# **APPENDIX 4**

Soils Analyses



Umwelt (Australia) Pty Ltd

# Proposed Lynwood Quarry Marulan

Report on Soil Survey

0689-1D 11 May 2005

> ASSET GEOTECHNICAL ENGINEERING PTY LTD ABN 24 093 381 107

PO Box 3385 15 Sandlewood Close Rouse Hill NSW 2155 Ph: 02 9836 2144 Fax: 02 9836 0225 assetgeo@callaustralia.net.au 0689-1D 11 May 2005



geotechnical engineering consultants

Asset Geotechnical Engineering Pty Ltd ABN 24 093 381 107

PO Box 3385 15 Sandlewood Close ROUSE HILL NSW 2155 Ph 02 9836 2144 Fax 02 9836 0225 assetgeo@callaustralia.net.au

Umwelt (Australia) Pty Ltd PO Box 838 TORONTO NSW 2283

Attention: Mr John Merrell

Dear Sir,

# PROPOSED LYNWOOD QUARRY, MARULAN REPORT ON SOIL SURVEY

We are pleased to present our report on a soil survey carried out for the above project.

This report documents field and laboratory investigations and provides discussion and recommendations for land capability with respect to existing site conditions and with respect to rehabilitation of areas after quarrying.

Please contact us if you have any questions regarding this report or if you require further assistance.

For and on behalf of **Asset Geotechnical Engineering Pty Ltd** 

Mark Bastl

Mark Bartel BE MEngSc MIEAust CPEng Principal Geotechnical Engineer

### TABLE OF CONTENTS

1.0		2
2.0	SCOPE OF WORK	2
3.0	PROJECT AREA DESCRIPTION & REGIONAL GEOLOGY	3
4.0	SOIL LANDSCAPES	3
5.0	SUBSURFACE PROFILE FROM TEST PITTING	4
6.0	LABORATORY TEST RESULTS	5
7.0	REHABILITATION	6

# **INFORMATION SHEETS**

## APPENDICES

A	Field Investigation Result	ts
---	----------------------------	----

B Laboratory Test Results

## FIGURES

- 1 Site Locality
- 2 Test Locations and Soil Landscape

### **1.0 INTRODUCTION**

This report presents the results of a soil survey for the proposed Lynwood hard rock quarry near Marulan. The investigation was commissioned by Mr John Merrell of Umwelt (Australia) Pty Ltd. The work was carried out in accordance with a proposal by Asset Geotechnical Engineering Pty Ltd dated 7 July 2004, reference P0673.

The objective of the survey is to provide information on the surface and subsurface soil conditions as part of an Environmental Impact Statement (EIS) for the proposed quarry. Specifically, the report describes the properties of the soils present in the project area and outlines measures required to achieve a suitable rehabilitation outcome.

This report should be read in conjunction with the attached Information Sheets.

### 2.0 SCOPE OF WORK

The scope of work for the soil survey comprised:

- A review of existing regional maps and reports relevant to the project area, held within our files.
- Review of Soil Landscape Maps prepared by the Department of Infrastructure, Planning and Natural Resources (DIPNR).
- Visual observations of surface features.
- Logging of 22 test pits (TP1 to TP22), to sample and assess the nature and consistency of soils at accessible areas of the project area.
- Carrying out laboratory tests on the recovered soil samples to provide data on chemical and physical properties.
- Engineering assessment and reporting.

The test pits were excavated on 3<sup>rd</sup> and 4<sup>th</sup> November 2004 using a rubber-tyred backhoe. The test locations are shown on the attached Figure 2.

The test pits were excavated to depths ranging from 0.35 metres to 1.3 metres depth and were terminated in weathered bedrock. On completion of logging and sampling, each test pit was backfilled with the excavation spoil and lightly tamped using the backhoe bucket before rolling with the backhoe tyre. Remaining spoil was left and trimmed neatly flush or slightly mounded to the adjacent ground surface.

The test pit locations were set out by our engineer and were located by hand-held GPS measurements. The subsurface conditions encountered were recorded during the progress of the excavations. Soil samples were retained for laboratory testing. Surface levels at the test locations were not determined.

Engineering logs are provided in Appendix A to this report. The results of the laboratory testing are summarised in Section 5 and are provided in Appendix B.

### 3.0 PROJECT AREA DESCRIPTION & REGIONAL GEOLOGY

The project area is located approximately 3km west of Marulan as shown in the attached Figure 1. The project area occupies approximately 1000 hectares adjacent to the Hume Highway, and is dissected by the Main Southern Railway.

The regional topography includes gently undulating plains, undulating rises, and rolling low hills to steep hills. The overall relief is about 80m, from about RL 710m AHD to about RL 630m AHD. The terrain is incised by numerous open depressions and watercourses that generally flow towards Joarimin Creek near the centre of the project area, Marulan Creek in the south, or Lakyersleigh Creek in the northwest. The Main Southern Railway cuts through the project area near the centre running in a roughly westerly direction before crossing Joarimin Creek and heading northwest.

Vegetation includes open forest and woodland that has been cleared over much of the lower areas. Current land use comprises predominantly open grazing.

The 1:250,000 Goulburn Geological Map indicates the project area is underlain predominantly by Bindook Porphyry (quartz feldspar porphyry, dacite, felsite, and tuff) with the southeastern corner underlain by Marulan Granite (granite and granodiorite).

Numerous rocky outcrops and rock covered areas were observed over the elevated hilly parts of the project area.

### 4.0 SOIL LANDSCAPES

The DIPNR soil landscape mapping identifies four landscape units within the project area. The units are summarised below.

### **Bindook Road**

Undulating low hills on Devonian Bindook Porphyry. This unit is identified by the sub-angular porphyry rock outcrop on upper slopes and crests.

### **Bindook Road variant A**

This variant features steeper hills and stony ridgelines with more rock outcrop than the Bindook Road landscape.

З

### Jaqua

This unit is characterised by long foot-slopes and undulating low rises on Devonian Granite and Permian sediments.

### Marulan

Comprising gently undulating rises to undulating low hills formed on Devonian Granite. Distinct surface expression of outcropping well rounded spheroidal Granite tors is common.

