

SLR Consulting

Hillsong Church Greater West Development 1 Water Street, Werrington, NSW

Preliminary Salinity Assessment

Our ref: 4064-R1 2 March 2017

Geotechnics Groundwater Contamination Ground Risk Management



DOCUMENT AUTHORISATION

Hillsong Church Greater West Development 1 Water Street, Werrington, NSW Preliminary Salinity Assessment

Prepared for SLR Consulting

Our ref: 4064-R1 2 March 2017

For and on behalf of Asset Geotechnical Engineering Pty Ltd

Mark Bartel

Mark Bartel BE MEngSc GMQ RPEQ MIEAust CPEng NER (Civil) Managing Director / Senior Principal Geotechnical Engineer

DOCUMENT CONTROL

Distribution Register

Сору	Media	Recipient	Location
1	Secure PDF	Craig Cowper	SLR Consulting
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Document Status

Rev	Revision Details	Author	Reviewer		Approved for Issue		
			Name	Initials	Name	Initials	Date
0	Initial issue	D. Jacob	M. Green	MQ	M. Bartel	MAB	2 March 2017

Asset Geotechnical Engineering Pty Ltd Suite 2.05 / 56 Delhi Road North Ryde NSW 2113 02 9878 6005 assetgeo.com.au

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1. INTRODUCTION

1.1 General

This report presents the results of a preliminary salinity assessment for the above project. The assessment was commissioned on 17 February 2017 by Craig Cowper of SLR Consulting. The work was carried out in accordance with the proposal by Asset Geotechnical Engineering Pty Ltd (Asset) dated 17 February 2017, reference 4064-P1.

Drawings supplied to us for this investigation comprised:

- Survey plans (prepared by: LTS Lockley; ref: 42599DT; dated: November 2015)
- Preliminary architectural plans (prepared by: NBRS Architecture; ref: 15467; dwg: 000 010, 100 110, 300 and 400 and 1000 1004.; dated: January 2017)

Based on the supplied drawings, we understand that the project involves construction of a church complex consisting of a three-storey auditorium building with administrative offices, with ancillary structures that include a single storey childcare facility with an associated playground and a service area. Future developments are understood to include extensions on either side of the main auditorium, which include a smaller auditorium to the north and a children's ministry building to the south. The parking lot for the complex is proposed to be constructed in three stages, with the first stage consisting of 186 parking spaces. No basements have been proposed for the development. The finished floor level of the main auditorium is at approximately RL 26.5m AHD.

1.2 Scope of Work

The objective was to assess the surface and subsurface conditions with respect to salinity, to provide a preliminary salinity assessment to support a Development Application for the proposed development.

The following scope of work was carried out to achieve the project objectives:

- A review of existing regional maps and reports relevant to the site, held within our files.
- Clearance of underground services at proposed test locations.
- Visual observations of surface features.
- Subsurface investigation at four locations to sample and assess the nature and consistency of subsurface soils and bedrock at accessible areas of the site.
- Carrying out laboratory tests on the recovered soil samples.
- Engineering assessment and reporting.

This report must be read in conjunction with the attached "Important Information about your Geotechnical Report" in Appendix A. Attention is drawn to the limitations inherent in site investigations and the importance of verifying the subsurface conditions inferred herein.

2. SITE DESCRIPTION

The site is located off Old Western Highway between the Cobham Remand centre and Wollemi School, as shown in Figure 1. It is roughly rectangular and has a street frontage with the unpaved section of Water Street for about 50m. The block is about 158m wide and is about 192m deep. A vacant grassland borders the site to the north.

Topographically, the site is located in a region of flat topography, with no discernible slope changes. The overall ground surface slopes in the region are about $2^{\circ} - 3^{\circ}$.



The site shows no signs of recent previous occupancy and historical aerial imagery from 1943 indicates that the major portion of the site has been grasslands, except for some residential structures in the south and south-west corner.

Site drainage is expected to be by surface run-off or percolation through the clayey surface soils. Vegetation consists mostly of prairie grass and a spare copse of trees located in the south-eastern periphery of the site. Cacti plants (Prickly Pear – a controlled invasive weed) were also noticed in this region. It was observed that large tracts around the site showed patches of dormant foliage where no grass growth was observed. Fissures or cracks were also observed in some regions, both of which are indicative of reactive or saline soils, and may be indicative of high relative wetness index. We note that the 1: 100,000 Salinity Potential Map of Western Sydney indicates the site is in a region of high salinity potential.

Rock outcrops were not observed. A dried-out waterhole was observed in the central north region of the site. The ephemeral Claremont Creek is located to the southeast of the site. This periodically flows in a northerly direction.

Soil Landscape type is characterised by the South Creek Landscape. This is typically marked by floodplains, valley flats and drainage depressions of the channels on the Cumberland Plain. Geotechnical hazards associated with this landscape include - flood hazard, seasonal waterlogging, localised permanently high water-tables, localised water erosion hazard and localised surface movement potential.

3. FIELDWORK & LABORATORY TESTING

3.1 Borehole Investigation

The fieldwork was undertaken on 17 February 2017 by a Geotechnical Engineer from Asset, and included subsurface investigation at four locations.

Buried metallic services and utilities within the site boundaries near the proposed test locations were cleared by referring to DBYD utility maps.

The boreholes were drilled to target depths of 1.2m to 1.5m. The test locations are shown on the attached Figure 2. Engineering logs are provided in Appendix B together with their explanatory notes.

The test locations were set out by our Geotechnical Engineer by measurements relative to existing site features. The subsurface conditions encountered were logged during drilling. Surface levels at the test locations were estimated by interpolation from levels shown on the survey plan provided (prepared by: LTS Lockley; ref: 42599DT; dated: November 2015.

On completion of logging and sampling, each borehole was backfilled with the drilling spoil. Remaining spoil was left and trimmed neatly flush or slightly mounded to the adjacent ground surface.

3.2 Laboratory Testing

Soil samples recovered during the fieldwork were delivered to a NATA registered laboratory. The following tests were carried out on selected samples:

- Soil aggressivity testing (chloride, sulphate and pH).
- Salinity testing (Cation Exchange Capacity, Exchangeable Sodium, resistivity and salinity).



Test results are attached. Testing was carried out generally in accordance with AS1289 "Methods of Testing Soil for Engineering Purposes" or as described in the laboratory test results.

4. SUBSURFACE CONDITIONS

4.1 Geology

The 1:100,000 Penrith Geological Map indicates the site is underlain by quaternary alluvial soils (clay, silt and fine-grained sand) overlying Bringelly Shale.

4.2 Subsurface Conditions

A generalised geotechnical model for the site has been developed is shown in Table 1. For a detailed description of the subsurface conditions, refer the attached engineering logs and explanatory notes. For specific design input, reference should be made to the logs and/or the specific test results, in place of the following summary.

Unit	Origin	Description	Depth to Top of Unit ¹ (m)	Unit Thickness ¹ (m)
1	Topsoil/ Residual	CLAY, medium to high plasticity, brown to dark brown, traces of fine to medium grained sand and fine to medium grained subangular to subrounded gravel, some rootlets, grass fibres and twigs.	Ground surface	0.2 - 0.4
2	Residual	CLAY, medium to high plasticity, brown, traces of fine to medium grained sand and subangular gravel, traces of ironstones and ironstaining observed. Generally stiff to very stiff.	0.2 - 0.4	0.9 – 1.3

Table 1 - Generalised Site Geotechnical Model

Notes:

1. The depths and unit thicknesses are based on the information from the test locations only and do not necessarily represent the maximum and minimum values across the site.

4.3 Groundwater

Groundwater was not observed in the boreholes during drilling depths of 1.2m to 1.5m, even though the soil was observed to be noticeably moist in borehole BH2 from 0.8m. It is noted that the groundwater observation may have been made before water levels had stabilised. No long-term groundwater monitoring was carried out.

4.4 Laboratory Test Results

Results from the laboratory testing undertaken on selected soil samples are included in Appendix C, and are summarised in Tables 2 and 3.

Test Location & Depth (m)	Conductivity (dS/m) ¹	Soil Texture Group	Multiplication Factor	EC _e (dS/m) ²	Salinity Class
BH1 (0.0 – 0.2)	0.12	Clay loams	9	1.08	Non-saline
BH2 (0.0 – 0.2)	0.08	Clay loams	9	0.72	Non-saline
BH3 (0.3 – 0.4)	0.1	Clay loams	9	0.9	Non-saline

Table 2 – Laboratory Test Results: Salinity Assessment

1 1 dS/m = 1,000 µS/cm = 640 mg/kg

2 Typical sea water has EC_w = 50 dS/m

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Test Location & Depth (m)	Chloride (mg/kg)	Hď	Resistivity (Ωm.cm)	Sulphate (mg/kg)	Soil Condition (A or B)	Exposure Classification (Concrete) AS 2159- 2009	Exposure Classification (Steel) AS 2159-2009
BH1 (0.0 – 0.2)	670	8	2,047	80	В	Non-aggressive	Non-aggressive
BH2 (0.0 – 0.2)	260	7.4	2,057	40	В	Non-aggressive	Non-aggressive
BH3 (0.3 – 0.4)	860	7.3	2,375	20	В	Non-aggressive	Non-aggressive

Table 3 - Laboratory Test Results: Aggressivity Assessment

5. DISCUSSIONS & RECOMMENDATIONS

5.1 Salinity

The laboratory test results indicate that the tested soils are classified as Non-saline (DLWC, Table 6.2) with an **ECe of <2dS/m**.

Therefore, it is concluded that a Salinity Management Plan is not required for this project, and no further salinity assessment is required.

Notwithstanding the above, given that the site lies within an area mapped as having a high salinity potential, and noting that there are surficial vegetation features suggestive of salinity in the area, it is recommended that design and construction of the development be in accordance with the recommendations in 'Building in a Saline Environment', by Department of Environment and Climate Change, 2008.

5.2 Aggressivity to Concrete

The laboratory test results indicate that the soils are classified as "Non-aggressive" with respect to concrete piles (as per AS2159-2009 Piling-Design and Installation).

In accordance with AS 2159-2009 Section 6.4 Design for Durability of Concrete Piles, "For the range of chemical conditions in the soil surrounding the piles, the condition leading to the most severe aggressive conditions shall be allowed for."

Therefore, for a 50-year design life, minimum concrete strength of **32MPa** and a minimum cover to reinforcement of **60mm** (cast-in-place piles) is recommended for a "Mild" environment in AS2159-2009 for concrete piles. The cover should be increased to **75mm** for a 100-year design life. The concrete strength and cover requirements are a minimum, and should be reviewed by the pile designer / structural engineer to take other design considerations into account.

5.3 Aggressivity to Steel

The laboratory test results indicate that the soils are classified as "Non-aggressive" with respect to steel piles (as per AS2159-2009 Piling-Design and Installation).

