177214.019	LB144429	23 Mar 2018	26 Mar 2018	30 Mar 2018	27 Mar 2018	30 Mar 2018	29 Mar 2018
BH7-1.0	SE177214.020	LB144429	23 Mar 2018	26 Mar 2018	30 Mar 2018	27 Mar 2018	30 Mar 2018	29 Mar 2018
BH7-1.5	SE177214.021	LB144493	23 Mar 2018	26 Mar 2018	30 Mar 2018	28 Mar 2018	30 Mar 2018	29 Mar 2018
BH8-0.5	SE177214.022	LB144493	23 Mar 2018	26 Mar 2018	30 Mar 2018	28 Mar 2018	30 Mar 2018	29 Mar 2018
BH8-1.0	SE177214.023	LB144493	23 Mar 2018	26 Mar 2018	30 Mar 2018	28 Mar 2018	30 Mar 2018	29 Mar 2018
BH8-1.5	SE177214.024	LB144493	23 Mar 2018	26 Mar 2018	30 Mar 2018	28 Mar 2018	30 Mar 2018	29 Mar 2018
BH9-0.5	SE177214.025	LB144493	23 Mar 2018	26 Mar 2018	30 Mar 2018	28 Mar 2018	30 Mar 2018	29 Mar 2018
BH9-1.0	SE177214.026	LB144493	23 Mar 2018	26 Mar 2018	30 Mar 2018	28 Mar 2018	30 Mar 2018	29 Mar 2018
BH9-1.5	SE177214.027	LB144493	23 Mar 2018	26 Mar 2018	30 Mar 2018	28 Mar 2018	30 Mar 2018	29 Mar 2018
BH10-0.5	SE177214.028	LB144493	23 Mar 2018	26 Mar 2018	30 Mar 2018	28 Mar 2018	30 Mar 2018	29 Mar 2018
BH10-1.0	SE177214.029	LB144493	23 Mar 2018	26 Mar 2018	30 Mar 2018	28 Mar 2018	30 Mar 2018	29 Mar 2018
BH10-1.5	SE177214.030	LB144493	23 Mar 2018	26 Mar 2018	30 Mar 2018	28 Mar 2018	30 Mar 2018	29 Mar 2018
BH11-0.5	SE177214.031	LB144493	23 Mar 2018	26 Mar 2018	30 Mar 2018	28 Mar 2018	30 Mar 2018	29 Mar 2018
BH11-1.0	SE177214.032	LB144493	23 Mar 2018	26 Mar 2018	30 Mar 2018	28 Mar 2018	30 Mar 2018	29 Mar 2018
BH11-1.5	SE177214.033	LB144493	23 Mar 2018	26 Mar 2018	30 Mar 2018	28 Mar 2018	30 Mar 2018	29 Mar 2018
BH12-0.5	SE177214.034	LB144493	23 Mar 2018	26 Mar 2018	30 Mar 2018	28 Mar 2018	30 Mar 2018	29 Mar 2018
BH12-1.0	SE177214.035	LB144493	23 Mar 2018	26 Mar 2018	30 Mar 2018	28 Mar 2018	30 Mar 2018	29 Mar 2018
BH12-1.5	SE177214.036	LB144493	23 Mar 2018	26 Mar 2018	30 Mar 2018	28 Mar 2018	30 Mar 2018	29 Mar 2018
BH13-0.5	SE177214.037	LB144493	23 Mar 2018	26 Mar 2018	30 Mar 2018	28 Mar 2018	30 Mar 2018	29 Mar 2018
BH13-1.0	SE177214.038	LB144493	23 Mar 2018	26 Mar 2018	30 Mar 2018	28 Mar 2018	30 Mar 2018	29 Mar 2018
BH13-1.5	SE177214.039	LB144493	23 Mar 2018	26 Mar 2018	30 Mar 2018	28 Mar 2018	30 Mar 2018	29 Mar 2018
BH14-0.5	SE177214.040	LB144493	23 Mar 2018	26 Mar 2018	30 Mar 2018	28 Mar 2018	30 Mar 2018	29 Mar 2018
BH14-1.0	SE177214.041	LB144493	23 Mar 2018	26 Mar 2018	30 Mar 2018	28 Mar 2018	30 Mar 2018	29 Mar 2018
BH14-1.5	SE177214.042	LB144493	23 Mar 2018	26 Mar 2018	30 Mar 2018	28 Mar 2018	30 Mar 2018	29 Mar 2018

#### Exchangeable Cations and Cation Exchange Capacity (CEC/ESP/SAR)

Method: ME-(AU)-[ENV]AN122

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH1-0.5	SE177214.001	LB144555	23 Mar 2018	26 Mar 2018	20 Apr 2018	28 Mar 2018	20 Apr 2018	03 Apr 2018
BH1-1.0	SE177214.002	LB144555	23 Mar 2018	26 Mar 2018	20 Apr 2018	28 Mar 2018	20 Apr 2018	03 Apr 2018
BH1-1.5	SE177214.003	LB144555	23 Mar 2018	26 Mar 2018	20 Apr 2018	28 Mar 2018	20 Apr 2018	03 Apr 2018
BH2-0.5	SE177214.004	LB144555	23 Mar 2018	26 Mar 2018	20 Apr 2018	28 Mar 2018	20 Apr 2018	03 Apr 2018
BH2-1.0	SE177214.005	LB144555	23 Mar 2018	26 Mar 2018	20 Apr 2018	28 Mar 2018	20 Apr 2018	03 Apr 2018
BH2-1.5	SE177214.006	LB144555	23 Mar 2018	26 Mar 2018	20 Apr 2018	28 Mar 2018	20 Apr 2018	03 Apr 2018
BH3-0.5	SE177214.007	LB144555	23 Mar 2018	26 Mar 2018	20 Apr 2018	28 Mar 2018	20 Apr 2018	03 Apr 2018
BH3-1.0	SE177214.008	LB144555	23 Mar 2018	26 Mar 2018	20 Apr 2018	28 Mar 2018	20 Apr 2018	03 Apr 2018
BH3-1.5	SE177214.009	LB144555	23 Mar 2018	26 Mar 2018	20 Apr 2018	28 Mar 2018	20 Apr 2018	03 Apr 2018
BH4-0.5	SE177214.010	LB144555	23 Mar 2018	26 Mar 2018	20 Apr 2018	28 Mar 2018	20 Apr 2018	03 Apr 2018
BH4-1.0	SE177214.011	LB144555	23 Mar 2018	26 Mar 2018	20 Apr 2018	28 Mar 2018	20 Apr 2018	03 Apr 2018
BH4-1.5	SE177214.012	LB144555	23 Mar 2018	26 Mar 2018	20 Apr 2018	28 Mar 2018	20 Apr 2018	03 Apr 2018
BH5-0.5	SE177214.013	LB144555	23 Mar 2018	26 Mar 2018	20 Apr 2018	28 Mar 2018	20 Apr 2018	03 Apr 2018
BH5-1.0	SE177214.014	LB144555	23 Mar 2018	26 Mar 2018	20 Apr 2018	28 Mar 2018	20 Apr 2018	03 Apr 2018
BH5-1.5	SE177214.015	LB144555	23 Mar 2018	26 Mar 2018	20 Apr 2018	28 Mar 2018	20 Apr 2018	03 Apr 2018

SGS holding time criteria are drawn from current regulations and are highly dependent on sample container preservation as specified in the SGS "Field Sampling Guide for Containers and Holding Time" (ref: GU-(AU)-ENV.001). Soil samples guidelines are derived from NEPM "Schedule B(3) Guideline on Laboratory Analysis of Potentially Contaminated Soils". Water sample guidelines are derived from "AS/NZS 5667.1 : 1998 Water Quality - sampling part 1" and APHA "Standard Methods for the Examination of Water and Wastewater" 21st edition 2005.

Extraction and analysis holding time due dates listed are calculated from the date sampled, although holding times may be extended after laboratory extraction for some analytes. The due dates are the suggested dates that samples may be held before extraction or analysis and still be considered valid.