The soil landscape boundaries have been transposed from the SCA maps onto the Towrang 1:25,000 Topographic Map as shown in the attached Figure 2.

### 5.0 SUBSURFACE PROFILE FROM TEST PITTING

The generalised subsurface profile as per the test pitting is summarised below:

Layer	Description	Depth to Base (m)
Topsoil	SILT / Sandy SILT / Silty SAND, low plasticity fines, fine to medium sand	0.05 / 0.20
Slopewash	Clayey SAND / Sandy SILT / Gravelly SILT, fine to medium grained, low plasticity fines	0.15 / 0.4
Residual	SAND / Clayey SAND, fine to medium grained	0.4 / 1.15
Residual	CLAY / Sandy CLAY, medium plasticity	0.4 / 1.0
Bedrock	PORPHYRY or GRANITE, medium to coarse grained	

## 6.0 LABORATORY TEST RESULTS

Results from the laboratory testing undertaken on selected soil samples are included in Appendix B and are summarised in Table 1 below.

Sample	Engineering Description	Hq	Conductivity dS/m	Multiplication Factor	m/Sb BCe	mg/kg Chloride	Cation Exchange Capacity cmol+/kg	Emerson Class	Sxchangeable Sxchangeable	Resistivity m.mdo	նא∖նա ⊅OS	Totoal Phosphorous mg/kg	Available Potassium mg/kg	Total Sulphur %
TP1 / 0-0.1	Sandy SILT (Topsoil)	5.5	0			4.								
TP1 / 0.05-0.15	Gravelly Clayey SAND (Slopewash)	6.0	060.0	14	1.3	33	3.1	9	0.3	>100	43			
TP1 / 0.5-0.6	Sandy CLAY (Residual)	5.1	0.080	8	0.6	62	6.2	5	3.8	63	35			
TP2 / 0-0.1	Sandy SILT (Topsoil)	4.7	0.240	10	2.4	38								
TP2 / 0.2-0.3	Silty SAND (Slopewash)	5.3	0.080	14	1.1	25								
TP2 / 0.4-0.5	Sandy CLAY (Residual)	5.0	0.110	8	0.9	47								
TP3 / 0.05-0.15	Sandy SILT (Topsoil)	7.1	0.210	10	2.1	35	7.1	9	0.4	51	19			
TP3 / 0.25-0.35	Clayey SAND (Slopewash)	7.1	0.070	14	1.0	22	3.0	5	0.6	75	17			
TP4 / 0-0.1	Silty SAND (Topsoil)	5.2	0:030	14	0.4	5	3.1	8				68	135	0.021
TP4 / 0.3-0.4	Clayey SAND (Residual)	5.4	0.015	14	0.2	<5	2.5	9				42	78	0.007
TP5 / 0.05-0.15	Sandy SILT (Topsoil)	4.5	0.075	10	0.8	60								
TP6 / 0-0.15	SILT (Topsoil)	4.8	0.070	10	0.7	15								
TP7 / 0-0.15	Sandy SILT (Topsoil)	4.8	0.100	10	1.0	30								
TP8 / 0-0.1	Silty SAND (Topsoil)	5.4	0.100	14	1.4	8	5.8	8				260	180	0.029
TP8 / 0.4-0.6	SAND (Residual)	5.4	0.030	17	0.5	8								
TP9 / 0-0.1	SILT (Topsoil)	4.5	0.230	10	2.3	49								
TP10 / 0-0.05	SILT (Topsoil)	4.5	0.100	10	1.0	14	5.6	9				390	86	0.038
TP10 / 0.05-0.15	Sandy SILT (Slopewash)	4.5	0.090	10	0.9	7								
TP10 / 0.5-0.6	Sandy CLAY (Residual)	5.2	0.070	8	0.6	64	6.9	5				200	27	0.02
TP11 / 0-0.1	Sandy SILT (Topsoil)	4.6	0.330	10	3.3	45								
TP13 / 0-0.05	SILT (Topsoil)	4.7	0.180	10	1.8	8								
TP13/0.1-0.2	Sandy SILT (Residual)	4.6	0.070	10	0.7	32								
TP14 / 0-0.1	Silty SAND (Topsoil)	5.8	0.080	14	1.1	12	8.3	9				260	135	0.032
TP14 / 0.1-0.2	Gravelly Silty SAND (Residual)	5.4	0.055	14	0.8	29								
TP14 / 0.4-0.6	Sandy CLAY (Residual)	5.3	0.045	8	0.4	26	10.4	2				67	82	0.009
TP16 / 0-0.1	Silty SAND (Topsoil)	5.0	0.050	14	0.7	10								
TP18 / 0.05-0.1	Silty SAND (Topsoil)	5.3	0.040	14	0.6	10	3.8	9				120	185	0.017
TP18 / 0.15-0.25	Clayey SAND (Slopewash)	4.8	0.040	14	0.6	18								
TP18 / 0.6-0.7	Sandy CLAY (Residual)	5.5	0.060	8	0.5	35								
TP19 / 0.05-0.1	SILT (Topsoil)	5.3	060.0	10	0.9	110	3.3	9				200	50	0.012
TP19 / 0.5-0.65	CLAY (Residual)	5.1	0.120	8	1.0	120	15.8	8				84	55	0.013
TP21 / 0.05-0.1	Silty SAND (Topsoil)	5.0	0.095	14	1.3	79								
TP22 / 0-0.1	SILT (Topsoil)	4.8	0.150	10	1.5	150								

The laboratory testing indicates that the soils are not dispersive by nature, are assessed to be slightly to moderately acidic and non-saline to slightly saline. The soils generally have a low Cation Exchange Capacity (CEC), which will limit the soil's ability to retain nutrients. The soil phosphorous levels are generally sufficient for grazing / open pasture use. However, the potassium and sulphur levels are relatively low and should be improved during rehabilitation to facilitate plant growth should it be desired to establish permanent pasture.

6

#### 7.0 REHABILITATION

Topsoil from areas to be quarried should be stripped and stockpiled separately from lower subsoils. During rehabilitation after quarrying, the topsoil should be spread and amended as follows, based on the proposed land use:

### Areas to be used for Native Vegetation (i.e. not grazing or cultivation)

No amendment is considered necessary.