Corrosion allowance, coating protection systems, and cathodic protection should be adopted as per AS2159-2009 for a "Non-saline" exposure classification, with a uniform corrosion allowance of **<0.01mm/year**.

³ Department of Land and Water Conservation, "Site Investigations for Urban Salinity", 2002



6. LIMITATIONS

In addition to the limitations inherent in site investigations (refer to the attached Information Sheets), it must be pointed out that the recommendations in this report are based on assessed subsurface conditions from limited investigations, focused on salinity and aggressiveness characteristics of the soils. Further investigation would be required for other aspects of the development such as building footings and retaining walls.

This report and details for the proposed development should be submitted to relevant regulatory authorities that have an interest in the property (e.g. Council) or are responsible for services that may be within or adjacent to the site (e.g. Sydney Water, Roads and Maritime Services), for their review.

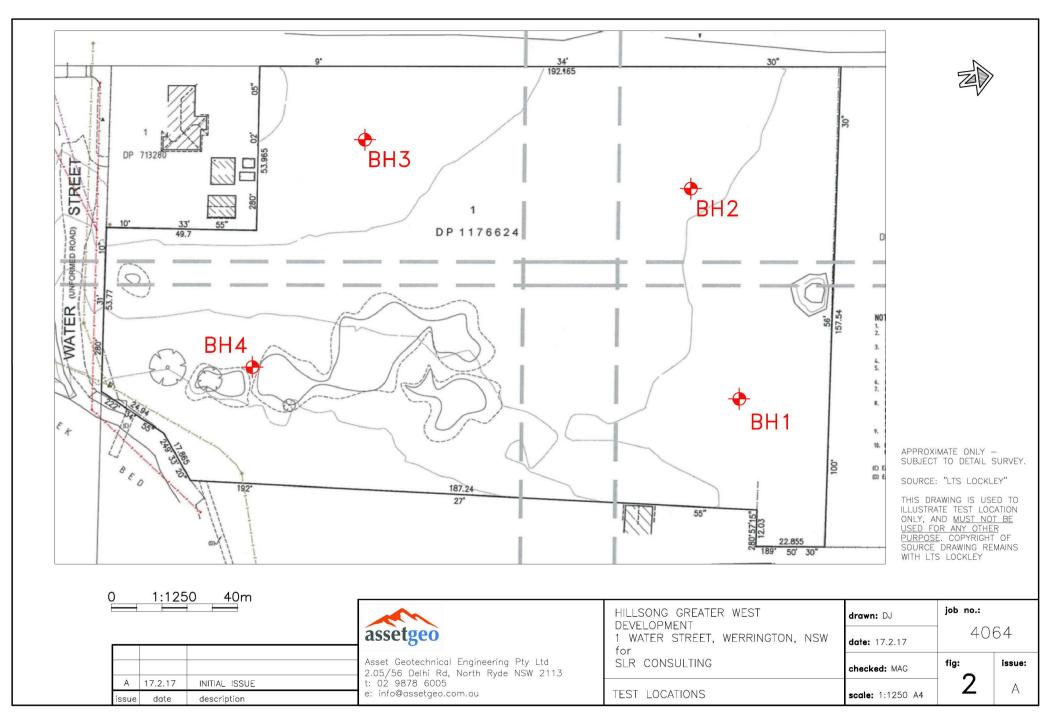
The document "Important Information about your Geotechnical Report" in Appendix A provides additional information about the uses and limitations of this report.



FIGURES

Figure 1 – Site Locality Figure 2 – Test Locations







APPENDIX A

Important Information about your Geotechnical Report





SCOPE OF SERVICES

The geotechnical report ("the report") has been prepared in accordance with the scope of services as set out in the contract, or as otherwise agreed, between the Client and Asset Geotechnical Engineering Pty Ltd ("Asset"), for the specific site investigated. The scope of work may have been limited by a range of factors such as time, budget, access and/or site disturbance constraints.

The report should not be used if there have been changes to the project, without first consulting with Asset to assess if the report's recommendations are still valid. Asset does not accept responsibility for problems that occur due to project changes if they are not consulted.

RELIANCE ON DATA

Asset has relied on data provided by the Client and other individuals and organizations, to prepare the report. Such data may include surveys, analyses, designs, maps and plans. Asset has not verified the accuracy or completeness of the data except as stated in the report. To the extent that the statements, opinions, facts, information, conclusions and/or recommendations ("conclusions") are based in whole or part on the data, Asset will not be liable in relation to incorrect conclusions should any data, information or condition be incorrect or have been concealed, withheld, misrepresented or otherwise not fully disclosed to Asset.

GEOTECHNICAL ENGINEERING

Geotechnical engineering is based extensively on judgment and opinion. It is far less exact than other engineering disciplines. Geotechnical engineering reports are prepared for a specific client, for a specific project and to meet specific needs, and may not be adequate for other clients or other purposes (e.g. a report prepared for a consulting civil engineer may not be adequate for a construction contractor). The report should not be used for other than its intended purpose without seeking additional geotechnical advice. Also, unless further geotechnical advice is obtained, the report cannot be used where the nature and/or details of the proposed development are changed.

LIMITATIONS OF SITE INVESTIGATION

The investigation program undertaken is a professional estimate of the scope of investigation required to provide a general profile of subsurface conditions. The data derived from the site investigation program and subsequent laboratory testing are extrapolated across the site to form an inferred geological model, and an engineering opinion is rendered about overall subsurface conditions and their likely behavior with regard to the proposed development. Despite investigation, the actual conditions at the site might differ from those inferred to exist, since no subsurface exploration program, no matter how comprehensive, can reveal all subsurface details and anomalies.

The engineering logs are the subjective interpretation of subsurface conditions at a particular location and time, made by trained personnel. The actual interface between materials may be more gradual or abrupt than a report indicates.

Therefore, the recommendations in the report can only be regarded as preliminary. Asset should be retained during the project implementation to assess if the report's recommendations are valid and whether or not changes should be considered as the project proceeds.

SUBSURFACE CONDITIONS ARE TIME DEPENDENT

Subsurface conditions can be modified by changing natural forces or man-made influences. The report is based on conditions that existed at the time of subsurface exploration. Construction operations adjacent to the site, and natural events such as floods, or ground water fluctuations, may also affect subsurface conditions, and thus the continuing adequacy of a geotechnical report. Asset should be kept appraised of any such events, and should be consulted to determine if any additional tests are necessary.

VERIFICATION OF SITE CONDITIONS

Where ground conditions encountered at the site differ significantly from those anticipated in the report, either due to natural variability of subsurface conditions or construction activities, it is a condition of the report that Asset be notified of any variations and be provided with an opportunity to review the recommendations of this report. Recognition of change of soil and rock conditions requires experience and it is recommended that a suitably experienced geotechnical engineer be engaged to visit the site with sufficient frequency to detect if conditions have changed significantly.

REPRODUCTION OF REPORTS

This report is the subject of copyright and shall not be reproduced either totally or in part without the express permission of this Company. Where information from the accompanying report is to be included in contract documents or engineering specification for the project, the entire report should be included in order to minimize the likelihood of misinterpretation from logs.

REPORT FOR BENEFIT OF CLIENT

The report has been prepared for the benefit of the Client and no other party. Asset assumes no responsibility and will not be liable to any other person or organisation for or in relation to any matter dealt with or conclusions expressed in the report, or for any loss or damage suffered by any other person or organisation arising from matters dealt with or conclusions expressed in the report (including without limitation matters arising from any negligent act or omission of Asset or for any loss or damage suffered by any other party relying upon the matters dealt with or conclusions expressed in the report). Other parties should not rely upon the report or the accuracy or completeness of any conclusions and should make their own inquiries and obtain independent advice in relation to such matters.

DATA MUST NOT BE SEPARATED FROM THE REPORT

The report as a whole presents the site assessment, and must not be copied in part or altered in any way.

Logs, figures, drawings, test results etc. included in our reports are developed by professionals based on their interpretation of field logs (assembled by field personnel) and laboratory evaluation of field samples. These data should not under any circumstances be redrawn for inclusion in other documents or separated from the report in any way.

PARTIAL USE OF REPORT

Where the recommendations of the report are only partially followed, there may be significant implications for the project and could lead to problems. Consult Asset if you are not intending to follow all of the report recommendations, to assess what the implications could be. Asset does not accept responsibility for problems that develop where the report recommendations have only been partially followed if they have not been consulted.

OTHER LIMITATIONS

Asset will not be liable to update or revise the report to take into account any events or emergent circumstances or fact occurring or becoming apparent after the date of the report.



APPENDIX B

Soil & Rock Explanation Sheets Borehole Logs

Soil and Rock Explanation Sheets (1 of 2)

natural excavation

hand excavation backhoe bucket

excavator bucket

dozer blade

ripper tooth



Asphalt

Concrete

Brick

Level

Inflow

Outflow (complete)

Outflow

(partial)

Known

----- Probable

Possible

extremely low

very low

medium

very high

extremely high

low

high

EH

Boundaries

Other

Water

LOG ABBREVIATIONS AND NOTES

METHOD

borel	nole logs	excav	ation logs
AS	auger screw *	NE	natural e
AD	auger drill *	HE	hand ex
RR	roller / tricone	BH	backhoe
W	washbore	EX	excavato
СТ	cable tool	DZ	dozer bl
HA	hand auger	R	ripper to
D	diatube		
В	blade / blank bit		
V	V-bit		
Т	TC-bit		
* hit s	hown by suffix e g AD	N/	

bit shown by suffix e.g. ADV

coring

NMLC, NQ, PQ, HQ

SUPPORT

borehole logs		exca	vation logs
Ν	nil	N	nil
М	mud	S	shoring
С	casing	В	benched
NQ	NQ rods		

CORE-LIFT

- casing installed
- barrel withdrawn

NOTES, SAMPLES, TESTS

- disturbed D bulk disturbed B
- thin-walled sample, 50mm diameter U50 ΗP hand penetrometer (kPa)
- SV shear vane test (kPa)
- DCP dynamic cone penetrometer (blows per 100mm penetration)
- SPT standard penetration test
- SPT value (blows per 300mm) N*
- * denotes sample taken
- Nc SPT with solid cone
- refusal of DCP or SPT R

USCS SYMBOLS

- Well graded gravels and gravel-sand mixtures, little or no fines. GW GP Poorly graded gravels and gravel-sand mixtures, little or no fines.
- Silty gravels, gravel-sand-silt mixtures. GΜ
- GC Clayey gravels, gravel-sand-clay mixtures.
- Well graded sands and gravelly sands, little or no fines. SW
- SP Poorly graded sands and gravelly sands, little or no fines.
- Silty sand, sand-silt mixtures. SM
- Clayey sand, sand-clay mixtures. SC
- Inorganic silts of low plasticity, very fine sands, rock flour, silty or ML clayey fine sands.
- CL Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays.