Extraction and analysis dates are shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria. If the sampled date is not supplied then compliance with criteria cannot be determined. If the received date is after one or both due dates then holding time will fail by default.

**Exchangeable Cations and Cation Exchange Capacity (CEC/ESP/SAR) (continued)**
**Method: ME-(AU)-[ENV]AN122**

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH6-0.5	SE177214.016	LB144555	23 Mar 2018	26 Mar 2018	20 Apr 2018	28 Mar 2018	20 Apr 2018	03 Apr 2018
BH6-1.0	SE177214.017	LB144555	23 Mar 2018	26 Mar 2018	20 Apr 2018	28 Mar 2018	20 Apr 2018	03 Apr 2018
BH6-1.5	SE177214.018	LB144555	23 Mar 2018	26 Mar 2018	20 Apr 2018	28 Mar 2018	20 Apr 2018	03 Apr 2018
BH7-0.5	SE177214.019	LB144555	23 Mar 2018	26 Mar 2018	20 Apr 2018	28 Mar 2018	20 Apr 2018	03 Apr 2018
BH7-1.0	SE177214.020	LB144555	23 Mar 2018	26 Mar 2018	20 Apr 2018	28 Mar 2018	20 Apr 2018	03 Apr 2018
BH7-1.5	SE177214.021	LB144555	23 Mar 2018	26 Mar 2018	20 Apr 2018	28 Mar 2018	20 Apr 2018	03 Apr 2018
BH8-0.5	SE177214.022	LB144555	23 Mar 2018	26 Mar 2018	20 Apr 2018	28 Mar 2018	20 Apr 2018	03 Apr 2018
BH8-1.0	SE177214.023	LB144556	23 Mar 2018	26 Mar 2018	20 Apr 2018	28 Mar 2018	20 Apr 2018	03 Apr 2018
BH8-1.5	SE177214.024	LB144556	23 Mar 2018	26 Mar 2018	20 Apr 2018	28 Mar 2018	20 Apr 2018	03 Apr 2018
BH9-0.5	SE177214.025	LB144556	23 Mar 2018	26 Mar 2018	20 Apr 2018	28 Mar 2018	20 Apr 2018	03 Apr 2018
BH9-1.0	SE177214.026	LB144556	23 Mar 2018	26 Mar 2018	20 Apr 2018	28 Mar 2018	20 Apr 2018	03 Apr 2018
BH9-1.5	SE177214.027	LB144556	23 Mar 2018	26 Mar 2018	20 Apr 2018	28 Mar 2018	20 Apr 2018	03 Apr 2018
BH10-0.5	SE177214.028	LB144556	23 Mar 2018	26 Mar 2018	20 Apr 2018	28 Mar 2018	20 Apr 2018	03 Apr 2018
BH10-1.0	SE177214.029	LB144556	23 Mar 2018	26 Mar 2018	20 Apr 2018	28 Mar 2018	20 Apr 2018	03 Apr 2018
BH10-1.5	SE177214.030	LB144556	23 Mar 2018	26 Mar 2018	20 Apr 2018	28 Mar 2018	20 Apr 2018	03 Apr 2018
BH11-0.5	SE177214.031	LB144556	23 Mar 2018	26 Mar 2018	20 Apr 2018	28 Mar 2018	20 Apr 2018	03 Apr 2018
BH11-1.0	SE177214.032	LB144556	23 Mar 2018	26 Mar 2018	20 Apr 2018	28 Mar 2018	20 Apr 2018	03 Apr 2018
BH11-1.5	SE177214.033	LB144556	23 Mar 2018	26 Mar 2018	20 Apr 2018	28 Mar 2018	20 Apr 2018	03 Apr 2018
BH12-0.5	SE177214.034	LB144556	23 Mar 2018	26 Mar 2018	20 Apr 2018	28 Mar 2018	20 Apr 2018	03 Apr 2018
BH12-1.0	SE177214.035	LB144556	23 Mar 2018	26 Mar 2018	20 Apr 2018	28 Mar 2018	20 Apr 2018	03 Apr 2018
BH12-1.5	SE177214.036	LB144556	23 Mar 2018	26 Mar 2018	20 Apr 2018	28 Mar 2018	20 Apr 2018	03 Apr 2018
BH13-0.5	SE177214.037	LB144556	23 Mar 2018	26 Mar 2018	20 Apr 2018	28 Mar 2018	20 Apr 2018	03 Apr 2018
BH13-1.0	SE177214.038	LB144556	23 Mar 2018	26 Mar 2018	20 Apr 2018	28 Mar 2018	20 Apr 2018	03 Apr 2018
BH13-1.5	SE177214.039	LB144556	23 Mar 2018	26 Mar 2018	20 Apr 2018	28 Mar 2018	20 Apr 2018	03 Apr 2018
BH14-0.5	SE177214.040	LB144556	23 Mar 2018	26 Mar 2018	20 Apr 2018	28 Mar 2018	20 Apr 2018	03 Apr 2018
BH14-1.0	SE177214.041	LB144556	23 Mar 2018	26 Mar 2018	20 Apr 2018	28 Mar 2018	20 Apr 2018	03 Apr 2018
BH14-1.5	SE177214.042	LB144556	23 Mar 2018	26 Mar 2018	20 Apr 2018	28 Mar 2018	20 Apr 2018	03 Apr 2018