### Areas to be used for Permanent Grazing Land:

- Increase pH to a target value of between 6 and 8.5. To raise the pH by 1, lime should be spread at the rate of 2500 kg/ha and thoroughly mixed to 100mm depth.
- Potassium should be raised to a target minimum value of 125 mg/kg. A dosage rate of 200 kg/ha is . recommended for initial treatment.
- Organic materials (e.g. manure), ammonium sulphur, or gypsum should be added to improve sulphur . levels. A dosage rate of 10 to 20 kg of sulphur per hectare should be applied.





geotechnical engineering consultants

### 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"). The scope of work may have been limited by a range of factors such as time, budget, access and/or site disturbance constraints.

### **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 programme 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 programme 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 behaviour 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.

### 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.

### **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.

# Information Sheet 2 of 3



Sandstone

Shale

geotechnical engineering consultants

### LOG ABBREVIATIONS AND NOTES

### METHOD

boreh	ole logs	exc
AS	auger screw *	NE
AD	auger drill *	HE
RR	roller / tricone	BH
W	washbore	ΕX
CT	cable tool	DZ
HA	hand auger	R
D	diatube	
В	blade / blank bit	
V	V-bit	
	<b>TO</b> 1 1	

natural	excavation
hand e	xcavation
backho	be bucket
excava	tor bucket
dozer k	olade
ripper t	tooth

- TC-bit \* bit shown by suffix e.g. ADV

### coring

NMLC, NQ, PQ, HQ

#### SUPPORT

boreh	ole logs	exca	vation logs
Ν	nil	N	nil
Μ	mud	S	shoring
С	casing	В	benched
NQ	NQ rods		

#### CORE-LIFT

casing installed

#### barrel withdrawn

### NOTES, SAMPLES, TESTS

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

#### USCS SYMBOLS

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

DENSITY INDEX

very loose

very dense

medium dense

loose

dense

VL

MD

VD

D

L

- OL Organic silts and organic silty clays of low plasticity.
- ΜН
- СН
- Inorganic silts of high plasticity. Inorganic clays of high plasticity. Organic clays of medium to high plasticity. ОН
- ΡT Peat muck and other highly organic soils.

#### MOISTURE CONDITION

- D drv
- М moist
- W wet
- Wp plastic limit W liquid limit

### CONSISTENCY

VS very soft S soft F firm St stiff VSt very stiff Н hard

# excavation logs

# Fill ала 1 ала 1 ала 1 ала Peat. Topsoil

GRAPHIC LOG

Soil

 $\otimes$ 



Rock

#### Boundaries

known

#### WEATHERING

WEATH	ERING	STREN	GTH
XW	extremely weathered	EL	extremely low
HW	highly weathered	VL	very low
MW	moderately weathered	L	low
SW	slightly weathered	М	medium
FR	fresh	Н	high
		VH	verv high

\_\_\_\_\_ probable

EH extremely high

#### RQD (%)

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

#### DEFECTS

sh pl cu

un

st

ir

type		coating	1
JT	joint	cl	clean
PT	parting	st	stained
SZ	shear zone	ve	veneer
SM	seam	со	coating

ape		rough	ness
	planar	ро	polished
	curved	sl	slickensided
	undulating	sm	smooth
	stepped	ro	rough
	irregular	vr	very rough

#### inclination

measured above axis and perpendicular to core

possible

# Information Sheet 3 of 3



In all geotechnical engineering consultants

#### AS1726-1993

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

#### SOIL

### MOISTURE CONDITION

#### Description Term

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

Wet As for moist, but with free water forming on hands when handled. Moisture content of cohesive soils may also be described in relation to plastic limit ( $W_P$ ) or liquid limit ( $W_1$ ) [>> much greater than, > greater than, < less than. << much less than]

#### CONSISTENCY OF COHESIVE SOILS

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

### DENSITY OF GRANULAR SOILS

<b>Term</b> Very Loose Loose Medium Dense	<b>Density Index(%)</b> < 15 15 – 35 35 – 65	<b>Term</b> Dense Very Dense	<b>Density Index (%)</b> 65 – 85 >85
PARTICLE SIZE Name Boulders Cobbles	E Subdivision	<b>Size (mm)</b> > 200 63 - 200	
Gravel	coarse medium fine	20 – 63 6 – 20 2.36 – 6	
Sand	coarse	0.6 - 2.36	

#### 

MINOR CO Term	Proportion by Mass								
	coarse grained	fine grained							
Trace	≤ 5% <sup>−</sup>	≤ 15 <sup>°</sup> ⁄ <sub>∞</sub>							
Some	5 – 2%	15 – 30%							

medium

fine

#### SOIL ZONING

Silt & Clay

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.

0.2 - 0.6

< 0.075

0.075 - 0.2

#### 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.
ОН	Organic clays of medium to high plasticity.
PT	Peat muck and other highly organic soils.

# **ROCK**

#### SEDIMENTARY ROCK TYPE DEFINITIONS Rock Type **Definition** (more than 50% of rock consists of ... gravel sized (>2mm) fragments. Conglomerate sand sized (0.06 to 2mm) grains. Sandstone Siltstone silt sized (<0.06mm) particles, rock is not laminated. Claystone clay, rock is not laminated. ... silt or clay sized particles, rock is laminated. Shale LAYERING 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 lavering STRUCTURE Term Spacing (mm) Term Spacing Thinly laminated <6 Medium bedded 200 - 600Laminated 6 - 20Thickly bedded 600 - 2.000 Very thinly bedded 20 - 60 Very thickly bedded > 2,000 Thinly bedded 60 - 200 STRENGTH ls50 (MPa) Is50 (MPa) Term Term Extremely Low 1.0 - 3.0 3.0 - 10.0 < 0.03 Hiah 0.03 - 0.1 Very High Very low Low 0.1 - 0.3 Extremely High >10.0 Medium 0.3 - 1.0 NOTE: Is50 = Point Load Strength Index WEATHERING Term Description Residual Soil Soil derived from weathering of rock; the mass structure and substance fabric are no longer evident. Extremely ..... Bock is weathered to the extent that it has soil properties (either disintegrates or can be remoulded). Fabric of original rock is still visible. Rock strength usually highly changed by weathering; rock Highly ..... may be highly discoloured. Rock strength usually moderately changed by weathering; Moderately .... rock may be moderately discoloured. Rock is slightly discoloured but shows little or no change of Slightly ..... strength from fresh rock. Rock shows no signs of decomposition or staining. Fresh DEFECT DESCRIPTION Туре A surface or crack across which the rock has little or no Joint tensile strength. May be open or closed. A surface or crack across which the rock has little or no Parting tensile strength. Parallel or sub-parallel to layering/ bedding. May be open or closed. Zone of rock substance with roughly parallel, near pla-Sheared Zone nar, curved or undulating boundaries cut by closely spaced joints, sheared surfaces or other defects. Seam with deposited soil (infill), extremely weathered Seam insitu rock (XW), or disoriented usually angular fragments of the host rock (crushed). Shape Planar Consistent orientation. Gradual change in orientation. Curved 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 <1mm). Feels like fine to coarse sandpaper. Many large surface irregularities, amplitude generally Very Rough >1mm. Feels like very coarse sandpaper Coating Clean No visible coating or discolouring Stai