DENSITY INDEX

- OL Organic silts and organic silty clays of low plasticity.
- MH Inorganic silts of high plasticity.
- Inorganic clays of high plasticity. CH
- Organic clays of medium to high plasticity. OH
- Peat muck and other highly organic soils. PT

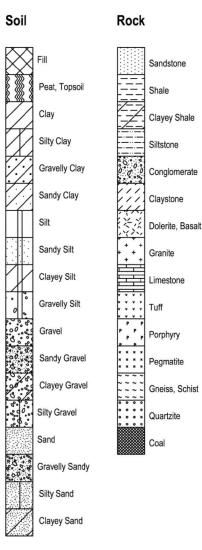
MOISTURE CONDITION

D	dry
М	moist
W	wet
Wp	plastic limit

	probere mine
WI	liquid limit

CONSISTENCY

VS	very soft	VL	very loose
S	soft	L	loose
F	firm	MD	medium dense
St	stiff	D	dense
VSt	very stiff	VD	very dense
Н	hard		
Fb	friable		



WEATHERING

WEATH	HERING	STRE	NGTH
XW	extremely weathered	EL	ext
HW	highly weathered	VL	vei
MW	moderately weathered	L	lov
SW	slightly weathered	M	me
FR	fresh	Н	hig
		VH	vei

RQD (%)

sum of intact core pieces > 2 x diameter x 100 total length of section being evaluated

DEFECTS:

I

type		coati	ng
JT	joint	cl	clean
PT	parting	st	stained
SZ	shear zone	ve	veneer
SM	seam	со	coating

shape		roughness		
pl	planar	ро	polished	
cu	curved	sl	slickensided	
un	undulating	sm	smooth	
st	stepped	ro	rough	
ir	irregular	vr	very rough	

inclination

measured above axis and perpendicular to core

Soil and Rock Explanation Sheets (2 of 2)



AS1726-1993

Soils and rock are described in the following terms, which are broadly in accordance with AS1726-1993.

SOIL

MOISTURE CONDITION

Term Description

Dry	Looks and feels dry. Cohesive and cemented soils are hard, friable or
	powdery. Un-cemented granular soils run freely through the hand.
Moist	Feels cool and darkened in colour. Cohesive soils can be moulded.
	Granular soils tend to cohere.

 $\begin{array}{ll} \mbox{Wet} & \mbox{As for moist, but with free water forming on hands when handled.} \\ \mbox{Moisture content of cohesive soils may also be described in relation to plastic limit (W_{P}) or liquid limit (W_{L}) [>> much greater than, > greater than, < less than, << much less than]. \\ \end{array}$

CONSISTENCY OF COHESIVE SOILS

Term	<u>Su (kPa)</u>	Term	<u>Su (kPa)</u>
Very soft	< 12	Very Stiff	100 - 200
Soft	12 – 25	Hard	> 200
Firm	25 - 50	Friable	-
Stiff	50 - 100		

DENSITY OF GRANULAR SOILS

Term	Density Index (%)	Term	Density Index (%)
Very Loose	< 15	Dense	65 - 85
Loose	15 – 35	Very Dense	>85
Medium Dense	35 - 65		

PARTICLE SIZE

Name	Subdivision	<u>Size (mm)</u>
Boulders		> 200
Cobbles		63 - 200
Gravel	coarse	20 - 63
	medium	6 – 20
	fine	2.36 - 6
Sand	coarse	0.6 - 2.36
	medium	0.2 - 0.6
	fine	0.075 - 0.2
Silt & Clay		< 0.075

MINOR COMPONENTS

Term	Proportion by Ma	SS:
	coarse grained	fine grained
Trace	= 5%	= 15%
Some	5 - 2%	15 - 30%

SOIL ZONING

Layers	Continuous exposures.
Lenses	Discontinuous layers of lenticular shape.
Pockets	Irregular inclusions of different material.

SOIL CEMENTING

Weakly	Easily broken up by hand.
Moderately	Effort is required to break up the soil by hand.

USCS SYMBOLS

Symbol	Description
GW	Well graded gravels and gravel-sand mixtures, little or
	no fines.
GP	Poorly graded gravels and gravel-sand mixtures, little or no fines.
GM	Silty gravels, gravel-sand-silt mixtures.
GC	Clayey gravels, gravel-sand-clay mixtures.
SW	Well graded sands and gravelly sands, little or no fines.
SP	Poorly graded sands and gravelly sands, little or no
	fines.
SM	Silty sand, sand-silt mixtures.
SC	Clayey sand, sand-clay mixtures.
ML	Inorganic silts of low plasticity, very fine sands, rock
	flour, silty or clayey fine sands.
CL	Inorganic clays of low to medium plasticity, gravelly
	clays, sandy clays, silty clays.
OL	Organic silts and organic silty clays of low plasticity.
MH	Inorganic silts of high plasticity.
СН	Inorganic clays of high plasticity.
OH	Organic clays of medium to high plasticity.
PT	Peat muck and other highly organic soils.

Asset Geotechnical Engineering Pty Ltd Document Set ID: 7947972

ROCK

SEDIMENTARY ROCK TYPE DEFINITIONS

Description

Rock Type	Definition (more than 50% of rock consists of)
Conglomerate	gravel sized (>2mm) fragments.
Sandstone	sand sized (0.06 to 2mm) grains.
Siltstone	silt sized (<0.06mm) particles, rock is not laminated.
Claystone	clay, rock is not laminated.
Shale	silt or clay sized particles, rock is laminated.
LAYERING	

Term

Term	Description
Massive	No layering apparent.
Poorly Developed	Layering just visible. Little effect on properties.
Well Developed	Layering distinct. Rock breaks more easily parallel
	to layering.

STRUCTURE Term

Term	Spacing (mm)	Term	Spacing
Thinly laminated	<6	Medium bedded	200 - 600
Laminated	6 - 20	Thickly bedded	600 - 2,000
Very thinly bedded	20 - 60	Very thickly bedded	> 2,000
Thinly bedded	60 - 200		

STRENGTH(NOTE: Is50 = Point Load Strength Index)

	0	
Is50 (MPa)	Term	Is50 (MPa)
<0.03	High	1.0 - 3.0
0.03 - 0.1	Very High	3.0 - 10.0
0.1 - 0.3	Extremely High	>10.0
0.3 – 1.0		
	Is50 (MPa) <0.03 0.03 – 0.1 0.1 – 0.3	<0.03 High 0.03 - 0.1 Very High 0.1 - 0.3 Extremely High

WEATHERING

<u>Term</u> Residual Soil	Description Soil derived from weathering of rock; the mass struc- ture and substance fabric are no longer evident.
Extremely	Rock is weathered to the extent that it has soil properties (either disintegrates or can be remoulded). Fabric of origi- nal rock is still visible.
Highly	Rock strength usually highly changed by weathering; rock may be highly discoloured.
Moderately	Rock strength usually moderately changed by weathering; rock may be moderately discoloured.
Slightly	Rock is slightly discoloured but shows little or no change of strength from fresh rock.
Fresh	Rock shows no signs of decomposition or staining.

DEFECT DESCRIPTION

Туре	
Joint	A surface or crack across which the rock has little or no
	tensile strength. May be open or closed.
Parting	A surface or crack across which the rock has little or no
	tensile strength. Parallel or sub-parallel to layering/bed-
	ding. May be open or closed.
Sheared Zone	Zone of rock substance with roughly parallel, near pla-
	nar, curved or undulating boundaries cut by closely
Seam	spaced joints, sheared surfaces or other defects. Seam with deposited soil (infill), extremely weathered
Seam	insitu rock (XW), or disoriented usually angular frag-
	ments of the host rock (crushed).
Shape	ments of the host fock (clushed).
Planar	Consistent orientation.
Curved	Gradual change in orientation.
Undulating	Wavy surface.
Stepped	One or more well defined steps.
Irregular	Many sharp changes in orientation.
Roughness	
Polished	Shiny smooth surface.
Slickensided	Grooved or striated surface, usually polished.
Smooth	Smooth to touch. Few or no surface irregularities.
Rough	Many small surface irregularities (amplitude generally
N 20 20 2	<1mm). Feels like fine to coarse sandpaper.
Very Rough	Many large surface irregularities, amplitude generally
	>1mm. Feels like very coarse sandpaper.
Coating	
Clean Stained	No visible coating or discolouring.
Veneer	No visible coating but surfaces are discolored. A visible coating of soil or mineral, too thin to measure;
veneer	may be patchy
Coating	Visible coating =1mm thick. Thicker soil material de-
country	scribed as seam.



BH no: sheet:

1 of 1

BH1

job no.: 4064

clier	nt:		C	SLR Co	onsultir	ng					tarted:	17.2.2017													
	cipal	•			Jiisuitii	18					inished:														
	ect:	•	(Geotechnical Investigation and Salinity Assessment								Gentechnical Investigation and Salinity Assessment					Geotechnical Investigation and Salinity Assessment							ogged:	DJ
	tion							n,NSW			hecked														
2	pme	3			auger	<i>ct, wc</i>	1111910				RL surfa	and approximate and the													
-	nete			100m		inclinati	on: -9	0° bearing: E: N:			latum:	AHD													
			nation					ormation																	
											L.														
method	support	water	notes samples, tests, etc	RL	depth metres	graphic log	USCS symbol	material description soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	100 뉴 hand 200 균 penetro- 400 meter	structure and additional observations													
ΗA		served					СН	CLAY, medium to high plasticity, brown, traces of fine to medium grained sand and fine to medium grained subangular gravel, traces of organic matter (twigs, rootlets and root fibres).	D	St-VSt		Topsoil/residual.													
		None observed		и				(twigs, rootlets and root fibres).																	
				_25.5	0.3		СН	As above, but no organic matter present, traces of ironstone inclusions and ironstaining observed.	D	St-VSt		Residual													
					0.5						× 150														
				8																					
				_25.0	_																				
					1.0																				
					1.1		СН	As above, but brown mottled grey-red.	D-M	F-St	× 125														
				_24.5																					
					1.4			Borehole No: BH1 terminated at 1.4m																	
					<u>1</u> .5																				
				_24.0																					
					2.0																				
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					2.5																				
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				_23.0	_																				
					3.0																				
DEE	R TO	EXPL	ΑΝΑΤΙΟ	N SHEE		DESCRIPT		TERMS AND SYMBOLS USED				Borehole Log - Revision													

Asset Geotechnical Engineering Pty Ltd A: 2.05 / 56 Delhi Road, North Ryde NSW 2113 P: 02 9878 6005 W: assetgeo.com.au Document Set ID: 7947972



BH no: sheet:

1 of 1

BH2

job no.: 4064

			-0								00 110	4004
clien	t:		S	LR Co	onsultir	ng				s	started:	17.2.2017
princ		:	0			0					inished	
proje			G	eote	chnica	l Invest	igatio	n and Salinity Assessment			ogged:	DJ
locat								on,NSW			checked	: MAG
equi	pme	nt:	F	land	auger						RL surfa	ce: 26.31 m approx
diam				00m	m			0° bearing: E: N:		C	datum:	AHD
drilli	ng ir	nform	mation			mate	rial inf	ormation				1
method	support	water	notes samples, tests, etc	RL	depth metres	graphic log	USCS symbol	material description soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	100 hand 200 전 penetro- 400 meter	structure and additional observations
HA		None observed					СН	CLAY, medium to high plasticity, brown to dark brown, traces of fine to medium grained sand and fine to medium grained subangular to subrounded gravel, traces of organic matter (twigs, rootlets, grave and seat fibure).	D			Topsoil/residual
		None		_26.0	0.2		СН	grass and root fibres). As above, but no organic matter present.	D	St-VSt		
				5	0.5							-
				_25.5	0.8		СН	As above, but low to medium plasticity, noticeably	M	S-F		
				2			Сп	moister soil.	(< <wp)< td=""><td></td><td>× 50</td><td>-</td></wp)<>		× 50	-
				_25.0								
					1.5 1.5			Borehole No: BH2 terminated at 1.5m				
				_24.5								
					<u>2</u> .0							-
				_24.0								
					<u>2</u> .5							
				_23.5								
					3.0			TERMS AND SYMBOLS USED				Borehole Log - Revision 10

4064 LOGS.GPJ 28/2/17



BH no:

sheet: 1 of 1

BH3

job no.: 4064

clien	t:		S	LR Co	onsultir	ng					tarted:	
princ		l:								inished		
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locat						et, We	rringto			hecked	0.0 77	
equi	-				auger		0	0°			RL surfa	
diam drilli			⊥ nation	00m	m			0° bearing: E: N: ormation		<u> </u>	latum:	AHD
					s	graphic log	USCS symbol	material description soil type: plasticity or particle characteristics,	ure tion	consistency/ density index	hand penetro- meter	structure and additional observations
method	support	water	notes samples, tests, etc	RL	depth metres	graph		colour, secondary and minor components.	moisture condition	consis densit	kPa 81 82 80 84	
НА		None observed		t A			СН	CLAY, high plasticity, brown, traces of fine to medium grained sand and fine to medium grained subangular gravel, traces of organic matter (twigs, rootlets and root fibres).	D	St-VSt		Topsoil/residual -
		ž		_26.5	0.3		СН	As above, but no organic matter present, traces of ironstone inclusions.	D	St-VSt		Residual
					<u>0</u> .5							_
				_26.0	_							-
				26.0	_						× 150	-
					<u>1</u> .0							_
					1.2			Borehole No: BH3 terminated at 1.2m				
				25.5								-
					<u>1.5</u>							-
												-
				_25.0								
					<u>2</u> .0							_
					_							
				_24.5	_							
					<u>2</u> .5							
					_							
				_24.0								
												-
					3.0							
REEE	R TO							TERMS AND SYMBOLS USED elhi Road, North Ryde NSW 2113 P: 02 9878 6005 W				Borehole Log - Revision 10

4064 LOGS.GPJ 28/2/17



BH no:

sheet: 1 of 1

BH4

job no.: 4064

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lient:		SLR C	onsultir	าย				9	started:	17.2.2017
rincipal:	,			0					inished	
roject:	1	Geote	echnical	l Inves	tigatio	n and Salinity Assessment			ogged:	DJ
ocation:						on,NSW			hecked	: MAG
quipment:			auger		0			F	RL surfa	
iameter:		100m	m	inclinat	i on: -9	0° bearing: E: N:		C	datum:	AHD
rilling info	rmation			mate	erial inf	ormation				
metnod support water	notes samples, tests, etc	RL	depth metres	graphic log	USCS symbol	material description soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	100 hand 200 전 penetro- 400 meter	structure and additional observations
None observed					СН	CLAY, medium to high plasticity, brown, traces of fine to medium grained sand and fine to medium grained subangular gravel, traces of organic matter (twigs, rootlets and root fibres).	D	F-St		Topsoil/residual
No		_25.5			СН	As above, but no organic matter present.	D-M	St-VSt		Residual
			<u>0</u> .5							
		_25.0								
			1.0						× 150	
		24.5	1.3			Borehole No: BH4 terminated at 1.3m				
			1.5							
			-							
		_24.0	-							
			2.0							
		_23.5								
			2.5							
		_23.0	_							
			- 3.0							

4064 LOGS.GPJ 28/2/17



APPENDIX C

Laboratory Test Results



Corrosion & Scaling Assessment: Soil Reporting Profile

Sample Drop Off: 16 Chilvers Road Tel: 1300 30 40 80 Thornleigh NSW 2120 Fax: Mailing Address: PO Box 357 Em: Pennant Hills NSW 1715 Web: www.sesl.com.au

1300 64 46 89 info@sesl.com.au

Batch N°: 423	347 Sample N°: 1	Date Received	: 20/2/17	Report Status: O Draft
Client Name:	Asset Geotechnical	Project Name:	Ref: 4064 - 1 Water St Werring	ton
Client Contact:	: Denny Jacob	SESL Quote N°	:	
Client Job N°:		Sample Name:	BH1 (0-0.2m)	
Client Order N	•:	Description:	Soil	
Address:	Suite2.05/56 Delhi Rd North Ryde NSW 2113	Test Type:	USAWS	

TEST	RESULT	COMMENTS
pH in water (1:5)	8	Moderate alkalinity
EC mS/cm (1:5)	0.12	Low
Texture Class	-	Did not test
Soil Condition Class (Permeability)	-	Did not test
SOLUBLE ANION ANALYSIS		
Sulphate (1:5) mgSO₄ / kg	80	Low (non to mildly aggressive)
Chloride (1:5) mgCl / kg	670	Low (non-aggressive)
* Resistivity Ω. m	20.47	Moderate (non to mildly aggressive)

* Resistivity tested on a saturated sample/paste

(Note:- 10,000 mg/kg = 1%)

Recommendations

Recommendations by SESL Australia not requested.

pH, EC, Soluble SO4: Bradley et al., (1983); Cl, (4500-Cl- E; APHA, 1998); Resistivity, AS1289.4.4.1:1997, Texture - PM0003 (Texture- "Northcote" (1992))

mohin Consultant: C **Michelle Murphy**

Authorised Signatory: Ryan Jacka

Date Report Generated 27/02/2017

Tests are performed under a quality system certified as complying with ISO 9001: 2008. Results and conclusions assume that sampling is representative. This document shall not be reproduced except in full.



Corrosion & Scaling Assessment: Soil Reporting Profile

 Sample Drop Off:
 16 Chilvers Road Thornleigh NSW 2120
 Tel:
 1300 30 40 80

 Mailing Address:
 PO Box 357 Pennant Hills NSW 1715
 Em:
 info@sesl.com.au

 Web:
 www.sesl.com.au

Batch N°: 42347 Sample N°: 2 Date Received: 20/2/17 Report Status: O Draft
 Final **Client Name: Asset Geotechnical** Project Name: Ref: 4064 - 1 Water St Werrington Client Contact: Denny Jacob SESL Quote N°: Client Job N°: Sample Name: BH2 (0-0.2m) Client Order N°: Description: Soil Suite2.05/56 Delhi Rd USAWS Address: Test Type: North Ryde NSW 2113

TEST	RESULT	COMMENTS
pH in water (1:5)	7.4	Slight alkalinity
EC mS/cm (1:5)	0.08	Very low
Texture Class	-	Did not test
Soil Condition Class (Permeability)	-	Did not test
SOLUBLE ANION ANALYSIS		
Sulphate (1:5) mgSO₄ / kg	40	Low (non to mildly aggressive)
Chloride (1:5) mgCl / kg	260	Low (non-aggressive)
* Resistivity Ω. m	20.57	Moderate (non to mildly aggressive)

* Resistivity tested on a saturated sample/paste

Recommendations

Recommendations by SESL Australia not requested.

pH, EC, Soluble SO₄**:** Bradley et al., (1983); **CI**, (4500-CI- E; APHA, 1998); **Resistivity**, AS1289.4.4.1:1997, **Texture** - PM0003 (Texture- "Northcote" (1992))

she Consultant: **Michelle Murphy** C

)

Authorised Signatory: Ryan Jacka

Date Report Generated 27/02/2017

(Note:- 10,000 mg/kg = 1%)

Tests are performed under a quality system certified as complying with ISO 9001: 2008. Results and conclusions assume that sampling is representative. This document shall not be reproduced except in full.



Corrosion & Scaling Assessment: Soil Reporting Profile

 Sample Drop Off:
 16 Chilvers Road Thornleigh NSW 2120
 Tel:
 1300 30 40 80

 Mailing Address:
 PO Box 357 Pennant Hills NSW 1715
 Em:
 info@sesl.com.au

 Web:
 www.sesl.com.au

Batch N°: 42347 Sample N°: 3 Date Received: 20/2/17 Report Status: O Draft
 Final **Client Name: Asset Geotechnical** Project Name: Ref: 4064 - 1 Water St Werrington Client Contact: Denny Jacob SESL Quote N°: Client Job N°: Sample Name: BH3 (0.3-0.4m) Client Order N°: Description: Soil Suite2.05/56 Delhi Rd USAWS Address: Test Type: North Ryde NSW 2113

TEST	RESULT	COMMENTS
pH in water (1:5)	7.3	Slight alkalinity
EC mS/cm (1:5)	0.1	Very low
Texture Class	-	Did not test
Soil Condition Class (Permeability)	-	Did not test
SOLUBLE ANION ANALYSIS		
Sulphate (1:5) mgSO₄ / kg	20	Low (non to mildly aggressive)
Chloride (1:5) mgCl / kg	860	Low (non-aggressive)
* Resistivity Ω. m	23.75	Moderate (non to mildly aggressive)

* Resistivity tested on a saturated sample/paste

Recommendations

Recommendations by SESL Australia not requested.

pH, EC, Soluble SO₄**:** Bradley et al., (1983); **CI**, (4500-CI- E; APHA, 1998); **Resistivity**, AS1289.4.4.1:1997, **Texture** - PM0003 (Texture- "Northcote" (1992))

she Consultant: Michelle Murphy C

ð

Authorised Signatory: Ryan Jacka

Date Report Generated 27/02/2017

(Note:- 10,000 mg/kg = 1%)

Tests are performed under a quality system certified as complying with ISO 9001: 2008. Results and conclusions assume that sampling is representative. This document shall not be reproduced except in full.