**Moisture Content**
**Method: ME-(AU)-[ENV]AN002**

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH1-0.5	SE177214.001	LB144542	23 Mar 2018	26 Mar 2018	06 Apr 2018	28 Mar 2018	02 Apr 2018	29 Mar 2018
BH1-1.0	SE177214.002	LB144542	23 Mar 2018	26 Mar 2018	06 Apr 2018	28 Mar 2018	02 Apr 2018	29 Mar 2018
BH1-1.5	SE177214.003	LB144542	23 Mar 2018	26 Mar 2018	06 Apr 2018	28 Mar 2018	02 Apr 2018	29 Mar 2018
BH2-0.5	SE177214.004	LB144542	23 Mar 2018	26 Mar 2018	06 Apr 2018	28 Mar 2018	02 Apr 2018	29 Mar 2018
BH2-1.0	SE177214.005	LB144542	23 Mar 2018	26 Mar 2018	06 Apr 2018	28 Mar 2018	02 Apr 2018	29 Mar 2018
BH2-1.5	SE177214.006	LB144542	23 Mar 2018	26 Mar 2018	06 Apr 2018	28 Mar 2018	02 Apr 2018	29 Mar 2018
BH3-0.5	SE177214.007	LB144542	23 Mar 2018	26 Mar 2018	06 Apr 2018	28 Mar 2018	02 Apr 2018	29 Mar 2018
BH3-1.0	SE177214.008	LB144542	23 Mar 2018	26 Mar 2018	06 Apr 2018	28 Mar 2018	02 Apr 2018	29 Mar 2018
BH3-1.5	SE177214.009	LB144542	23 Mar 2018	26 Mar 2018	06 Apr 2018	28 Mar 2018	02 Apr 2018	29 Mar 2018
BH4-0.5	SE177214.010	LB144542	23 Mar 2018	26 Mar 2018	06 Apr 2018	28 Mar 2018	02 Apr 2018	29 Mar 2018
BH4-1.0	SE177214.011	LB144542	23 Mar 2018	26 Mar 2018	06 Apr 2018	28 Mar 2018	02 Apr 2018	29 Mar 2018
BH4-1.5	SE177214.012	LB144542	23 Mar 2018	26 Mar 2018	06 Apr 2018	28 Mar 2018	02 Apr 2018	29 Mar 2018
BH5-0.5	SE177214.013	LB144542	23 Mar 2018	26 Mar 2018	06 Apr 2018	28 Mar 2018	02 Apr 2018	29 Mar 2018
BH5-1.0	SE177214.014	LB144542	23 Mar 2018	26 Mar 2018	06 Apr 2018	28 Mar 2018	02 Apr 2018	29 Mar 2018
BH5-1.5	SE177214.015	LB144542	23 Mar 2018	26 Mar 2018	06 Apr 2018	28 Mar 2018	02 Apr 2018	29 Mar 2018
BH6-0.5	SE177214.016	LB144542	23 Mar 2018	26 Mar 2018	06 Apr 2018	28 Mar 2018	02 Apr 2018	29 Mar 2018
BH6-1.0	SE177214.017	LB144542	23 Mar 2018	26 Mar 2018	06 Apr 2018	28 Mar 2018	02 Apr 2018	29 Mar 2018
BH6-1.5	SE177214.018	LB144542	23 Mar 2018	26 Mar 2018	06 Apr 2018	28 Mar 2018	02 Apr 2018	29 Mar 2018
BH7-0.5	SE177214.019	LB144542	23 Mar 2018	26 Mar 2018	06 Apr 2018	28 Mar 2018	02 Apr 2018	29 Mar 2018
BH7-1.0	SE177214.020	LB144542	23 Mar 2018	26 Mar 2018	06 Apr 2018	28 Mar 2018	02 Apr 2018	29 Mar 2018
BH7-1.5	SE177214.021	LB144542	23 Mar 2018	26 Mar 2018	06 Apr 2018	28 Mar 2018	02 Apr 2018	29 Mar 2018
BH8-0.5	SE177214.022	LB144542	23 Mar 2018	26 Mar 2018	06 Apr 2018	28 Mar 2018	02 Apr 2018	29 Mar 2018
BH8-1.0	SE177214.023	LB144542	23 Mar 2018	26 Mar 2018	06 Apr 2018	28 Mar 2018	02 Apr 2018	29 Mar 2018
BH8-1.5	SE177214.024	LB144542	23 Mar 2018	26 Mar 2018	06 Apr 2018	28 Mar 2018	02 Apr 2018	29 Mar 2018
BH9-0.5	SE177214.025	LB144542	23 Mar 2018	26 Mar 2018	06 Apr 2018	28 Mar 2018	02 Apr 2018	29 Mar 2018
BH9-1.0	SE177214.026	LB144542	23 Mar 2018	26 Mar 2018	06 Apr 2018	28 Mar 2018	02 Apr 2018	29 Mar 2018
BH9-1.5	SE177214.027	LB144542	23 Mar 2018	26 Mar 2018	06 Apr 2018	28 Mar 2018	02 Apr 2018	29 Mar 2018
BH10-0.5	SE177214.028	LB144542	23 Mar 2018	26 Mar 2018	06 Apr 2018	28 Mar 2018	02 Apr 2018	29 Mar 2018
BH10-1.0	SE177214.029	LB144542	23 Mar 2018	26 Mar 2018	06 Apr 2018	28 Mar 2018	02 Apr 2018	29 Mar 2018
BH10-1.5	SE177214.030	LB144542	23 Mar 2018	26 Mar 2018	06 Apr 2018	28 Mar 2018	02 Apr 2018	29 Mar 2018

SGS holding time criteria are drawn from current regulations and are highly dependent on sample container preservation as specified in the SGS "Field Sampling Guide for Containers and Holding Time" (ref: GU-(AU)-ENV.001). Soil samples guidelines are derived from NEPM "Schedule B(3) Guideline on Laboratory Analysis of Potentially Contaminated Soils". Water sample guidelines are derived from "AS/NZS 5667.1 : 1998 Water Quality - sampling part 1" and APHA "Standard Methods for the Examination of Water and Wastewater" 21st edition 2005.

Extraction and analysis holding time due dates listed are calculated from the date sampled, although holding times may be extended after laboratory extraction for some analytes. The due dates are the suggested dates that samples may be held before extraction or analysis and still be considered valid.

Extraction and analysis dates are shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria. If the sampled date is not supplied then compliance with criteria cannot be determined. If the received date is after one or both due dates then holding time will fail by default.

#### Moisture Content (continued)

Method: ME-(AU)-[ENV]AN002

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH11-0.5	SE177214.031	LB144542	23 Mar 2018	26 Mar 2018	06 Apr 2018	28 Mar 2018	02 Apr 2018	29 Mar 2018
BH11-1.0	SE177214.032	LB144542	23 Mar 2018	26 Mar 2018	06 Apr 2018	28 Mar 2018	02 Apr 2018	29 Mar 2018
BH11-1.5	SE177214.033	LB144542	23 Mar 2018	26 Mar 2018	06 Apr 2018	28 Mar 2018	02 Apr 2018	29 Mar 2018
BH12-0.5	SE177214.034	LB144542	23 Mar 2018	26 Mar 2018	06 Apr 2018	28 Mar 2018	02 Apr 2018	29 Mar 2018
BH12-1.0	SE177214.035	LB144542	23 Mar 2018	26 Mar 2018	06 Apr 2018	28 Mar 2018	02 Apr 2018	29 Mar 2018
BH12-1.5	SE177214.036	LB144542	23 Mar 2018	26 Mar 2018	06 Apr 2018	28 Mar 2018	02 Apr 2018	29 Mar 2018
BH13-0.5	SE177214.037	LB144542	23 Mar 2018	26 Mar 2018	06 Apr 2018	28 Mar 2018	02 Apr 2018	29 Mar 2018
BH13-1.0	SE177214.038	LB144542	23 Mar 2018	26 Mar 2018	06 Apr 2018	28 Mar 2018	02 Apr 2018	29 Mar 2018
BH13-1.5	SE177214.039	LB144542	23 Mar 2018	26 Mar 2018	06 Apr 2018	28 Mar 2018	02 Apr 2018	29 Mar 2018
BH14-0.5	SE177214.040	LB144542	23 Mar 2018	26 Mar 2018	06 Apr 2018	28 Mar 2018	02 Apr 2018	29 Mar 2018
BH14-1.0	SE177214.041	LB144542	23 Mar 2018	26 Mar 2018	06 Apr 2018	28 Mar 2018	02 Apr 2018	29 Mar 2018
BH14-1.5	SE177214.042	LB144542	23 Mar 2018	26 Mar 2018	06 Apr 2018	28 Mar 2018	02 Apr 2018	29 Mar 2018