Juli	No visible coaling of alcoologining.
ained	No visible coating but surfaces are discoloured.
neer	A visible coating of soil or mineral, too thin to measure;
	may be patchy
ating	Visible coating $\leq$ 1mm thick. Thicker soil material de-
	scribed as seam.

Ver Coa

# APPENDIX A

Field Investigation Results

geotechnical engineering consultants

PO Box 3385 Rouse Hill NSW 2155 Ph: (02) 9836 2144 Fax: (02) 9836 0225 assetgeo@callaustralia.net.au job r

EX no:	TP01	
sheet:	1 of 1	
job no.:	0689-1	
started:	3.11.2004	

	Lient: UMWELT (AUSTRALIA) PTY LTD started: 3.11.2004											
clie						STRAL	IA) PT	/ LTD			started:	3.11.2004
prin proj	icipal	1:			YMIX Osed f	י חסער		QUARRY			inished	: 3.11.2004 MAB
	ation			1ARU			UCK	ZUARRI			ogged: checked	
	quipment:  4WD BACKHOE  RL surface:											
	ensio				wide b					(	datum:	
exca	avati	avation information material information										
pc	ort		les, etc		ø	graphic log	USCS symbol	material	tion	consistency/ density index	hand penetro- meter	structure and additional observations
method	support	water	notes samples, tests, etc	Ы	depth metres			soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition		kPa 00 00 00 00 00 00 00 00	
ВН	N		D			त्र के क्षेत्र के के के के के के के के के के के के के	ML	Sandy SILT, low plasticity, dark grey, grass roots	>>Wp	F		TOPSOIL
			D		0.1		SC	Gravelly Clayey SAND, medium to cause grained, fine rounded gravel, light grey	M-W	MD		SLOPEWASH
					0.25		CL	Sandy CLAY, medium plasticity, fine to medium sand, mottled orange-brown and grey	>Wp	VSt		RESIDUAL
					_							
					<u>0.</u> 5							
		NE	D		_							
					0.75		CL	Sandy CLAY, medium plasticity, medium to coarse		VSt-H		
					_			sand, light grey				
					<u>1.</u> 01	+ + +		PORPHYRY, medium to coarse grained, grey, highly				BEDROCK
						+ + + + + + + + + + + + + + + + + + +		weathered				
					1.1			TP01 terminated at 1.1m				
					_							
					_							
					_							
					<u>1.</u> 5							
					-							
					_							
					2.0							
Refe	er to In	nforma	ition Shee	ts for T	erms and	Symbols	;					Excavation Log - Revision

geotechnical engineering consultants

PO Box 3385 Rouse Hill NSW 2155 Ph: (02) 9836 2144 Fax: (02) 9836 0225 assetgeo@callaustralia.net.au job n

et: 1 of 1 no.: 0689-1		
no.: 0689-1	10:	TP02
	et:	1 of 1
ed: 3.11.2004	ו.סר:	0689-1
ed: 3.11.2004		
	ed:	3.11.2004

EX	Excavation Log											
clie			ι	JMWE	elt (Au	ISTRAL	IA) PT\	' LTD			started:	3.11.2004
	cipa	l:		READ							inished	
	pject:  PROPOSED HARD ROCK QUARRY  logged:  MAB    ration:  MARULAN  checked:  MAB											MAB MAB
	Indextor:  MARULAN  Checked:  MAB    quipment:  4WD BACKHOE  RL surface:											
	imensions: 0.45m wide by 2.0m long datum:											
	avation information material information											
							lodi	material		iy/ lex	e ero	
pq	ort		etc,		s and a second	ic <u>o</u>	sym	matenai	tion	stend ty ind	hand penetro- meter	structure and additional observations
method	support	water	notes samples, tests, etc	H	depth metres	graphic log	USCS symbol	soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	kPa ₽ 8 8 8 9	
BH	z	-	2 00 42		02	2 22 22 22 2 2 2 2 2 2	ML		>>Wp	F	5 02 00 04 1 02 00 04	TOPSOIL
1			D			2 <u>22 22 2</u> 2 <u>29 28</u> 29 2 29 28 29						
					0.1		SM	Silty SAND, fine grained, light grey	М	MD		SLOPEWASH
				-	-							
			D									
					-							
					L							
		В	D		0.4		CL	Sandy CLAY, medium plasticity, grey with	>Wp	VSt		
				-	<u>0</u> .5							-
					-							
					0.7	//// + + + + + + + +		PORPHYRY, medium grained, grey, moderately weathered				BEDROCK
					0.8	++++++		TD02 terminated at 0.0m				
					0.8			TP02 terminated at 0.8m				
					-							
					1.0							
					1.0							-
					L							
					F							
					╞							
					1.5							
					<u>1</u> .5							-
					F							
					L							
					F							
					F							
Refe	er to Ir	l nforma	l ation Shee	l ets for T	2.0 erms and	I Symbols	;	I		l		Excavation Log - Revision 9
						,						- 3

geotechnical engineering consultants

PO Box 3385 Rouse Hill NSW 2155 Ph: (02) 9836 2144 Fax: (02) 9836 0225 assetgeo@callaustralia.net.au