Mehlich 3 - Multi-nutrient Extractant

 Sample Drop Off:
 16 Chilvers Road Thornleigh NSW 2120
 Tel:
 1300 30 40 80

 Mailing Address:
 PO Box 357 Pennant Hills NSW 1715
 Em:
 info@sesl.com.au

 Web:
 www.sesl.com.au

Batch N°: 42347 Sample N°: 1 Date Received: 20/2/17 Report Status: O Draft
 Final **Client Name: Asset Geotechnical** Project Name: Ref: 4064 - 1 Water St Werrington Client Contact: **Denny Jacob** Client Job N°: SESL Quote N°: Client Order N°: Sample Name: BH1 (0-0.2m) Address: Suite2.05/56 Delhi Rd Description: Soil North Ryde NSW 2113 Test Type: USAWS RECOMMENDATIONS Recommendations by SESL Australia not requested. **SOIL SAMPLE DEPTH (mm):** O 100 O 150 O 200 FERTILITY RATING: O Low O Moderate **O** High pH and ELECTRICAL CONDUCTIVITY Slight Alkalinity V. Slight Acidity Moderate Alkalinity Neutral ≤4.0 4.5 5.5 6.0 8.0 8.5 9.0 9.5 ≥10 5.0 6.5 7.0 7.5 pH in H₂O (1:5)8.02 5.61 pH in CaCl₂ (1:5)0.001 0.010 0.100 1.000 10.000 Salinity (EC 1:5 dS/m) 0.12 - Low Sodium (Na) (mg/kg) 494 High Chloride (Cl) (mg/kg) 680.2 Very High **CATION BALANCE CATION RATIOS EXCHANGEABLE CATION PERCENTAGE** Note: Hydrogen only determined when pH in CaCl_2 ≤ 5.5 Al only determined if pH in CaCl_2 is ≤ 5.2 Extractable Extractable Extractable Ratio **Target Range** Magnesium (Mg) Hydrogen (H) Result Calcium (Ca) Extractable Extractable Aluminium* (AI) 0.3 4.1 - 6.0Exchangeable Ca:Mg Potassium (K) Sodium (Na) Comment: Potential Calcium deficiency Na 16.4% High sodicity Na < 5% Mg:K 56.7 2.6 - 5.0Comment: Potential Potassium deficiency Mg 12 - 25% Ca Ca 17.3% K/(Ca+Mg) 0.01 < 0.07 57 - 78% Low Comment: Acceptable K 3 - 11% Mg 64.9% K 1.1% High, magnesic K:Na N/A 0.1 Low H < 10% AI < 1% Sodium Absorption Ratio: D.N.T. IDEAL ACTUAL **EXCHANGEABLE CATIONS** cmol(+)/kg Na: K: H: AI: **EFFECTIVE CATION EXCHANGE CAPACITY (eCEC)** Ca: Ma: 8.50 2.15 0.15 2.26 0 10 20 50 100 **SOLUBLE CATIONS** cmol(+)/kg 13.1 Moderate Na: K: Ca: Ma:

ASPAC

A member of the Australasian Soil and Plant Analysis Council † This laboratory has been awarded a Certificate of Proficiency for specific soil and plant tissue analyses by the Australasian Soil and Plant Analysis Council (ASPAC). Tests for which proficiency has been demonstrated are highlighted in this report. Disclaimer: Tests are performed under a quality system complying with ISO 9001: 2008. Results are based on the analysis of the sample taken or received by SESL. Due to the variability of sampling procedures, environmental conditions and managerial factors, SESL does not accept any liability for a lack of performance based on its interpretation and recommendations. This document must not be reproduced except in full.



Mehlich 3 - Multi-nutrient Extractant

Sample Drop Off: 16 Chilvers Road

Mailing Address:

Thornleigh NSW 2120 PO Box 357

Pennant Hills NSW 1715

Tel: 1300 30 40 80 1300 64 46 89 Fax: info@sesl.com.au Em: Web: www.sesl.com.au

Batch N°: 42347

Sample N°: 1

Date Received: 20/2/17

Report Status: O Draft
 Final

Major Huttherits (mg/kg) Very Low Low Watginal (g/Adequate High (g/sqm) (g/sqm		1		3	JTRIENT	LE N	VAILA	ANIA	PL					
Phosphate-P (PO ₄) - 12.6 Difference Potassium (Ks) ⁺ 59.6 11.9 52.3 11.9 52.3 Sulphate-S (SO ₄) - 13.6 90.2 372.1 11.0 Magnesium (Mg) ⁺ 1033 206.1 38.7 Dr Iron (Fe) - 110.1 Diff. - 110.1 Diff. Kanganese (Mn) ⁺ - 8.8 Diff. - 1.3 Diff. Copper (Cu) - - 1.3 Diff. - 0.5 Diff. Formation of graph ranges: Wery Low Marginal Surgly of this nutrient states are incommended. Potential response to muter. The level is excessive and muter. NotEs. Adaptamet recommended. Potential response to muter. <th>djustme (g/sqm)</th> <th></th> <th></th> <th>High</th> <th>Adequate</th> <th>inal</th> <th>Mar</th> <th>Low</th> <th>Very Low</th> <th> <u> </u></th> <th>Construction and Construction</th> <th>Major Nutrients</th>	djustme (g/sqm)			High	Adequate	inal	Mar	Low	Very Low	<u> </u>	Construction and Construction	Major Nutrients		
Potassium (K) ¹ Sulphate-S (SO ₄) Calcium (Ca) ¹ 452 Magnesium (Mg) ¹ 1033 Calcium (Ca) ¹ 452 Magnesium (Mg) ¹ 1033 Calcium (Ca) ¹ 452 206.1 38.7 Dr 100.1 206.1 38.7 Dr 101.1 Did Marganese (Mn) ¹ - 8.8 Did Copper (Cu) - 1.3 Did Copper (Cu) - 1.3 Did Copper (Cu) - 1.3 Did Derorn (B) ¹ - 1.3 Did Derorn (B) ¹ - Deretail ridden Deretail response to nutrient addition is 20 Did Deretail response to Did Deretail response to Did Did Deretail response to Did Did Did Did Did Did Did Did	id not te	-	-								-	Nitrate-N (NO ₃)		
Sulphate-S (SO,) - 13.6 Calcium (Ca) [†] 452 90.2 372.1 Magnesium (Mg) [†] 1033 206.1 38.7 Dr Magnesium (Mg) [†] 1033 - 110.1 Dir Magnesium (Mg) [†] - 8.8 Dir Zinc (Zn) [†] - 1.3 Dir Copper (Cu) - 1.3 Dir Boron (B) [†] - 0 - 1.3 Dir Growth Is likely to be served to graph ranges: Magnal Supply of this nutrient is barely adequate for solubiling purposes to nutrient addition is 5 to 30%. Magnal Supply of this nutrient is barely adequate for solubiling purposes to nutrient addition is 5 to 30%. Magnesite are nonsmerideling purposes to nutrient addition is 5 to 30%. Magnesite All (Mg (Mg)) - High Phosphorus Saturation Index Exchangeable Acidity Physical Description - Supply of this nutrient is to adequate for the plant, and out addition is 5 to 30%. Supply of this nutrient is to adequate for the plant, and out addition is 5 to 30%. - Dir 0 - 0.5 Supply of this nutrient is bare for adequate for the plant, and out addition is 5 to 30%. - - -	id not te	12.6	-								-	Phosphate-P (PO ₄)		
Calcium (Ca) ¹ 452 90.2 372.1 Magnesium (Mg) [†] 1033 206.1 38.7 Dr Iron (Fe) - 110.1 Div Anganese (Mn) [†] - 8.8 Div Zinc (Zn) [†] - 1 Div Copper (Cu) - 1.3 Div Boron (B) [†] - 0.5 Div Explanation of graph ranges: Image: Compart (Cu) - 0.5 Div Growth is likely to be serverly degressed and deficiency synthesis in solution is solue soly. Supply of this nutrient is barely adequate for the plant, and response to nutrient addition is solue solv. The level is exceessive and may dedication is solue solv. Out-outer response to nutrient addition is solue solv. Supply of this nutrient is solue solv. Supply of this nutrient is addition is solue solv. Diverse addition is solue solv. Diverse addition is solue solv. Out-outer response to nutrient addition is solue solv. Supply of this nutrient is addition is solue solv. Diverse addition is solue solu	40.4	52.3	11.9								59.6	Potassium (K) [†]		
Magnesium (Mg) ¹ 1033 206.1 38.7 Drive Iron (Fe) - 110.1 Dive Manganese (Mn) ¹ - 8.8 Dive Zinc (Zn) ¹ - 1.0 Dive Copper (Cu) - 1.3 Dive Boron (B) ¹ - 0.5 Dive Explanation of graph ranges: - 0.5 Dive Orwth is likely to be are used and green and and only promoses are usally recommende to outside in the solid scale of the part, and and only promoses to nuriterint addition is 30 - 0.5 Dive Potential response to nuriterint addition is 30 - - 1.3 Dive -	13.6	13.6	-								-	Sulphate-S (SO ₄)		
Image: Construction of graph ranges: - 110.1 Div Very Low - 1.3 Div Copper (Cu) - 1.3 Div Supply of this nutrient addition is 50 to 50%. - 0 NOTEs: Adjustment recommendation calculates for the plant, and and only publication is 50 to 50%. Notes: Adjustment recommendation calculates for the plant, and and only publication is 50 to 50%. Notes: Adjustment recommendation calculates for the plant, and and only publication is 50 to 50%. Notes: Adjustment recommendation calculates for the plant, and and only publication is 50 to 50%. Phosphorus Saturation Index Exchangeable Acidity Physical Description 0 0 Exchangeable Acidity (mon/100g ⁻¹): 13.1 Colou:: 0 Cox Plant response to applied P is likely. 0 Exchangeable Acidity (mon/100g ⁻¹): 13.1 Colou:: 0 Cox Plant response to applied P is likely. 0 To achieve 67.5% exch. Ca (g/sqm): 0 Texture: Did 0 Cox Chieve pH 6.0 (g/sqm): 0 Cox Chieve pH 6.0 (g/sqm): 0 Colou:: Exchangeable Acidity (mon/100g ⁻¹): Colou:: Structural unit: Did 0 Cox Chieve pH 6.0 (g/sqm): 0 To achieve 67.5% exch. Ca (g/sqm)	281.9	372.1	90.2								452	Calcium (Ca) [†]		
Manganese (Mn) [†] - 8.8 Div Anaganese (Mn) [†] - 1 Div Copper (Cu) - 1.3 Div Boron (B) [†] - 0.5 Div Explanation of graph ranges: Very Low - 0.5 Div Growth is likely to be serverly direpset and deficiency, performanded present Large applications is 00 b0%. Marginal Supply of this nutrient is adequate for the plant, and and only The level is excessive and may be definitential to pollution of the plant, and and only The level is excessive and may be definitential to pollution of the adequate for the plant, and and only The level is excessive and may be definitential to pollution of the adequate for the plant, and and only The level is excessive and may be definitential application to the adequate to the phylicolocity and pollution is 50 b OTES: Adjustment recommended. Potential response to nutrient addition is 50 b The level is excessive and may be definitential to pollution of pollution is 30 b The level is excessive and may be definitential to pollution of pollution is 50 b The level is excessive and may be definitential to pollution of pollution is 50 b The level is excessive and may be definitential to pollution of pollution is 50 b The level is excessive and may be definitential to pollution of pollution is 50 b The level is excessive and may be definitential to pollution of pollution is 50 b The level is excessive and may be definitential to pollution of pollution is 50	rawdow	38.7	206.1								1033	Magnesium (Mg) [†]		
Address Verify - 1 Div Zinc (Zn) ¹ - 1 Div Copper (Cu) - 1.3 Div Boron (B) ¹ - 0.5 Div Explanation of graph ranges: Very Low - 0.5 Div Crowth is likely to be served depressed and served paragenet to sub-chical response to nutrient addition is 30 to 60%. Marginal Supply of this nutrient is addrequete for the plant, and and only mainteriance application response to nutrient addition is 30 to 60%. The level is excessive and nutrient addition is 30 to 60%. Potential response to nutrient addition is 30 to 60%. Exchangeable Acidity The level is excessive and nutrient addition is 30 to 60%. The level is excessive and nutrient addition is 30 to 60%. 0 0 Exchangeable Acidity The level is excessive and nutrient addition is 30 to 60%. The level is excessive and nutrient addition is 30 to 60%. 0 0 Exchangeable Acidity (mail and only mainterim response to nutrient addition is 30 to 60%. The level is excessive and nutrient addition is 30 to 60%. 0 0 Cation Exch. Capacity (eCEC): 13.1 Estimated clay content: Div 1.3 Cation Exch. Capacity (eCEC): 13.1 Estimated clay content: Exchangeable Acidity (meq/1	id not te	110.1	-								-	ron (Fe)		
Zinc (Zn) † - 1 Did Copper (Cu) - 1.3 Did Boron (B) † - 0.5 Did Explanation of graph ranges: Very Low - 0.5 Did Orgen (Cu) - 0.5 Did Did - 0.5 Did Supply of this nutrient is likely to be severely dopresed and deficiency symptoms present. Large applications is 60 to 90%. Marginal Supply of this nutrient is addition is 50 to 90%. Notes: Adjustment recommended. Potential response to nutrient addition is 50 to 90%. Notes: Adjustment recommended. Potential response to nutrient addition is 50 to 90%. Notes: Adjustment recommended. Potential response to nutrient addition is 50 to 90%. Notes: Adjustment recommended. Potential response to nutrient addition is 50 to 90%. Notes: Recommended. Potential response to nutrient addition is 20 Notes: Recommended. Potential response to nutrient addition is 20 Notes: Recommended. Potential response to nutrient addition is 20%. Physical Description Phosphorus Saturation Index Exchangeable Acidity (Meg/100g ⁻¹): 13.1 Estimated clay content: Did 0 0 0 Exchangeable Acidity (Meg/100g ⁻¹): 2 Gravel content: Colour: Exchangeable Acidity (Meg/100g ⁻¹): 2 Exchangeable Acidity (Meg/100g ⁻¹): 2 Gravel	id not te	8.8	-								-	Manganese (Mn) [†]		
Copper (Cu) - 1.3 Did Boron (B) [↑] - 0.5 Did Explanation of graph ranges: - 0.5 Did Very Low - 0.5 Did Growth is likely to be severely depressed and deficiency. Potential "hidden present Large applications is 60 to 90%. Marginal Supply of this nutrient is adduate for the plant, and monger. or sub-clinical deficiency. Potential response to nutrient addition is 50 to 50%. The level is excessive and monger. or sub-clinical deficiency. Potential response to nutrient addition is 50 to 50%. The level is excessive and growth is is 60 to 90%. Phosphorus Saturation Index Exchangeable Acidity Potential response to nutrient addition is 50 to 50%. Did Di	id not te	1	-								-			
Borno (B) ⁺ - 0.5 Dir Explanation of graph ranges: Very Low - 0.5 Dir Growth is likely to be severely depressed and deficiency. Potential Thidden nurger, or sub-clinical deficiency. Potential Thidden present Large applications is 60 to 90%. Marginal Supply of this nutrient is barely adequate for the solution is 60 to 90%. Supply of this nutrient is barely adequate for the solution is 50 to 90%. The level is excessive and may be detrimental to polation of and and and surface waters. Drawdown is recommended. Potential response to nutrient addition is 5 to 30%. The level is excessive and may contribute to pollution of reases are recommended. Potential response to nutrient addition is 5 to 30%. The level is excessive and may contribute to pollution of reases are recommended. Potential response to nutrient addition is 5 to 30%. The level is excessive and may contribute to pollution of reases are recommended. Potential response to nutrient addition is 5 to 30%. The level is excessive and may contribute to pollution of reases are recommended. Potential response to nutrient addition is 5 to 30%. The level is excessive and may contribute to pollution of reases are recommended. Potential response to nutrient addition is 5 to 30%. The level is excessive and may contribute to pollution of reases are recommended. Potential response to nutrient addition is 5 to 30%. The level is excessive and may contribute to pollution of reases are recommended. Potential response to nutrient addition is 5 to 313 the Exchangeable Acidity (meq/100g ⁻¹): The revel sector addition is 6 to achieve pH 6.0 (g/sqm): The cana level sector addition rate: D	id not te	1.3	-								-			
Explanation of graph ranges: Very Low NOTEs: Adjustment recommendation calculated application to shift the solutes two elemental application application of shift the solutes two elemental application application is 30 to 90%. NOTEs: Adjustment recommendation calculated for the plant, and and only maintenance applications is the adequate for the plant, and and only container sponse to nutrient addition is 50 to 90%. NOTEs: Adjustment recommendation calculated for the plant, and and only maintenance application is 30 to 90%. NOTEs: Adjustment recommendation calculated for the plant, and and only maintenance application is 50 to 90%. Notes: Adjustment recommendation calculated for the plant, and and only maintenance application is 50 to 90%. Notes: Adjustment recommendation calculated for the plant, and and only maintenance application is 50 to 90%. Notes: Adjustment recommendation calculated for the plant, and addonly calculated for the plant, and and only maintenance application is 30 to 90%. Phosphorus Saturation Index Exchangeable Acidity Physical Description 0 Adams-Evans Buffer pH (BpH): - Texture: 0 Sum of Base Cations (meq/100g ⁻¹): 13.1 Colour: Exchangeable Acidity (meq/100g ⁻¹): - Gravel content: - 0 Lime Application Rate - - Aggregate strength: - 0 - - Colour: - Colour: Colour: 0 - <td< td=""><td>id not te</td><td>0.5</td><td>-</td><td></td><td></td><td></td><td>//////</td><td></td><td></td><td></td><td>-</td><td></td></td<>	id not te	0.5	-				//////				-			
Very Low Low Marginal Adequate High Growth is likely to be severely depressed and deficiency, symptoms present Large applications are usable to the or soil building in soil to solve. Potential "hidden hunger, or sub-clinical deficiency, and minimises impact or brank and purposes are usably recommended. Potential response to nutrient addition is 50 to 90%. Supply of this nutrient is barely adequate for the plant, and build-up is still response to nutrient addition is 50 to 90%. Marginal Supply of this nutrient and and only maintenance application to 60%. Build up is still addition is 50 to 90%. The level is excessive and may the detrimental to plant, and and only maintenance application rate recommended. Potential response to nutrient addition is 5 to to 60%. The level is excessive and may the detrimental to plant, and anoly may contribute to pollution of ground and supresse to nutrient addition is 5 to to 60%. The level is excessive and may the detrimental to plant, and anoly may contribute to pollution of ground and supresse to nutrient addition is 5 to to 60%. The level is excessive and may the detrimental to plant, and anoly may contribute to pollution of ground and supresse to nutrient addition is 5 to to 60%. Phosphorus Saturation Index Exchangeable Acidity Adams-Evans Buffer pH (BpH): - The sturre: Sum of Base Cations (meq/100g ⁻¹): - The sturre: - Did Base Saturation (%): - The sturre: - Did Potential infiltration rate: -	ulates the	nent recommendation	NOTES: Adjuste								ranges:			
Growth is likely to be severely depressed and deficiency symptoms present. Large applications for soil building purposes are usually recommended. Potential response to nutrient addition is >00%. Potential "hidden hunger", or sub-clinical deficiency symptoms prosent in utrient addition is 60 to 90%. Supply of this nutrient is barely adequate for the plant, and only maintenance application recommended. Potential response to nutrient addition is 50 to 60%. The level is excessive and maintenance application reason to apply forthis. There is no again prosent is the plant, and only maintenance application reason to apply forthis nutrient addition is 50 to 60%. The level is excessive and maintenance application reason to apply forthis nutrient addition is 50 to 60%. The level is excessive and maintenance apply forthis. There is no again prosent is the plant, and only maintenanced. Potential response to nutrient addition is 50 to 60%. The level is excessive and may be definement. Drawdown: The objective nutrient manager ground and surface waters. Drawdown: The objective nutrient manager areason to apply forthis nutrient addition is 50 to 60%. Phosphorus Saturation Index Exchangeable Acidity Maintenance of the plant, and addition is 50 to 60%. Exchangeable Acidity (eCEC): 13.1 Texture: Sum of Base Cations (meq/100g ⁻¹): Exchangeable Acidity (meq/100g ⁻¹): Exchangeable Acidity (%): the catione Rate - to achieve pH 6.0 (g/sqm): - to neutralise Al (g/sqm): - to neutralise Al (g/sqm): - to achieve ef 7.5% exch. Ca (g/sqm): The CGAR is corrected for a soil The CGAR is corrected for a soil The CGAR is corrected for a soil Organic Carbon (OC%) ¹ : Did not test Organic Matter (OM%): - to maintenance addition is 4000°.	vel to within	ation to shift the soil te	elemental applica		High	ate	💋 Adeo	qinal	Mare					
$\begin{array}{c} \mbox{Adams-Evans Buffer pH (BpH):} & - & Texture: \\ \mbox{Sum of Base Cations (meq/100g^{-1}): 13.1 & Colour: \\ \mbox{Eff. Cation Exch. Capacity (eCEC): 13.1 & Estimated clay content: & Did Base Saturation (%): & 100 & Size: \\ \mbox{Exchangeable Acidity (meq/100g^{-1}): - & Gravel content: \\ \mbox{Exchangeable Acidity (meq/100g^{-1}): - & Aggregate strength: \\ \mbox{Exchangeable Acidity (%): & - & Aggregate strength: \\ \mbox{Exchangeable Acidity (%): & - & Aggregate strength: \\ \mbox{Exchangeable Acidity (%): & - & Aggregate strength: \\ \mbox{Exchangeable Acidity (%): & - & Aggregate strength: \\ \mbox{Exchangeable Acidity (%): & - & Did Base Cations (meq/100g^{-1}): & - & Content: \\ \mbox{Exchangeable Acidity (%): & - & Aggregate strength: \\ \mbox{Exchangeable Acidity (%): & - & Did Base Cations (meq/100g^{-1}): & - & Content: \\ \mbox{Exchangeable Acidity (%): & - & Did Base Cations (meq/100g^{-1}): & - & Content: \\ \mbox{Exchangeable Acidity (%): & - & Did Base Cations (meq/100g^{-1}): & - & Content: \\ Exchangeable Acidity (%): & - & Content: \\ \mbox{Exchangeable Acidity (%): & - & C$	Jlk density of		• g/sqm measure	ecommended.	Drawdown is re Potential respo	Potential response to Potential response to Drawdov nutrient addition is 30 nutrient addition is 5 to Potentia					are usually recommended. Potential response to			
$\begin{array}{cccccccccccccccccccccccccccccccccccc$		on	Descriptio	Physical De			cidity	ngeable A	Exchar	Phosphorus Saturation Index				
$\begin{array}{c} 0.11 \\ 0.06 \\ Adequate \\ 0 \\ \hline \\ Mmol/kg \\ \hline \\ \\ 0 \\ \hline \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\$				Texture:): ·	er pH (BpH	Evans Buffe	Adams-E					
High $Adequate0ExcessiveAdequate0Eff. Cation Exch. Capacity (eCEC):13.1Estimated clay content:DidBase Saturation (%):100Size:Exchangeable Acidity (meq/100g-1):Gravel content:Exchangeable Acidity (%):-Aggregate strength:Structural unit:DidDidO- to achieve pH 6.0 (g/sqm):0- to achieve pH 6.0 (g/sqm):-O- to neutralise Al (g/sqm):-Calculated EC_{SE} (dS/m):Calculated EC_{SE} (dS/m):Calculated EC_{SE} (dS/m):Organic Carbon (OC%)†: Did not testOrganic Matter (OM%):$				Colour:	5.1	0g⁻¹):	ns (meq/1	Base Cation	Sum of E					
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	not tes					,				High				
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		ntanti								0.06 Excessive Adequate				
Immol/kg Lime Application Rate Structural unit: Did 0 - to achieve pH 6.0 (g/sqm): 0 Potential infiltration rate: Did Low. Plant response to applied P is likely. - to neutralise Al (g/sqm): - - Calculated EC _{SE} (dS/m): Gypsum Application Rate Requires EC and Soil Texture result Organic Carbon (OC%) [†] : Did not test - to achieve 67.5% exch. Ca (g/sqm): 0 Organic Matter (OM%): -														
Lime Application Rate Potential infiltration rate: Did 0 - to achieve pH 6.0 (g/sqm): 0 Low. Plant response to applied P is likely. - to neutralise Al (g/sqm): - Gypsum Application Rate Permeability (mm/hr): Did - to achieve 67.5% exch. Ca (g/sqm): 0 Organic Carbon (OC%) [†] : Did not test The CGAR is corrected for a soil Organic Matter (OM%): -			-				ity (%):	jeable Aciu	Exchang	:0.4				
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Low. Plant response to applied P is likely. - to neutralise Al (g/sqm): - Calculated EC _{SE} (dS/m): Gypsum Application Rate - to achieve 67.5% exch. Ca (g/sqm): Requires EC and Soil Texture result - to achieve 67.5% exch. Ca (g/sqm): Organic Carbon (OC%) [†] : Did not test The CGAR is corrected for a soil Organic Matter (OM%):	not tes				0		(g/sqm):	ieve pH 6.0	– to achi	0				
Gypsum Application Rate Requires EC and Soil Texture result – to achieve 67.5% exch. Ca (g/sqm): 0 Organic Carbon (OC%) [†] : Did not test The CGAR is corrected for a soil Organic Matter (OM%):	not tes			-			 to neutralise AI (g/sqm): 				applied P is like	Low. Plant response to a		
 − to achieve 67.5% exch. Ca (g/sqm): 0 Organic Carbon (OC%)[†]: Did not test The CGAR is corrected for a soil Organic Matter (OM%): - 	lt.			_			on Rate	n Applicati	Gypsum					
The CGAR is corrected for a soil Organic Matter (OM%): -					0	g/sqm):								
depth of mm and any Lime				-		oil	The CGAR is corrected for a soil							
addition to achieve pH 6.0.			comments:	Additional			depth of mm and any Lime addition to achieve pH 6.0.							