#### pH in soil (1:5)

Method: ME-(AU)-[ENV]AN101

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH1-0.5	SE177214.001	LB144429	23 Mar 2018	26 Mar 2018	30 Mar 2018	27 Mar 2018	28 Mar 2018	28 Mar 2018
BH1-1.0	SE177214.002	LB144429	23 Mar 2018	26 Mar 2018	30 Mar 2018	27 Mar 2018	28 Mar 2018	28 Mar 2018
BH1-1.5	SE177214.003	LB144429	23 Mar 2018	26 Mar 2018	30 Mar 2018	27 Mar 2018	28 Mar 2018	28 Mar 2018
BH2-0.5	SE177214.004	LB144429	23 Mar 2018	26 Mar 2018	30 Mar 2018	27 Mar 2018	28 Mar 2018	28 Mar 2018
BH2-1.0	SE177214.005	LB144429	23 Mar 2018	26 Mar 2018	30 Mar 2018	27 Mar 2018	28 Mar 2018	28 Mar 2018
BH2-1.5	SE177214.006	LB144429	23 Mar 2018	26 Mar 2018	30 Mar 2018	27 Mar 2018	28 Mar 2018	28 Mar 2018
BH3-0.5	SE177214.007	LB144429	23 Mar 2018	26 Mar 2018	30 Mar 2018	27 Mar 2018	28 Mar 2018	28 Mar 2018
BH3-1.0	SE177214.008	LB144429	23 Mar 2018	26 Mar 2018	30 Mar 2018	27 Mar 2018	28 Mar 2018	28 Mar 2018
BH3-1.5	SE177214.009	LB144429	23 Mar 2018	26 Mar 2018	30 Mar 2018	27 Mar 2018	28 Mar 2018	28 Mar 2018
BH4-0.5	SE177214.010	LB144429	23 Mar 2018	26 Mar 2018	30 Mar 2018	27 Mar 2018	28 Mar 2018	28 Mar 2018
BH4-1.0	SE177214.011	LB144429	23 Mar 2018	26 Mar 2018	30 Mar 2018	27 Mar 2018	28 Mar 2018	28 Mar 2018
BH4-1.5	SE177214.012	LB144429	23 Mar 2018	26 Mar 2018	30 Mar 2018	27 Mar 2018	28 Mar 2018	28 Mar 2018
BH5-0.5	SE177214.013	LB144429	23 Mar 2018	26 Mar 2018	30 Mar 2018	27 Mar 2018	28 Mar 2018	28 Mar 2018
BH5-1.0	SE177214.014	LB144429	23 Mar 2018	26 Mar 2018	30 Mar 2018	27 Mar 2018	28 Mar 2018	28 Mar 2018
BH5-1.5	SE177214.015	LB144429	23 Mar 2018	26 Mar 2018	30 Mar 2018	27 Mar 2018	28 Mar 2018	28 Mar 2018
BH6-0.5	SE177214.016	LB144429	23 Mar 2018	26 Mar 2018	30 Mar 2018	27 Mar 2018	28 Mar 2018	28 Mar 2018
BH6-1.0	SE177214.017	LB144429	23 Mar 2018	26 Mar 2018	30 Mar 2018	27 Mar 2018	28 Mar 2018	28 Mar 2018
BH6-1.5	SE177214.018	LB144429	23 Mar 2018	26 Mar 2018	30 Mar 2018	27 Mar 2018	28 Mar 2018	28 Mar 2018
BH7-0.5	SE177214.019	LB144429	23 Mar 2018	26 Mar 2018	30 Mar 2018	27 Mar 2018	28 Mar 2018	28 Mar 2018
BH7-1.0	SE177214.020	LB144429	23 Mar 2018	26 Mar 2018	30 Mar 2018	27 Mar 2018	28 Mar 2018	28 Mar 2018
BH7-1.5	SE177214.021	LB144493	23 Mar 2018	26 Mar 2018	30 Mar 2018	28 Mar 2018	29 Mar 2018	29 Mar 2018
BH8-0.5	SE177214.022	LB144493	23 Mar 2018	26 Mar 2018	30 Mar 2018	28 Mar 2018	29 Mar 2018	29 Mar 2018
BH8-1.0	SE177214.023	LB144493	23 Mar 2018	26 Mar 2018	30 Mar 2018	28 Mar 2018	29 Mar 2018	29 Mar 2018
BH8-1.5	SE177214.024	LB144493	23 Mar 2018	26 Mar 2018	30 Mar 2018	28 Mar 2018	29 Mar 2018	29 Mar 2018
BH9-0.5	SE177214.025	LB144493	23 Mar 2018	26 Mar 2018	30 Mar 2018	28 Mar 2018	29 Mar 2018	29 Mar 2018
BH9-1.0	SE177214.026	LB144493	23 Mar 2018	26 Mar 2018	30 Mar 2018	28 Mar 2018	29 Mar 2018	29 Mar 2018
BH9-1.5	SE177214.027	LB144493	23 Mar 2018	26 Mar 2018	30 Mar 2018	28 Mar 2018	29 Mar 2018	29 Mar 2018
BH10-0.5	SE177214.028	LB144493	23 Mar 2018	26 Mar 2018	30 Mar 2018	28 Mar 2018	29 Mar 2018	29 Mar 2018
BH10-1.0	SE177214.029	LB144493	23 Mar 2018	26 Mar 2018	30 Mar 2018	28 Mar 2018	29 Mar 2018	29 Mar 2018
BH10-1.5	SE177214.030	LB144493	23 Mar 2018	26 Mar 2018	30 Mar 2018	28 Mar 2018	29 Mar 2018	29 Mar 2018
BH11-0.5	SE177214.031	LB144493	23 Mar 2018	26 Mar 2018	30 Mar 2018	28 Mar 2018	29 Mar 2018	29 Mar 2018
BH11-1.0	SE177214.032	LB144493	23 Mar 2018	26 Mar 2018	30 Mar 2018	28 Mar 2018	29 Mar 2018	29 Mar 2018
BH11-1.5	SE177214.033	LB144493	23 Mar 2018	26 Mar 2018	30 Mar 2018	28 Mar 2018	29 Mar 2018	29 Mar 2018
BH12-0.5	SE177214.034	LB144493	23 Mar 2018	26 Mar 2018	30 Mar 2018	28 Mar 2018	29 Mar 2018	29 Mar 2018
BH12-1.0	SE177214.035	LB144493	23 Mar 2018	26 Mar 2018	30 Mar 2018	28 Mar 2018	29 Mar 2018	29 Mar 2018
BH12-1.5	SE177214.036	LB144493	23 Mar 2018	26 Mar 2018	30 Mar 2018	28 Mar 2018	29 Mar 2018	29 Mar 2018
BH13-0.5	SE177214.037	LB144493	23 Mar 2018	26 Mar 2018	30 Mar 2018	28 Mar 2018	29 Mar 2018	29 Mar 2018
BH13-1.0	SE177214.038	LB144493	23 Mar 2018	26 Mar 2018	30 Mar 2018	28 Mar 2018	29 Mar 2018	29 Mar 2018
BH13-1.5	SE177214.039	LB144493	23 Mar 2018	26 Mar 2018	30 Mar 2018	28 Mar 2018	29 Mar 2018	29 Mar 2018
BH14-0.5	SE177214.040	LB144493	23 Mar 2018	26 Mar 2018	30 Mar 2018	28 Mar 2018	29 Mar 2018	29 Mar 2018
BH14-1.0	SE177214.041	LB144493	23 Mar 2018	26 Mar 2018	30 Mar 2018	28 Mar 2018	29 Mar 2018	29 Mar 2018
BH14-1.5	SE177214.042	LB144493	23 Mar 2018	26 Mar 2018	30 Mar 2018	28 Mar 2018	29 Mar 2018	29 Mar 2018

#### Soluble Anions (1:5) In Soil by Ion Chromatography

Method: ME-(AU)-[ENV]AN245

Sample Name	Sample No.	QC Ref
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SGS holding time criteria are drawn from current regulations and are highly dependent on sample container preservation as specified in the SGS "Field Sampling Guide for Containers and Holding Time" (ref: GU-(AU)-ENV.001). Soil samples guidelines are derived from NEPM "Schedule B(3) Guideline on Laboratory Analysis of Potentially Contaminated Soils". Water sample guidelines are derived from "AS/NZS 5667.1 : 1998 Water Quality - sampling part 1" and APHA "Standard Methods for the Examination of Water and Wastewater" 21st edition 2005.

Extraction and analysis holding time due dates listed are calculated from the date sampled, although holding times may be extended after laboratory extraction for some analytes. The due dates are the suggested dates that samples may be held before extraction or analysis and still be considered valid.

Extraction and analysis dates are shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria. If the sampled date is not supplied then compliance with criteria cannot be determined. If the received date is after one or both due dates then holding time will fail by default.