EX no: TP03 sheet: 1 of 1 job no.: 0689-1 started: 3.11.2004

сx	Ca	Va	tion	L	bg			C C		Ľ	00110	
clie						ISTRAL	IA) PT	( LTD		5	started:	3.11.2004
	cipal	l:		EAD			inished					
proj						HARD F	ROCK	QUARRY			ogged:	MAB
	MARULAN  checked:  MAB    equipment:  4WD BACKHOE  RL surface:											
	limensions: 0.45m wide by 2.0m long datum:											
	cavation information material information											
						b	nbol	material		icy/ dex	hand penetro- meter	structure and
method	support	water	notes samples, tests, etc	ЪГ	depth metres	graphic log	USCS symbol	soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	kPa	structure and additional observations
BH	o Z	>	C 0 2	ш.	00		ML		⊂ 0 >Wp	F	200 300 400	TOPSOIL
ш			D			44 44 44 44 44 44 44 44 44 44 44 44 44 44						
					0.1		SC	Clayey SAND, fine to medium grained, light brown	Μ	MD		SLOPEWASH
			D		_							
					_							
					0.35		CL	Sandy CLAY, medium plasticity, mottled orange-brown	>Wp	VSt		
					-			and grey				
		NE			<u>0</u> .5							-
			D									
					_							
					_							
					_							
					0.9	///// + + + +		PORPHYRY, medium grained, grey, moderately				BEDROCK
					0.95 1.0			TP03 terminated at 0.95m				
												-
					_							
					_							
					_							
					_							
					1.5							
					-							
					<b>–</b>							
					_							
					_							
					2.0							
Refe	er to In	Iforma	ition Sheet	ts for T	erms and	Symbols						Excavation Log - Revision 9

geotechnical engineering consultants

PO Box 3385 Rouse Hill NSW 2155 Ph: (02) 9836 2144 Fax: (02) 9836 0225 assetgeo@callaustralia.net.au job

EX no:	TP04	
sheet:	1 of 1	
job no.:	0689-1	
started:	3.11.2004	
finished:	3.11.2004	

Еx	Excavation Log												
	lient: UMWELT (AUSTRALIA) PTY LTD started: 3.11.2004												
	rincipal: READYMIX finished: 3.11.2004												
												MAB	
	ation:  MARULAN  checked:  MAB    uipment:  4WD BACKHOE  RL surface:												
	uipment:  4WD BACKHOE  RL surface:    nensions:  0.45m wide by 2.0m long  datum:												
		vation information material information											
						D	USCS symbol	material		consistency/ density index	hand penetro- meter	structure and	
g	ort	L	s etc,		_ %	hick	S syr		ture lition	isten ity in	per	additional observations	
method	support	water	notes samples, tests, etc	Ц	depth metres	graphic log	USC	soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	cons dens	kPa ₽ 8 8 8 9		
H	z	_	2 0 4		02	4 44 44 44 4 44 44 44	SM		M	L	5 02 00 <del>1</del>	TOPSOIL	
			D			5 77 75 77 76 76 76 7 77 75 77		Silty SAND, fine to medium grained, grey and dark grey, some medium to coarse gravel					
					0.1		SC			MD			
					0.1		30	Clayey SAND, medium to coarse grained, light grey, medium plasticity fines, some medium to coarse gravel		IVID		RESIDUAL	
					_								
						$\langle \rangle$							
					-							-	
			D			[ /]							
					0.4	+ + + +		PORPHYRY, medium to coarse grained, light brown,				BEDROCK	
						+ + + +		extremely weathered					
		ЩZ			0.5	+ + + + +						_	
						++++							
					_	+ + + + + +						-	
						+ + + +							
					_							-	
						+++++							
						+ + + + +							
					_							-	
						+ + + + +							
					0.9	+ + + +		PORPHYRY, medium to coarse grained, moderately				-	
					1.0	+ + + + + + + + + + + +		weathered					
					1.0	+ +		TP04 terminated at 1m					
					_							-	
					L							-	
					L							-	
												-	
					-							-	
					1.5								
					<u>1.</u> 5								
					F							-	
					L							-	
					-							-	
					-							-	
Def	or to !-	form	tion Sha-	to for T	2.0	Symbol							
Rete	ei io lí	norma	ation Shee	1011	enns and	i Syrinois	>					Excavation Log - Revision 9	

geotechnical engineering consultants

PO Box 3385 EX n Rouse Hill NSW 2155 Ph: (02) 9836 2144 shee Fax: (02) 9836 0225 assetgeo@callaustralia.net.au job n

EX no:	TP05	
sheet:	1 of 1	
job no.:	0689-1	
started:	3.11.2004	
finishad	3 11 2004	

ЕX	xcavation Log											
clie			ι	IMWE	ELT (AU	STRAL	IA) PT۱	′ LTD		S	started:	3.11.2004
	ncipa	I:										
	ject:					HARD F	ROCK	QUARRY			ogged:	MAB
	ation: ipme				LAN BACKH						hecked RL surfa	
	ipme iensi				wide b		lona				atum:	UE.
			formati		indo b			ormation				
											1	
						b	USCS symbol	material	_	/c//	hand penetro- meter	structure and
po	oort	5	s ples, etc		es e	graphic log	S S		sture ditior	sister sity ir	pel me	additional observations
method	support	water	notes samples, tests, etc	H	depth metres	grap	nsc	soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	kPa	
H	z					2 - 22 - 22 - 22 2 - 22 - 22 - 22	ML	Sandy SILT, low plasticity, light brown	D	Fb	- U 0 4	TOPSOIL
						<u>20 20 20</u> 20 20 20						
			D		-	12 12 12 12 12 12 12 12						-
						<u>96 48 98</u> 96 48 96						
					0.2	<u>83</u> 84 83	CL	Sandy CLAY medium plasticity orange brown and	<wp< td=""><td>Н</td><td></td><td>RESIDUAL</td></wp<>	Н		RESIDUAL
					0.2		0L	Sandy CLAY, medium plasticity, orange-brown and grey mottled, medium to coarse grained sand	< wp			RESIDURE
					_							-
1												
					_							-
					0.5							
		۳										
					_							-
			D									
					-							-
					0.8	<i>₹/////</i> +_+_+		PORPHYRY, medium to coarse grained, brown and				BEDROCK
						+ + + +		grey, extremely weathered				
					-	+ + + + +						-
						· * * * * *						
					<u>1.</u> 0	+ + + + + +						_
					1.05	+ + + +		PORPHYRY, medium to coarse grained, dark brown,				
					1.1	.+.+.		HW-MW TP05 terminated at 1.1m				
					L							-
					L							-
					L							_
												-
					1.5							
												_
1					-							-
1												
					-							-
1												
1					F							-
1												
					L							-
					2.0							
Refe	er to Ir	nforma	tion Shee	ts for T	erms and	Symbols	5					Excavation Log - Revision 9