Consultant: Michelle Murphy



Authorised Signatory: Ryan Jacka

Date Report Generated 27/02/2017

METHOD REFERENCES: pH (1:5 HzO) - Rayment & Higginson (1992) 4A1, pH (1:5 GaCiz) - Rayment & Higginson (1992) 4B1, EC (1:5) - Rayment & Higginson (1992) 5A2, Nitrate - Rayment & Higginson (1992) 5A2, Nitrate - Rayment & Higginson (1992) 7B1 Alurnihum - SESL in-house, PO-K, K. SOC, A. Mg, Na, Fe, Mn, Zn, Cu, B - Mehlich 3 (1984), Buffer pH and Hydrogen - Adams-Evans (1972) Texture/SitvatureColour - PMo003 (Texture "Northcole" (1992), Structure - "Murphy" (1991), Colour- "Munsell" (2000))



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Disciaimer: Tests are performed under a quality system complying with ISO 9001: 2008. Results are based on the analysis of the sample taken or received by SESL. Due to the variability of sampling procedures, environmental conditions and managerial factors, SESL does not accept any liability for a lack of performance based on its interpretation and recommendations. This document must not be reproduced except in full.



Mehlich 3 - Multi-nutrient Extractant

 Sample Drop Off:
 16 Chilvers Road Thornleigh NSW 2120
 Tel:
 1300 30 40 80

 Mailing Address:
 PO Box 357 Pennant Hills NSW 1715
 Em:
 info@sesl.com.au

 Web:
 www.sesl.com.au

Batch N°: 42347 Sample N°: 2 Date Received: 20/2/17 Report Status: O Draft
 Final **Client Name: Asset Geotechnical** Project Name: Ref: 4064 - 1 Water St Werrington Client Contact: **Denny Jacob** Client Job N°: SESL Quote N°: Client Order N°: Sample Name: BH2 (0-0.2m) Address: Suite2.05/56 Delhi Rd Description: Soil North Ryde NSW 2113 Test Type: USAWS RECOMMENDATIONS Recommendations by SESL Australia not requested. **SOIL SAMPLE DEPTH (mm):** O 100 O 150 O 200 FERTILITY RATING: O Low O Moderate **O** High pH and ELECTRICAL CONDUCTIVITY V. Slight Acidity Slight Alkalinity Moderate Alkalinity Neutral ≤4.0 4.5 6.0 7.0 8.0 8.5 9.0 9.5 ≥10 5.0 5.5 6.5 7.5 pH in H₂O (1:5)7.36 5.7 pH in CaCl₂ (1:5)0.001 0.010 0.100 1.000 10.000 Salinity (EC 1:5 dS/m) 0.08 - Very low Sodium (Na) (mg/kg) 367 High Chloride (Cl) (mg/kg) 263.5 High **CATION BALANCE CATION RATIOS EXCHANGEABLE CATION PERCENTAGE** Note: Hydrogen only determined when pH in CaCl_2 ≤ 5.5 Al only determined if pH in CaCl_2 is ≤ 5.2 Extractable Extractable Extractable Ratio **Target Range** Magnesium (Mg) Hydrogen (H) Result Calcium (Ca) Extractable Extractable Aluminium* (AI) 0.3 4.1 - 6.0Exchangeable Ca:Mg Potassium (K) Sodium (Na) Comment: Potential Calcium deficiency Na 11% oderate sodicity Na < 5% Mg:K 55.8 2.6 - 5.0Comment: Potential Potassium deficiency Mg 12 - 25% Ca Ca 22.2% K/(Ca+Mg) 0.01 < 0.07 57 - 78% Low Comment: Acceptable Mg 65.4% K 3 - 11% High, magnesic K:Na N/A K 1.2% 0.1 H < 10% Low AI < 1% Sodium Absorption Ratio: D.N.T. IDEAL ACTUAL **EXCHANGEABLE CATIONS** cmol(+)/kg Na: K: H: AI: **EFFECTIVE CATION EXCHANGE CAPACITY (eCEC)** Ca: Ma: 9.49 1.59 0.17 3.22 0 10 20 50 100 **SOLUBLE CATIONS** cmol(+)/kg 14.5 Moderate Na: K: Ca: Ma:

ASPAC

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Disclaimer: Tests are performed under a quality system complying with ISO 9001: 2008. Results are based on the analysis of the sample taken or received by SESL. Due to the variability of sampling procedures, environmental conditions and managerial factors, SESL does not accept any liability for a lack of performance based on its interpretation and recommendations. This document must not be reproduced except in full.