**Soluble Anions (1:5) in Soil by Ion Chromatography (continued)**
**Method: ME-(AU)-[ENV]AN245**

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH1-0.5	SE177214.001	LB144534	23 Mar 2018	26 Mar 2018	30 Mar 2018	28 Mar 2018	25 Apr 2018	04 Apr 2018
BH1-1.0	SE177214.002	LB144534	23 Mar 2018	26 Mar 2018	30 Mar 2018	28 Mar 2018	25 Apr 2018	04 Apr 2018
BH1-1.5	SE177214.003	LB144534	23 Mar 2018	26 Mar 2018	30 Mar 2018	28 Mar 2018	25 Apr 2018	04 Apr 2018
BH2-0.5	SE177214.004	LB144534	23 Mar 2018	26 Mar 2018	30 Mar 2018	28 Mar 2018	25 Apr 2018	04 Apr 2018
BH2-1.0	SE177214.005	LB144534	23 Mar 2018	26 Mar 2018	30 Mar 2018	28 Mar 2018	25 Apr 2018	04 Apr 2018
BH2-1.5	SE177214.006	LB144534	23 Mar 2018	26 Mar 2018	30 Mar 2018	28 Mar 2018	25 Apr 2018	04 Apr 2018
BH3-0.5	SE177214.007	LB144534	23 Mar 2018	26 Mar 2018	30 Mar 2018	28 Mar 2018	25 Apr 2018	04 Apr 2018
BH3-1.0	SE177214.008	LB144534	23 Mar 2018	26 Mar 2018	30 Mar 2018	28 Mar 2018	25 Apr 2018	04 Apr 2018
BH3-1.5	SE177214.009	LB144534	23 Mar 2018	26 Mar 2018	30 Mar 2018	28 Mar 2018	25 Apr 2018	04 Apr 2018
BH4-0.5	SE177214.010	LB144534	23 Mar 2018	26 Mar 2018	30 Mar 2018	28 Mar 2018	25 Apr 2018	04 Apr 2018
BH4-1.0	SE177214.011	LB144534	23 Mar 2018	26 Mar 2018	30 Mar 2018	28 Mar 2018	25 Apr 2018	04 Apr 2018
BH4-1.5	SE177214.012	LB144534	23 Mar 2018	26 Mar 2018	30 Mar 2018	28 Mar 2018	25 Apr 2018	04 Apr 2018
BH5-0.5	SE177214.013	LB144534	23 Mar 2018	26 Mar 2018	30 Mar 2018	28 Mar 2018	25 Apr 2018	04 Apr 2018
BH5-1.0	SE177214.014	LB144534	23 Mar 2018	26 Mar 2018	30 Mar 2018	28 Mar 2018	25 Apr 2018	04 Apr 2018
BH5-1.5	SE177214.015	LB144534	23 Mar 2018	26 Mar 2018	30 Mar 2018	28 Mar 2018	25 Apr 2018	04 Apr 2018
BH6-0.5	SE177214.016	LB144534	23 Mar 2018	26 Mar 2018	30 Mar 2018	28 Mar 2018	25 Apr 2018	04 Apr 2018
BH6-1.0	SE177214.017	LB144534	23 Mar 2018	26 Mar 2018	30 Mar 2018	28 Mar 2018	25 Apr 2018	04 Apr 2018
BH6-1.5	SE177214.018	LB144534	23 Mar 2018	26 Mar 2018	30 Mar 2018	28 Mar 2018	25 Apr 2018	04 Apr 2018
BH7-0.5	SE177214.019	LB144534	23 Mar 2018	26 Mar 2018	30 Mar 2018	28 Mar 2018	25 Apr 2018	04 Apr 2018
BH7-1.0	SE177214.020	LB144534	23 Mar 2018	26 Mar 2018	30 Mar 2018	28 Mar 2018	25 Apr 2018	04 Apr 2018
BH7-1.5	SE177214.021	LB144600	23 Mar 2018	26 Mar 2018	30 Mar 2018	29 Mar 2018	26 Apr 2018	04 Apr 2018
BH8-0.5	SE177214.022	LB144600	23 Mar 2018	26 Mar 2018	30 Mar 2018	29 Mar 2018	26 Apr 2018	04 Apr 2018
BH8-1.0	SE177214.023	LB144600	23 Mar 2018	26 Mar 2018	30 Mar 2018	29 Mar 2018	26 Apr 2018	04 Apr 2018
BH8-1.5	SE177214.024	LB144600	23 Mar 2018	26 Mar 2018	30 Mar 2018	29 Mar 2018	26 Apr 2018	04 Apr 2018
BH9-0.5	SE177214.025	LB144600	23 Mar 2018	26 Mar 2018	30 Mar 2018	29 Mar 2018	26 Apr 2018	04 Apr 2018
BH9-1.0	SE177214.026	LB144600	23 Mar 2018	26 Mar 2018	30 Mar 2018	29 Mar 2018	26 Apr 2018	04 Apr 2018
BH9-1.5	SE177214.027	LB144600	23 Mar 2018	26 Mar 2018	30 Mar 2018	29 Mar 2018	26 Apr 2018	04 Apr 2018
BH10-0.5	SE177214.028	LB144600	23 Mar 2018	26 Mar 2018	30 Mar 2018	29 Mar 2018	26 Apr 2018	04 Apr 2018
BH10-1.0	SE177214.029	LB144600	23 Mar 2018	26 Mar 2018	30 Mar 2018	29 Mar 2018	26 Apr 2018	04 Apr 2018
BH10-1.5	SE177214.030	LB144600	23 Mar 2018	26 Mar 2018	30 Mar 2018	29 Mar 2018	26 Apr 2018	04 Apr 2018
BH11-0.5	SE177214.031	LB144600	23 Mar 2018	26 Mar 2018	30 Mar 2018	29 Mar 2018	26 Apr 2018	04 Apr 2018
BH11-1.0	SE177214.032	LB144600	23 Mar 2018	26 Mar 2018	30 Mar 2018	29 Mar 2018	26 Apr 2018	04 Apr 2018
BH11-1.5	SE177214.033	LB144600	23 Mar 2018	26 Mar 2018	30 Mar 2018	29 Mar 2018	26 Apr 2018	04 Apr 2018
BH12-0.5	SE177214.034	LB144600	23 Mar 2018	26 Mar 2018	30 Mar 2018	29 Mar 2018	26 Apr 2018	04 Apr 2018
BH12-1.0	SE177214.035	LB144600	23 Mar 2018	26 Mar 2018	30 Mar 2018	29 Mar 2018	26 Apr 2018	04 Apr 2018
BH12-1.5	SE177214.036	LB144600	23 Mar 2018	26 Mar 2018	30 Mar 2018	29 Mar 2018	26 Apr 2018	04 Apr 2018
BH13-0.5	SE177214.037	LB144600	23 Mar 2018	26 Mar 2018	30 Mar 2018	29 Mar 2018	26 Apr 2018	04 Apr 2018
BH13-1.0	SE177214.038	LB144600	23 Mar 2018	26 Mar 2018	30 Mar 2018	29 Mar 2018	26 Apr 2018	04 Apr 2018
BH13-1.5	SE177214.039	LB144600	23 Mar 2018	26 Mar 2018	30 Mar 2018	29 Mar 2018	26 Apr 2018	04 Apr 2018
BH14-0.5	SE177214.040	LB144600	23 Mar 2018	26 Mar 2018	30 Mar 2018	29 Mar 2018	26 Apr 2018	04 Apr 2018
BH14-1.0	SE177214.041	LB144600	23 Mar 2018	26 Mar 2018	30 Mar 2018	29 Mar 2018	26 Apr 2018	04 Apr 2018
BH14-1.5	SE177214.042	LB144600	23 Mar 2018	26 Mar 2018	30 Mar 2018	29 Mar 2018	26 Apr 2018	04 Apr 2018

Surrogate results are evaluated against upper and lower limit criteria established in the SGS QA /QC plan (Ref: MP-(AU)-[ENV]QU-022). At least two of three routine level soil sample surrogate spike recoveries for BTEX/VOC are to be within 70-130% where control charts have not been developed and within the established control limits for charted surrogates. Matrix effects may void this as an acceptance criterion. Water sample surrogate spike recoveries are to be within 40-130%. The presence of emulsions, surfactants and particulates may void this as an acceptance criterion.

Result is shown in **Green** when within suggested criteria or **Red** with an appended reason identifier when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

No surrogates were required for this job.

Blank results are evaluated against the limit of reporting (LOR), for the chosen method and its associated instrumentation, typically 2.5 times the statistically determined method detection limit (MDL).

Result is shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria.