geotechnical engineering consultants

PO Box 3385 Rouse Hill NSW 2155 Ph: (02) 9836 2144 Fax: (02) 9836 0225 assetgeo@callaustralia.net.au job nc

D:	TP06	
t:	1 of 1	
0.:	0689-1	
ed:	3.11.2004	
ned <sup>.</sup>	3 11 2004	

ЕX	Excavation Log													
clie	nt:										started:	3.11.2004		
	icipal										inished			
	ject:		PROPOSED HARD ROCK QUARRY MARULAN								ogged:			
	ation: ipme				BACKHO	DE				checked: MAB RL surface:				
	ensio				wide by		long			RL surface: datum:				
			formati					ormation						
							0			. ×	4			
			ŝ			bo	dmy	material	еE	ency	hand penetro- meter	structure and additional observations		
method	support	water	notes samples, tests, etc		depth metres	graphic log	USCS symbol	soil type: plasticity or particle characteristics.	moisture condition	consistency/ density index	kPa			
			no sa tes	Ч	ge			soil type: plasticity or particle characteristics, colour, secondary and minor components.			100 200 400			
ВН	Z	В				1 54 57 5 1 54 54 54 1 5 5 5 5 5	ML		=Wp	St		TOPSOIL		
			D		0.05		ML	SILT, low plasticity, grey						
		ШN			0.15	+ + + + + + + + + +		PORPHYRY, medium to coarse grained, grey and orange-brown, extremely to highly weathered				BEDROCK		
						· • • • • • •								
						· * * * * *								
						+ + + +						-		
					0.35			Refusal on PORPHYRY, moderately weathered TP06 terminated at 0.35m						
					_							-		
					0.5									
					-							-		
					-							-		
					-							-		
					-							-		
					1.0									
					-							-		
1														
												-		
												-		
1														
1												-		
					15									
					<u>1.</u> 5							-		
1					-							-		
1														
1					-							-		
1														
1					-							-		
1														
1					-							-		
Rof	or to In	forma	tion Shoo	ts for T	2.0 erms and	Symbol	5					Excavation Log - Revision 9		
I Welt		norrid	non anee	່ວາປ I	uns anu	Junio	د					ENCONDUCTION - REVISION 9		

geotechnical engineering consultants

PO Box 3385 Rouse Hill NSW 2155 Ph: (02) 9836 2144 Fax: (02) 9836 0225 assetgeo@callaustralia.net.au job

EX no:	TP07	
sheet:	1 of 1	
job no.:	0689-1	
started:	3.11.2004	
C' ' I I	2 11 2001	

ЕX	60	cavation Log												
clie					ELT (AU	STRAL	IA) PT	′ LTD		S	started:	3.11.2004		
	icipa	: READYMIX PROPOSED HARD ROCK QUARRY								f	inished			
proj						HARD F	ROCK	QUARRY			ogged:	MAB		
	ation ipme				LAN BACKH						checked			
	ensi				wide b		lona			RL surface: datum:				
			formati					ormation						
							_				1			
						DO	USCS symbol	material	_	)cy/	hand penetro- meter	structure and		
pod	support	2	ss iples s, etc		es p	graphic log	SS s		sture	siste sity i	₽ 8 8 kPa	additional observations		
method	dns	water	notes samples, tests, etc	ᆔ	depth metres	grap	nsc	soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	0022004 0022004			
H	z		D			4 - 44 - 44 - 44 4 - 44 - 44 - 44	ML	Sandy SILT, low plasticity, dark grey, grass roots	>Wp	F		TOPSOIL		
					0.05		CL	Sandy CLAY, medium plasticity, light brown with		VSt		RESIDUAL		
					-			orange-brown mottle, fine to medium sand				-		
					-							-		
		RE			-							-		
			D											
					0.4	////		PORPHYRY, medium to coarse grained, light brown,				BEDROCK		
						+ + + + +		extremely to highly weathered				DEDITOON		
					0.5	· * * * * *						_		
					0.55	+ + + + +		Refusal on PORPHYRY, medium to coarse grained,						
					- 0.55			brown, highly to moderately weathered				-		
								TP07 terminated at 0.55m						
					_							_		
												_		
					L							_		
					1.0									
					<b>_</b>									
					-							-		
					F							-		
					F							-		
					15									
1					<u>1.</u> 5									
					╞							-		
					┝							-		
					┝							-		
					F							-		
D-/	or to 1	form	tion Shar	to for 7	2.0	Sumt						Execution Log Devision 0		
L Kete	er to fr	norma	tion Shee	is for I	erms and	sympols	<b>b</b>					Excavation Log - Revision 9		

geotechnical engineering consultants

PO Box 3385 Rouse Hill NSW 2155 Ph: (02) 9836 2144 Fax: (02) 9836 0225 assetgeo@callaustralia.net.au job r