Mehlich 3 - Multi-nutrient Extractant

Sample Drop Off: 16 Chilvers Road

Mailing Address:

Thornleigh NSW 2120 PO Box 357

Pennant Hills NSW 1715

Tel: 1300 30 40 80 1300 64 46 89 Fax: info@sesl.com.au Em: Web: www.sesl.com.au

Batch N°: 42347

Sample N°: 2

Date Received: 20/2/17

Report Status: O Draft
 Final

			F 64		VAILABLE	140	TRIENT	3	1		
Major Nutrients	Result (mg/kg)		Very Low	Low	Marginal	2	Adequate	High	Result (g/sqm)	Desirable (g/sqm)	Adjustmen (g/sqm)
Nitrate-N (NO ₃)	-								-	-	Did not tes
Phosphate-P (PO ₄)	-								-	12.6	Did not tes
Potassium (K) [†]	66.6								13.3	52.3	39
Sulphate-S (SO ₄)	-								-	13.6	13.6
Calcium (Ca) [†]	644								128.5	372.1	243.6
Magnesium (Mg) [†]	1153								230	38.7	Drawdowr
Iron (Fe)	-								-	110.1	Did not tes
Manganese (Mn) [†]	-								-	8.8	Did not tes
Zinc (Zn) [†]	-								-	1	Did not tes
Copper (Cu)	-					11			-	1.3	Did not tes
Boron (B) [†]	-								-	0.5	Did not tes
Explanation of graph	ranges:					////			NOTES: Adjust	ment recommendatio	n calculates the
Very Low	Low		Margi	nal	💋 Adequate		High		elemental applic	ation to shift the soil t and, which maximises	est level to within
oresent. Large applications for soil building purposes are usually recommended. Octential response to nutrient addition is >90%.	recommended. rates are recommended. ground a Potential response to Potential response to Drawdow					bute to pollution of d surface waters. reason to apply fertiliser when soil test levels exc. is recommended. • g/sqm measurements are based on soil bulk de seponse to nutrient <2%.			soil bulk density of		
Phosphorus Satur	Exchang	geable	Acidity		Physical Description						
			Adams-Ev	ans Buff	er pH (BpH):	-		Texture:			-
0.15					ons (meq/100g ⁻¹):	14	4.5	Colour:			
High					Capacity (eCEC):		4.5				Did not test
0.06 Excessive		Base Satu			10	00	Size:	.tt.		-	
Adequate					dity (meq/100g ⁻¹):	-		Gravel co			-
0 mmol/kg		0.4	Exchange	able Acio	aity (%):	-		Aggregate Structural	-		- Dial a sé és sé
	,		Lime App	lication	Rate				nfiltration rate		Did not test
0 Low. Plant response to applied P is likely.		 to achie 	ve pH 6.0) (g/sqm):	0	0				Did not test Did not test	
		ly.	– to neutralise Al (g/sqm):				-		I EC _{se} (dS/m):		Ju not lest
			Gypsum	Applicat	ion Rate			_	es EC and Soil Texture result.		
					sexch. Ca (g/sqn	ר):	0	Organic C	arbon (OC%)) [†] : Did not tes	st
									latter (OM%):	-	
			depth of mm and any Lime Additional						comments:		
			addition to	o achieve	рН 6.0.						

Consultant: Michelle Murphy



Authorised Signatory: Ryan Jacka

Date Report Generated 27/02/2017

METHOD REFERENCES: pH (1:5 HzO) - Rayment & Higginson (1992) 4A1, pH (1:5 GaCiz) - Rayment & Higginson (1992) 4B1, EC (1:5) - Rayment & Higginson (1992) 5A2, Nitrate - Rayment & Higginson (1992) 5A2, Nitrate - Rayment & Higginson (1992) 7B1 Alurnihum - SESL in-house, PO-K, K. SOC, A. Mg, Na, Fe, Mn, Zn, Cu, B - Mehlich 3 (1984), Buffer pH and Hydrogen - Adams-Evans (1972) Texture/SitvatureColour - PMo003 (Texture "Northcole" (1992), Structure - "Murphy" (1991), Colour- "Munsell" (2000))



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Disciaimer: Tests are performed under a quality system complying with ISO 9001: 2008. Results are based on the analysis of the sample taken or received by SESL. Due to the variability of sampling procedures, environmental conditions and managerial factors, SESL does not accept any liability for a lack of performance based on its interpretation and recommendations. This document must not be reproduced except in full.



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 Mailing Address:
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 Em:
 info@sesl.com.au

 Web:
 www.sesl.com.au

Batch N°: 42347 Sample N°: 3 Date Received: 20/2/17 Report Status: O Draft
 Final **Client Name: Asset Geotechnical** Project Name: Ref: 4064 - 1 Water St Werrington Client Contact: **Denny Jacob** Client Job N°: SESL Quote N°: Client Order N°: Sample Name: BH3 (0.3-0.4m) Address: Suite2.05/56 Delhi Rd Description: Soil North Ryde NSW 2113 Test Type: USAWS RECOMMENDATIONS Recommendations by SESL Australia not requested. **SOIL SAMPLE DEPTH (mm):** O 100 O 150 O 200 FERTILITY RATING: O Low O Moderate **O** High pH and ELECTRICAL CONDUCTIVITY Slight V. Slight Acidity Slight Alkalinity Moderate Alkalinity Acidit Neutral ≤4.0 4.5 5.5 6.0 7.0 8.0 8.5 9.0 9.5 ≥10 5.0 6.5 7.5 pH in H₂O (1:5)7.3 6.07 pH in CaCl₂ (1:5)0.001 0.010 0.100 1.000 10.000 Salinity (EC 1:5 dS/m) 0.1 - Very low Sodium (Na) (mg/kg) 548 Very High Chloride (Cl) (mg/kg) 873.9 Very High **CATION BALANCE CATION RATIOS EXCHANGEABLE CATION PERCENTAGE** Note: Hydrogen only determined when pH in CaCl_2 ≤ 5.5 Al only determined if pH in CaCl_2 is ≤ 5.2 Extractable Extractable Extractable Ratio **Target Range** Magnesium (Mg) Hydrogen (H) Result Calcium (Ca) Extractable Extractable Aluminium* (AI) 0.3 4.1 - 6.0Exchangeable Ca:Mg Potassium (K) Sodium (Na) Comment: Potential Calcium deficiency Na 15.3% Na < 5% High sodicity 2.6 - 5.0Mg:K 61 Comment: Potential Potassium deficiency Mg 12 - 25% Ca Ca 17% K/(Ca+Mg) 0.01 < 0.07 57 - 78% Low Comment: Acceptable Mg 66.4% K 3 - 11% High, magnesic K 1.1% K:Na N/A 0.1 Low H < 10% AI < 1% Sodium Absorption Ratio: D.N.T. IDEAL ACTUAL **EXCHANGEABLE CATIONS** cmol(+)/kg Na: K: H: AI: **EFFECTIVE CATION EXCHANGE CAPACITY (eCEC)** Ca: Ma: 10.36 2.38 0.17 2.65 0 10 20 50 100 **SOLUBLE CATIONS** cmol(+)/kg 15.6 Moderate Na: K: Ca: Ma: A member of the Australasian Soil and Plant Analysis Council ner: Tests are performed under a quality system complying with ISO 9001: 2008. Results are Disck based on the analysis of the sample taken or received by SESL. Due to the variability of sampling procedures, environmental conditions and managerial factors, SESL does not accept any liability for This laboratory has been awarded a Certificate of Proficiency for specific soil and plant tissue analyses by the Australasian Soil and Plant Analysis Council (ASPAC). Tests for which proficiency has a lack of performance based on its interpretation and recommendations. This document must not be

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been demonstrated are highlighted in this report.



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Sample Drop Off: 16 Chilvers Road

Mailing Address:

Thornleigh NSW 2120 PO Box 357

Pennant Hills NSW 1715

Tel: 1300 30 40 80 1300 64 46 89 Fax: info@sesl.com.au Em: Web: www.sesl.com.au

Batch N°: 42347

Sample N°: 3

Date Received: 20/2/17

Report Status: O Draft
 Final

Major Nutrients	Result (mg/kg) Image: Comparison of the comp	Very Low	Low	Marginal		Adequate	High	Result (g/sqm)	Desirable (g/sqm)	Adjustmer (g/sqm)
Phosphate-P (PO ₄) Potassium (K) [†] Sulphate-S (SO ₄) Calcium (Ca) [†] Magnesium (Mg) [†] Iron (Fe)	- 532									
Potassium (K) † Sulphate-S (SO4)Calcium (Ca) † Magnesium (Mg) † Iron (Fe)	- 532							-		Did not tes
Sulphate-S (SO₄) Calcium (Ca) [†] Magnesium (Mg) [†] Iron (Fe)	- 532							-	12.6	Did not tes
Calcium (Ca) [†] Magnesium (Mg) [†] Iron (Fe)								13.6	60.6	47
Magnesium (Mg) [†] Iron (Fe)								-	13.6	13.6
Iron (Fe)	The second s							106.1	431.7	325.6
	1259							251.2	44.9	Drawdow
Manganese (Mn) [†]	-							-	110.1	Did not tes
	-							-	8.8	Did not tes
Zinc (Zn) [†]	-							=	1	Did not tes
Copper (Cu)	-				111			-	1.3	Did not tes
Boron (B) [†]	-							-	0.5	Did not tes
Explanation of graph rar	naes:				////			NOTES: Adjustr	nent recommendation	calculates the
Very Low	Low	Marg	inal	💋 Adequate		High		elemental applica	ation to shift the soil t and, which maximises	est level to within
for soil building purposes add are usually recommended. Potential response to nutrient addition is >90%.	dition is 60 to 90%.	recommended. rates are recommended Potential response to nutrient addition is 30 to 60%. 30%.				ground and surf Drawdown is re Potential respor addition is <2%.	ecommended. • g/sqm measurements a onse to nutrient 1.33 tonne/m ³ and select			
Phosphorus Saturati	on Index	Exchan	geable /	Acidity			Physical	Descriptio	on	
		Adams-E	vans Buff	er pH (BpH):	-		Texture:			
0.15		Sum of Ba	ase Catio	ns (meq/100g ⁻¹):	15	.6	Colour:			
High			apacity (eCEC):	15		Estimated clay content:			Did not tes	
0.06 Excess	sive	Base Satu			10	0	Size:	1		
Adequate	Exchange		lity (meq/100g ⁻¹):	-		Gravel con	strength:		1	
0 mmol/kg	≥0.4	LACIALISE		ity (70).			Structural L	-		Did not tes
	Lime App				Potenti		I infiltration rate:		Did not tes	
0	 to achie 			0	0				Did not tes	
Low. Plant response to appli	Low. Plant response to applied P is likely.		– to neutralise AI (g/sqm):				- Calculated			
		Gypsum	Applicati	ion Rate			_		oil Texture re	esult.
		– to achieve 67.5% exch. Ca (g/sqm)				0	Organic Carbon (OC%) [†] : Did not test			st
		The CGAR is corrected for a soil					Organic Ma	tter (OM%):	-	
		•	depth of mm and any Lime addition to achieve pH 6.0.				Additional of	comments:		

Consultant: Michelle Murphy



Authorised Signatory: Ryan Jacka

Date Report Generated 27/02/2017

METHOD REFERENCES: pH (1:5 HzO) - Rayment & Higginson (1992) 4A1, pH (1:5 GaCiz) - Rayment & Higginson (1992) 4B1, EC (1:5) - Rayment & Higginson (1992) 5A2, Nitrate - Rayment & Higginson (1992) 5A2, Nitrate - Rayment & Higginson (1992) 7B1 Alurnihum - SESL in-house, PO-K, K. SOC, A. Mg, Na, Fe, Mn, Zn, Cu, B - Mehlich 3 (1984), Buffer pH and Hydrogen - Adams-Evans (1972) Texture/SitvatureColour - PMo003 (Texture "Northcole" (1992), Structure - "Murphy" (1991), Colour- "Munsell" (2000))



Document Set ID: 7947972 Version: 1, Version Date: 27/11/2017

A member of the Australasian Soil and Plant Analysis Council † This laboratory has been awarded a Certificate of Proficiency for specific soil and plant tissue analyses by the Australasian Soil and Plant Analysis Council (ASPAC). Tests for which proficiency has been demonstrated are highlighted in this report.

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