**Conductivity and TDS by Calculation - Soil****Method: ME-(AU)-[ENV]AN106**

Sample Number	Parameter	Units	LOR	Result
LB144429.001	Conductivity of Extract (1:5 dry sample basis)	µS/cm	1	0
LB144493.001	Conductivity of Extract (1:5 dry sample basis)	µS/cm	1	0

**Exchangeable Cations and Cation Exchange Capacity (CEC/ESP/SAR)****Method: ME-(AU)-[ENV]AN122**

Sample Number	Parameter	Units	LOR	Result
LB144555.001	Exchangeable Sodium, Na	mg/kg	2	0
LB144556.001	Exchangeable Sodium, Na	mg/kg	2	0

**Soluble Anions (1:5) In Soil by Ion Chromatography****Method: ME-(AU)-[ENV]AN245**

Sample Number	Parameter	Units	LOR	Result
LB144534.001	Chloride	mg/kg	0.25	<0.25
	Sulfate	mg/kg	5	<5.0
LB144600.001	Chloride	mg/kg	0.25	<0.25
	Sulfate	mg/kg	5	<5.0

Duplicates are calculated as Relative Percentage Difference (RPD) using the formula:  $RPD = |OriginalResult - ReplicateResult| \times 100 / Mean$

The RPD is evaluated against the Maximum Allowable Difference (MAD) criteria and can be graphically represented by a curve calculated from the Statistical Detection Limit (SDL) and Limiting Repeatability (LR) using the formula:  $MAD = 100 \times SDL / Mean + LR$

Where the Maximum Allowable Difference evaluates to a number larger than 200 it is displayed as 200.

RPD is shown in **Green** when within suggested criteria or **Red** with an appended reason identifier when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

#### Conductivity and TDS by Calculation - Soil

Method: ME-(AU)-[ENV]AN106

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE177214.010	LB144429.014	Conductivity of Extract (1:5 dry sample basis)	µS/cm	1	530	38.027651515	30	19
SE177214.020	LB144429.025	Conductivity of Extract (1:5 dry sample basis)	µS/cm	1	640	38.077784256	30	1
SE177214.030	LB144493.014	Conductivity of Extract (1:5 dry sample basis)	µS/cm	1	1100	105.302160331	30	2
SE177214.042	LB144493.031	Conductivity of Extract (1:5 dry sample basis)	µS/cm	1	240	51.974440298	31	4

#### Moisture Content

Method: ME-(AU)-[ENV]AN002

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE177214.010	LB144542.011	% Moisture	%w/w	0.5	13	13	37	1
SE177214.020	LB144542.022	% Moisture	%w/w	0.5	17	16	36	3
SE177214.030	LB144542.033	% Moisture	%w/w	0.5	12	12	38	0
SE177214.040	LB144542.044	% Moisture	%w/w	0.5	9.7	9.6	40	1
SE177214.042	LB144542.047	% Moisture	%w/w	0.5	10	11	40	1

#### pH in soil (1:5)

Method: ME-(AU)-[ENV]AN101

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE177214.010	LB144429.014	pH	pH Units	0.1	5.5	5.4	32	2
SE177214.020	LB144429.025	pH	pH Units	0.1	5.8	5.9	32	1
SE177214.030	LB144493.014	pH	pH Units	0.1	5.7	5.7	32	1
SE177214.042	LB144493.031	pH	pH Units	0.1	7.0	6.9	31	1

#### Soluble Anions (1:5) in Soil by Ion Chromatography

Method: ME-(AU)-[ENV]AN245

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE177214.010	LB144534.014	Chloride	mg/kg	0.25	610	750	30	20
		Sulfate	mg/kg	5	180	260	32	37 ②
SE177214.020	LB144534.027	Chloride	mg/kg	0.25	710	680	30	5
		Sulfate	mg/kg	5	370	390	31	6
SE177214.030	LB144600.014	Chloride	mg/kg	0.25	1500	1500	30	2
		Sulfate	mg/kg	5	450	450	31	0
SE177214.042	LB144600.031	Chloride	mg/kg	0.25	7.9	9.0	33	13
		Sulfate	mg/kg	5	470	490	31	6

Laboratory Control Standard (LCS) results are evaluated against an expected result, typically the concentration of analyte spiked into the control during the sample preparation stage, producing a percentage recovery. The criteria applied to the percentage recovery is established in the SGS QA /QC plan (Ref: MP-(AU)-[ENV]QU-022). For more information refer to the footnotes in the concluding page of this report.

Recovery is shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria.

#### Conductivity and TDS by Calculation - Soil

Method: ME-(AU)-[ENV]AN106

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB144429.002	Conductivity of Extract (1:5 dry sample basis)	µS/cm	1	NA	303	85 - 115	102
LB144493.002	Conductivity of Extract (1:5 dry sample basis)	µS/cm	1	NA	303	85 - 115	105

#### Exchangeable Cations and Cation Exchange Capacity (CEC/ESP/SAR)

Method: ME-(AU)-[ENV]AN122

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB144555.002	Exchangeable Sodium, Na	mg/kg	2	NA	72.68	80 - 120	115
LB144556.002	Exchangeable Sodium, Na	mg/kg	2	NA	72.68	80 - 120	115

#### pH in soil (1:5)

Method: ME-(AU)-[ENV]AN101

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB144429.003	pH	pH Units	0.1	7.5	7.415	98 - 102	101
LB144493.003	pH	pH Units	0.1	7.5	7.415	98 - 102	101

#### Soluble Anions (1:5) in Soil by Ion Chromatography

Method: ME-(AU)-[ENV]AN245

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB144534.002	Chloride	mg/kg	0.25	98	100	70 - 130	98
	Sulfate	mg/kg	5	96	100	70 - 130	96
LB144600.002	Chloride	mg/kg	0.25	98	100	70 - 130	98
	Sulfate	mg/kg	5	96	100	70 - 130	96

Matrix Spike (MS) results are evaluated as the percentage recovery of an expected result, typically the concentration of analyte spiked into a field sub -sample during the sample preparation stage. The original sample's result is subtracted from the sub-sample result before determining the percentage recovery. The criteria applied to the percentage recovery is established in the SGS QA/QC plan (ref: MP-(AU)-[ENV]QU-022). For more information refer to the footnotes in the concluding page of this report.

Recovery is shown in **Green** when within suggested criteria or **Red** with an appended reason identifier when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

No matrix spikes were required for this job.

Matrix spike duplicates are calculated as Relative Percent Difference (RPD) using the formula:  $RPD = |OriginalResult - ReplicateResult| \times 100 / Mean$

The original result is the analyte concentration of the matrix spike. The Duplicate result is the analyte concentration of the matrix spike duplicate.

The RPD is evaluated against the Maximum Allowable Difference (MAD) criteria and can be graphically represented by a curve calculated from the Statistical Detection Limit (SDL) and Limiting Repeatability (LR) using the formula:  $MAD = 100 \times SDL / Mean + LR$

Where the Maximum Allowable Difference evaluates to a number larger than 200 it is displayed as 200.

RPD is shown in **Green** when within suggested criteria or **Red** with an appended reason identifier when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

No matrix spike duplicates were required for this job.

Samples analysed as received.

Solid samples expressed on a dry weight basis.

QC criteria are subject to internal review according to the SGS QA/QC plan and may be provided on request or alternatively can be found here:  
[http://www.sgs.com.au/~media/Local/Australia/Documents/Technical Documents/MP-AU-ENV-QU-022 QA QC Plan.pdf](http://www.sgs.com.au/~media/Local/Australia/Documents/Technical%20Documents/MP-AU-ENV-QU-022%20QA%20QC%20Plan.pdf)

\* NATA accreditation does not cover the performance of this service .

\*\* Indicative data, theoretical holding time exceeded.

- Sample not analysed for this analyte.

IS Insufficient sample for analysis.

LNR Sample listed, but not received.

LOR Limit of reporting.

QFH QC result is above the upper tolerance.

QFL QC result is below the lower tolerance.

① At least 2 of 3 surrogates are within acceptance criteria.

② RPD failed acceptance criteria due to sample heterogeneity.

③ Results less than 5 times LOR preclude acceptance criteria for RPD.

④ Recovery failed acceptance criteria due to matrix interference.

⑤ Recovery failed acceptance criteria due to the presence of significant concentration of analyte (i.e. the concentration of analyte exceeds the spike level).

⑥ LOR was raised due to sample matrix interference.

⑦ LOR was raised due to dilution of significantly high concentration of analyte in sample.

⑧ Reanalysis of sample in duplicate confirmed sample heterogeneity and inconsistency of results.

⑨ Recovery failed acceptance criteria due to sample heterogeneity.

⑩ LOR was raised due to high conductivity of the sample (required dilution).

† Refer to Analytical Report comments for further information.