EX no:	TP08
sheet:	1 of 1
job no.:	0689-1
started:	3.11.2004
finished:	3.11.2004

ЕX	Excavation Log											
clie	nt:											
	icipa	I:										
	ject:					HARD F	ROCK	QUARRY			ogged:	MAB
	ation: ipme				LAN BACKHO						checked RL surfa	
	ensi				wide b		lona				datum:	ce.
			formatio		mach			ormation				
					- 8	graphic log	USCS symbol	material	ture ition	consistency/ density index	hand penetro- meter	structure and additional observations
method	support	water	notes samples, tests, etc	Ч	depth metres			soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition		kPa 00 00 00 00 00 00 00 00	
BH	Z		D			कर कर कर के पर के क के के के कि के के के कि	SM	Silty SAND, fine to medium grained, dark grey, grassroots	Μ	L		TOPSOIL
					— <u>0.1</u> —		SP	SAND, fine to medium grained, orange-brown		MD		- RESIDUAL
					_							-
			D		<u>0</u> .5							-
		R			-							
					- <u>0.8</u>		SC	Clay SAND, fine to medium grained, mottled orange-brown and light brown				-
					<u>1</u> .0							-
					- 1.15	+ + + +		PORPHYRY, medium to coarse grained, mottled light grey and orange-brown, highly weathered				
					- 1.25	+ + + + + + + + + + +		grey and orange-brown, nignly weathered TP08 terminated at 1.25m				
					_							-
					<u>1.</u> 5							-
					-							
					_							-
					_							-
Refe	er to Ir	 nforma	ation Shee	ts for T	2.0 erms and	Symbols	5					Excavation Log - Revision 9

geotechnical engineering consultants

PO Box 3385 Rouse Hill NSW 2155 Ph: (02) 9836 2144 Fax: (02) 9836 0225 assetgeo@callaustralia.net.au job n

0:	TP09	
et:	1 of 1	
10.:	0689-1	
ed:	3.11.2004	

ЕX	Excavation Log													
clie	nt:				elt (Au	STRAL	IA) PT۱	' LTD		S	started:	3.11.2004		
	icipa										inished			
proj										logged: MAB				
	ation			/ARU							checked			
	ipme				BACKH		long			RL surface:				
	ensio avati		nformati		wide b			ormation		C	datum:			
	avati													
							oq	matarial		lex ∕∕	r de			
g	ţ		etc			ic lo	syn	material	ion ure	stenc y inc	hand penetro- meter	structure and additional observations		
method	support	water	notes samples, tests, etc	ᆔ	depth metres	graphic log	USCS symbol	soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	kPa			
		≥	te si a	œ	σE	I 1					100 200 400			
ВН	Z		D			40 40 40 4 40 40 40 4 6 40 40	ML	SILT, low plasticity, dark grey, grass roots	>Wp	F		TOPSOIL		
						5 <u>50 55 50</u> 50 50 50								
			-		0.1		SM	Silty SAND, fine grained, light grey	М	MD		SLOPEWASH		
			D											
				1	F							-		
					0.3	////	CL	Sandy CLAY, medium plasticity, mottled light brown	>Wp	VSt				
								and orange-brown, fine to medium sand						
		ШZ			L							-		
					0.5							_		
						V///								
						V//A								
			D		F							-		
					⊢							-		
					0.75	+ + +		GRANITE, medium to coarse grained, brown and				BEDROCK		
					0.8	+ + +		orange-brown mottle, extremely weathered Near refusal on GRANITE, highly to moderately						
								weathered						
					L			TP09 terminated at 0.8m				-		
					1.0									
												_		
					F							-		
					┝							-		
					F							-		
					L							-		
					1.5									
					┝							-		
					F							-		
					L							-		
					F							-		
Dof	ar to /-		tion Shar	te for T	2.0	Symbol						Excountion Log Devicing 0		
L Kele	ะเเงท	norma	ation Shee	:101 I	erms and	Slogunde	<b>,</b>					Excavation Log - Revision 9		

geotechnical engineering consultants

PO Box 3385 Rouse Hill NSW 2155 Ph: (02) 9836 2144 Fax: (02) 9836 0225 assetgeo@callaustralia.net.au job nc

D:	TP10	
t:	1 of 1	
0.:	0689-1	
ي ما ر	2 11 2004	

ЕX	cavation Log											
clier	nt:	UMWELT (AUSTRALIA) PTY LTD								S	started:	3.11.2004
	cipa	al: READYMIX									inished	
proj						IARD F	ROCK	QUARRY		logged: MAB		
	ition:			1ARU		25					checked	
	ipme				BACKH(		long				RL surfa	ice:
	ensio avati		formatio		wide b			ormation		(	datum:	
0,00	avan		lonnati	011		mate						
							oqu	material		≥¥	hand penetro- meter	atructure and
g	br		es, etc		<i>(</i> 0	0 ic	syn	matchai	tion	stend ty ind	pene	structure and additional observations
method	support	water	notes samples, tests, etc	님	depth metres	graphic log	USCS symbol	soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	kPa	
	N SI	3		œ	σĿ			colour, secondary and minor components. SILT, low plasticity, dark grey, grass roots		от St	100 200 400	TODCOIL
BH	~		D			4 77 77 77 7 77 77 77 7 7 77 77	ML		=Wp	SI		
			D		0.05		ML	Sandy SILT, low plasticity, grey	<wp< td=""><td></td><td></td><td>SLOPEWASH</td></wp<>			SLOPEWASH
			D									
					0.15		CL	Sandy CLAY		VSt		RESIDUAL
					_							-
					-	$\langle / / \rangle$						-
						////						
		ШZ			-							-
					<u>0</u> .5							_
			D									
					0.6	++++		PORPHYRY, medium to coarse grained, mottled light grey and brown, XW-HW				BEDROCK
					L	+++++						
						· * * * * *						
						+ + + + + + + + + + + + + + + + + + + +						
					0.8			Near refusal on HW-MW PORPHYRY TP10 terminated at 0.8m				
					-							-
					<u>1.</u> 0							
					-							-
					L							-
					L							-
					-							-
					1.5							
					1.0							
					-							-
					L							-
												-
					-							-
					20							
Refe	er to In	Iforma	tion Shee	ts for ⊤	2.0 erms and	Symbols	5					Excavation Log - Revision 9
					ə anu	5,000						Ensuration Log - Nevision 9

geotechnical engineering consultants

PO Box 3385 Rouse Hill NSW 2155 Ph: (02) 9836 2144 Fax: (02) 9836 0225 assetgeo@callaustralia.net.au job n