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## SAMPLE RECEIPT ADVICE

SE177214

### CLIENT DETAILS

Contact **Craig Cowper**  
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Project **6930 - Austral**  
Order Number **P990**  
Samples **42**

### LABORATORY DETAILS

Manager **Huong Crawford**  
Laboratory **SGS Alexandria Environmental**  
Address **Unit 16, 33 Maddox St  
Alexandria NSW 2015**  
  
Telephone **+61 2 8594 0400**  
Facsimile **+61 2 8594 0499**  
Email **au.environmental.sydney@sgs.com**  
  
Samples Received **Mon 26/3/2018**  
Report Due **Wed 4/4/2018**  
SGS Reference **SE177214**

### SUBMISSION DETAILS

This is to confirm that 42 samples were received on Monday 26/3/2018. Results are expected to be ready by COB Wednesday 4/4/2018.  
Please quote SGS reference SE177214 when making enquiries. Refer below for details relating to sample integrity upon receipt.

Samples clearly labelled	Yes	Complete documentation received	Yes
Sample container provider	SGS	Sample cooling method	Ice Bricks
Samples received in correct containers	Yes	Sample counts by matrix	42 Soil
Date documentation received	26/3/2018	Type of documentation received	COC
Samples received in good order	Yes	Samples received without headspace	Yes
Sample temperature upon receipt	5.2°C	Sufficient sample for analysis	Yes
Turnaround time requested	Standard		

Unless otherwise instructed, water and bulk samples will be held for one month from date of report, and soil samples will be held for two months.

### COMMENTS

Fourteen soil samples have been placed on hold.

This document is issued by the Company under its General Conditions of Service accessible at [www.sgs.com/en/Terms-and-Conditions.aspx](http://www.sgs.com/en/Terms-and-Conditions.aspx).  
Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.

## CLIENT DETAILS

Client ALLIANCE GEOTECHNICAL PTY LTD

Project 6930 - Austral

## SUMMARY OF ANALYSIS

No.	Sample ID	Conductivity and TDS by Calculation - Soil	Exchangeable Cations and Cation Exchange Capacity	Moisture Content	pH in soil (1:5)	Soluble Anions (1:5) in Soil by Ion Chromatography
001	BH1-0.5	1	3	1	1	2
002	BH1-1.0	1	3	1	1	2
003	BH1-1.5	1	3	1	1	2
004	BH2-0.5	1	3	1	1	2
005	BH2-1.0	1	3	1	1	2
006	BH2-1.5	1	3	1	1	2
007	BH3-0.5	1	3	1	1	2
008	BH3-1.0	1	3	1	1	2
009	BH3-1.5	1	3	1	1	2
010	BH4-0.5	1	3	1	1	2
011	BH4-1.0	1	3	1	1	2
012	BH4-1.5	1	3	1	1	2
013	BH5-0.5	1	3	1	1	2
014	BH5-1.0	1	3	1	1	2
015	BH5-1.5	1	3	1	1	2
016	BH6-0.5	1	3	1	1	2
017	BH6-1.0	1	3	1	1	2
018	BH6-1.5	1	3	1	1	2
019	BH7-0.5	1	3	1	1	2
020	BH7-1.0	1	3	1	1	2
021	BH7-1.5	1	3	1	1	2
022	BH8-0.5	1	3	1	1	2
023	BH8-1.0	1	3	1	1	2
024	BH8-1.5	1	3	1	1	2

CONTINUED OVERLEAF

The above table represents SGS' interpretation of the client-supplied Chain Of Custody document.

The numbers shown in the table indicate the number of results requested in each package.

Please indicate as soon as possible should your request differ from these details.

Testing as per this table shall commence immediately unless the client intervenes with a correction.



## SAMPLE RECEIPT ADVICE

SE177214

### CLIENT DETAILS

Client ALLIANCE GEOTECHNICAL PTY LTD

Project 6930 - Austral

### SUMMARY OF ANALYSIS

No.	Sample ID	Conductivity and TDS by Calculation - Soil	Exchangeable Cations and Cation Exchange Capacity	Moisture Content	pH in soil (1:5)	Soluble Anions (1:5) in Soil by Ion Chromatography
025	BH9-0.5	1	3	1	1	2
026	BH9-1.0	1	3	1	1	2
027	BH9-1.5	1	3	1	1	2
028	BH10-0.5	1	3	1	1	2
029	BH10-1.0	1	3	1	1	2
030	BH10-1.5	1	3	1	1	2
031	BH11-0.5	1	3	1	1	2
032	BH11-1.0	1	3	1	1	2
033	BH11-1.5	1	3	1	1	2
034	BH12-0.5	1	3	1	1	2
035	BH12-1.0	1	3	1	1	2
036	BH12-1.5	1	3	1	1	2
037	BH13-0.5	1	3	1	1	2
038	BH13-1.0	1	3	1	1	2
039	BH13-1.5	1	3	1	1	2
040	BH14-0.5	1	3	1	1	2
041	BH14-1.0	1	3	1	1	2
042	BH14-1.5	1	3	1	1	2

The above table represents SGS' interpretation of the client-supplied Chain Of Custody document.

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Testing as per this table shall commence immediately unless the client intervenes with a correction.

 <b>SGS Environmental Services</b> Unit 16, 33 Maddox Street Alexandria NSW 2015 Telephone No: (02) 85940400 Facsimile No: (02) 85940499 Email: au.samplereceipt.sydney@sgs.com		<h3 style="text-align: center;">CHAIN OF CUSTODY &amp; ANALYSIS REQUEST</h3>												Page 1 of 6					
		Company Name: <u>Alliance Geotechnical Pty Ltd</u> Address: <u>10 Welder Road, Seven Hills NSW</u>  Contact Name: <u>Craig Cowper 0407 989 885</u>				Project Name/No: <u>6930 - Austral</u> Purchase Order No: <u>P990</u> Results Required By: <u>Standard 5 day turnaround</u> Telephone: <u>1800 288 188</u> Facsimile: <u>02 9838 8022</u> Email Results: <u>enviro@allgeo.com.au</u>													
Client Sample ID	Date Sampled	Lab Sample ID	WATER	SOIL	PRESERVATIVE	NO OF CONTAINERS	Sulfates	Chlorides	pH	Resistivity	Exchangeable Sodium %	Conductivity	Notes						
BH1 - 0.0	23/03/2018			X	Ice	1													HOLD
BH1 - 0.5	23/03/2018	1		X	Ice	1	X	X	X	X	X	X							
BH1 - 1.0	23/03/2018	2		X	Ice	1	X	X	X	X	X	X							
BH1 - 1.5	23/03/2018	3		X	Ice	1	X	X	X	X	X	X							
BH2 - 0.0	23/03/2018			X	Ice	1													HOLD
BH2 - 0.5	23/03/2018	4		X	Ice	1	X	X	X	X	X	X							
BH2 - 1.0	23/03/2018	5		X	Ice	1	X	X	X	X	X	X							HOLD
BH2 - 1.5	23/03/2018	6		X	Ice	1	X	X	X	X	X	X							
BH3 - 0.0	23/03/2018			X	Ice	1													HOLD
BH3 - 0.5	23/03/2018	7		X	Ice	1	X	X	X	X	X	X							
Relinquished By: Craig Cowper <i>[Signature]</i>			Date/Time: 26/03/18 @ 0930						Received By: <i>[Signature]</i>			Date/Time <i>26/03/18 @ 1:00</i>							
Relinquished By:			Date/Time:						Received By:			Date/Time							
Samples Intact: Yes / No			Temperature: Ambient / Chilled						Sample Cooler Sealed: Yes / No			Laboratory Quotation No:							
			Comments: analysis to NEPM standards. Please note sample dates and relevant holding times																



**SGS Environmental Services**  
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**Alexandria NSW 2015**  
**Telephone No: (02) 85940400**  
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**Email: au.samplereceipt.sydney@sgs.com**

## CHAIN OF CUSTODY & ANALYSIS REQUEST

Page 2 of 6

Company Name:	Alliance Geotechnical Pty Ltd	Project Name/No:	6930 - Austral
Address:	10 Welder Road,	Purchase Order No:	P990
	Seven Hills NSW	Results Required By:	Standard 5 day turnaround
Contact Name:	Craig Cowper 0407 989 885	Telephone:	1800 288 188
		Facsimile:	02 9838 8022
		Email Results:	enviro@allgeo.com.au

Client Sample ID	Date Sampled	Lab Sample ID	WATER	SOIL	PRESERVATIVE	NO OF CONTAINERS	Analysis Tests						Notes			
							Sulfates	Chlorides	pH	Resistivity	Exchangeable Sodium	Conductivity				
BH3 - 1.0	23/03/2018	8		X	Ice	1	X	X	X	X	X	X				
BH3 - 1.5	23/03/2018	9		X	Ice	1	X	X	X	X	X	X				
BH4 - 0.0	23/03/2018			X	Ice	1							HOLD			
BH4 - 0.5	23/03/2018	10		X	Ice	1	X	X	X	X	X	X				
BH4 - 1.0	23/03/2018	11		X	Ice	1	X	X	X	X	X	X				
BH4 - 1.5	23/03/2018	12		X	Ice	1	X	X	X	X	X	X				
BH5 - 0.0	23/03/2018			X	Ice	1							HOLD			
BH5 - 0.5	23/03/2018	13		X	Ice	1	X	X	X	X	X	X				
BH5 - 1.0	23/03/2018	14		X	Ice	1	X	X	X	X	X	X				
BH5 - 1.5	23/03/2018	15		X	Ice	1	X	X	X	X	X	X				
Relinquished By: Craig Cowper		Date/Time: 26/03/18 @ 0930				Received By:		Date/Time			26/03/18 @ 1-					
Relinquished By:		Date/Time:				Received By:		Date/Time								
Samples Intact: Yes / No		Temperature: Ambient / Chilled				Sample Cooler Sealed: Yes / No		Laboratory Quotation No:								
		Comments: analysis to NEPM standards. Please note sample dates and relevant holding times														



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## CHAIN OF CUSTODY & ANALYSIS REQUEST

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Company Name:	Alliance Geotechnical Pty Ltd	Project Name/No:	6930 - Austral
Address:	10 Welder Road,	Purchase Order No:	P990
	Seven Hills NSW	Results Required By:	Standard 5 day turnaround
Contact Name:	Craig Cowper 0407 989 885	Telephone:	1800 288 188
		Facsimile:	02 9838 8022
		Email Results:	enviro@allgeo.com.au

Client Sample ID	Date Sampled	Lab Sample ID	WATER	SOIL	PRESERVATIVE	NO OF CONTAINERS							Notes	
							Sulfates	Chlorides	pH	Resistivity	Exchangeable Sodium	Conductivity		
BH6 - 0.0	23/03/2018			X	Ice	1								HOLD
BH6 - 0.5	23/03/2018	16		X	Ice	1		X	X	X	X	X		
BH6 - 1.0	23/03/2018	17		X	Ice	1		X	X	X	X	X		
BH6 - 1.5	23/03/2018	18		X	Ice	1		X	X	X	X	X		
BH7 - 0.0	23/03/2018			X	Ice	1								HOLD
BH7 - 0.5	23/03/2018	19		X	Ice	1		X	X	X	X	X		
BH7 - 1.0	23/03/2018	20		X	Ice	1		X	X	X	X	X		
BH7 - 1.5	23/03/2018	21		X	Ice	1		X	X	X	X	X		
BH8 - 0.0	23/03/2018			X	Ice	1								HOLD
BH8 - 0.5	23/03/2018	22		X	Ice	1	X	X	X	X	X	X		

Relinquished By: Craig Cowper *(Signature)* Date/Time: 26/03/18 @ 0930 Received By: *(Signature)* Date/Time: 26/03/18 @ 11

Relinquished By: Date/Time: Received By: Date/Time:

Samples Intact: Yes / No Temperature: Ambient / Chilled Sample Cooler Sealed: Yes / No Laboratory Quotation No:

Comments: analysis to NEPM standards. Please note sample dates and relevant holding times



**SGS Environmental Services**  
**Unit 16, 33 Maddox Street**  
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## CHAIN OF CUSTODY & ANALYSIS REQUEST

Page 4 of 6

Company Name:	Alliance Geotechnical Pty Ltd	Project Name/No:	6930 - Austral
Address:	10 Welder Road,	Purchase Order No:	P990
	Seven Hills NSW	Results Required By:	Standard 5 day turnaround
Contact Name:	Craig Cowper 0407 989 885	Telephone:	1800 288 188
		Facsimile:	02 9838 8022
		Email Results:	enviro@allgeo.com.au

Client Sample ID	Date Sampled	Lab Sample ID	WATER	SOIL	PRESERVATIVE	NO OF CONTAINERS							Notes
							Sulfates	Chlorides	pH	Resistivity	Exchangeable Sodium	Conductivity	
BH8 - 1.0	23/03/2018	23		X	Ice	1	X	X	X	X	X	X	
BH8 - 1.5	23/03/2018	24		X	Ice	1	X	X	X	X	X	X	
BH9 - 0.0	23/03/2018			X	Ice	1							HOLD
BH9 - 0.5	23/03/2018	25		X	Ice	1	X	X	X	X	X	X	
BH9 - 1.0	23/03/2018	26		X	Ice	1	X	X	X	X	X	X	
BH9 - 1.5	23/03/2018	27		X	Ice	1	X	X	X	X	X	X	
BH10 - 0.0	23/03/2018			X	Ice	1							HOLD
BH10 - 0.5	23/03/2018	28		X	Ice	1	X	X	X	X	X	X	
BH10 - 1.0	23/03/2018	29		X	Ice	1	X	X	X	X	X	X	
BH10 - 1.5	23/03/2018	30		X	Ice	1	X	X	X	X	X	X	
Relinquished By: Craig Cowper <i>CAF</i>		Date/Time: 26/03/18 @ 0930				Received By: <i>S. Dwy</i>		Date/Time 26/03/18 @ 1~					
Relinquished By:		Date/Time:				Received By:		Date/Time					
Samples Intact: Yes / No		Temperature: Ambient / Chilled				Sample Cooler Sealed: Yes / No		Laboratory Quotation No:					
		Comments: analysis to NEPM standards. Please note sample dates and relevant holding times											



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		Facsimile:	02 9838 8022
		Email Results:	enviro@allgeo.com.au

Client Sample ID	Date Sampled	Lab Sample ID	WATER	SOIL	PRESERVATIVE	NO OF CONTAINERS							Notes
							Sulfates	Chlorides	pH	Resistivity	Exchangeable Sodium	Conductivity	
BH11 - 0.0	23/03/2018		X	Ice	1		X	X	X	X	X		HOLD
BH11 - 0.5	23/03/2018	31	X	Ice	1		X	X	X	X	X		
BH11 - 1.0	23/03/2018	32	X	Ice	1		X	X	X	X	X		
BH11 - 1.5	23/03/2018	33	X	Ice	1		X	X	X	X	X		
BH12 - 0.0	23/03/2018		X	Ice	1								HOLD
BH12 - 0.5	23/03/2018	34	X	Ice	1		X	X	X	X	X		
BH12 - 1.0	23/03/2018	35	X	Ice	1		X	X	X	X	X		
BH12 - 1.5	23/03/2018	36	X	Ice	1		X	X	X	X	X		
BH13 - 0.0	23/03/2018		X	Ice	1								HOLD
BH13 - 0.5	23/03/2018	37	X	Ice	1		X	X	X	X	X		
Relinquished By: Craig Cowper		Date/Time: 26/03/18 @ 0930						Received By:		Date/Time		26/03/18 01~	
Relinquished By:		Date/Time:						Received By:		Date/Time			
Samples Intact: Yes / No		Temperature: Ambient / Chilled						Sample Cooler Sealed: Yes / No		Laboratory Quotation No:			
		Comments: analysis to NEPM standards. Please note sample dates and relevant holding times											



# CHAIN OF CUSTODY & ANALYSIS REQUEST

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