EX no:	TP11
sheet:	1 of 1
job no.:	0689-1
started.	3 11 2004

Excavation Log												
clie	nt:					STRAL	IA) PTY	' LTD		S	started:	3.11.2004
	icipa	I:		READ							inished	
proj						IARD F	ROCK	QUARRY			ogged:	MAB
	ation: ipme			MARU	BACKH	DE					checked RL surfa	
	ensi				wide b			datum:				
exc	avati	on ir	formati	on								
hod	support	-	notes samples, tests, etc		es es	graphic log	USCS symbol	material	moisture condition	consistency/ density index	hand penetro- meter	structure and additional observations
method	ldns	water	note sam test:	ᆔ	depth metres	grap	nso	soil type: plasticity or particle characteristics, colour, secondary and minor components.	con	con	кга 900 500 400 500	
H	Z		D		_	<u>میر میچ می</u> به بند میچ می میڈ ملد می بند بند بند	ML	Sandy SILT, low plasticity, dark grey to brown, grass roots	=Wp	St		TOPSOIL
					0.15	<u>88 98 98</u> 8 96 98 98						
			D		0.15		SM	Silty Gravelly SAND, fine to coarse sand, fine gravel, light grey	Μ	MD		SLOPEWASH
					0.35	////	CL	Sandy CLAY, medium plasticity, mottled grey and	>Wp	St-VSt		
					_		0L	orange-brown	> <b>11</b>	51 151		-
		BN			0.5							_
					_							-
			D		_							-
								GRANITE, medium to coarse grained, mottled light grey				BEDROCK
					1.0	· + + + · + + + + · + + + +		and orange-brown, XW				
					1.0			Near refusal on GRANITE, medium to coarse grained, HW-MW				
								TP11 terminated at 1m				
					_							-
					_							-
					Γ							-
					L							
												_
					<u>1.</u> 5							
					L							-
					L							
					F							-
					F							-
Ref	er to Ir	nform=	ation Shee	ts for ⊤	2.0 erms and	Symbols	5					Excavation Log - Revision 9
					s and							

geotechnical engineering consultants

PO Box 3385 Rouse Hill NSW 2155 Ph: (02) 9836 2144 Fax: (02) 9836 0225 assetgeo@callaustralia.net.au job n

EX no:	TP12	
sheet:	1 of 1	
job no.:	0689-1	
started:	3.11.2004	

ЕX	Excavation Log  UMWELT (AUSTRALIA) PTY LTD  started:  3.11.2004											
clie	nt:					STRAL	IA) PT	′ LTD		5	started:	3.11.2004
	ncipa	I:		READ						f	inished:	
	ject:					HARD F	ROCK	QUARRY			ogged:	MAB
	ation			/ARU							checked	
	ipme ensi				BACKHO wide b					RL surfa datum:	ce:	
			formati		wide b			ormation			iatum.	
						mate						
method	support	J.	notes samples, tests, etc		es th	graphic log	USCS symbol	material	moisture condition	consistency/ density index	Hand ଜୁ penetro- meter	structure and additional observations
met	ldns	water	note sarr test:	ᆔ	depth metres	grap	nso	soil type: plasticity or particle characteristics, colour, secondary and minor components.	con	con	200 200 400 400	
В	z		D			त्र कर कर कर कर कर कर कर कर कर कर कर कर	ML	Sandy SILT, low plasticity, dark grey to grey, grass roots	>Wp	F		TOPSOIL
			D		0.1		ML	Gravelly SILT, low plasticity, light grey/brown, fine gravel		St		RESIDUAL
					0.25		CL	Sandy CLAY, medium plasticity, mottled brown and grey, fine to coarse sand		VSt		-
					_							-
		Ш	D		<u>0.</u> 5							-
					_							-
					_							-
					_							-
					0.9	//// +		GRANITE, medium to coarse grained, grey and brown,				BEDROCK
					0.95	· • • • •		XW TP12 terminated at 0.95m				
					1.0							_
					_							-
					_							-
					_							_
					_							-
					<u>1.</u> 5							_
					_							-
					_							-
					_							-
					_							-
Refe	er to Ir	nforma	tion Shee	ts for T	2.0 erms and	Symbols	6					Excavation Log - Revision 9

geotechnical engineering consultants

PO Box 3385 Rouse Hill NSW 2155 Ph: (02) 9836 2144 Fax: (02) 9836 0225 assetgeo@callaustralia.net.au job n

EX no:  TP13    sheet:  1 of 1    job no.:  0689-1
sheet: 1 of 1
EX no: TP13

CX	Litent: UMWELT (AUSTRALIA) PTY LTD started: 3.11.2004											
clie						ISTRAL	IA) PTY	' LTD			started:	3.11.2004
	ncipa	1:		READ							inished:	
proj				PROP MARU		HARD F	KOCK (	QUARRY			ogged:	MAB : MAB
	ation				BACKH	OF					checked RL surfa	
	quipment:  4WD BACKHOE  RL surfa    imensions:  0.45m wide by 2.0m long  datum:											
	avati											
						бо	mbol	material		ncy/ ndex	hand penetro- meter	structure and
method	support	water	notes samples, tests, etc	님	depth metres	graphic log	USCS symbol	soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	<sup>100</sup> 200 ha 300 pe 400 me	additional observations
표	z		D			2 22 22 22 2 22 22 22 2 22 22 22	ML	SILT, low plasticity, dark brown, grass roots	>Wp	F		TOPSOIL
			D	-	0.1		ML	Sandy SILT, low plasticity, light brown	D	Fb		RESIDUAL
				_	0.25		CL	Sandy CLAY, medium plasticity, mottled orange-brown,	<wp< td=""><td>Н</td><td></td><td>-</td></wp<>	Н		-
					_		02	brown and grey				
		NE	D									
					0.5							_
					0.6	+ + + + + + + + + + + + + +		PORPHYRY, medium to coarse grained, modelled brown, orange-brown and white, XW				BEDROCK
					-	· + + + + + + + + + + + + + + + + + + +						
					0.85	+ + + + + + + + + + + +		Near refusal on PORPHYRY, medium to coarse				-
					-			grained, brown and grey, MW TP13 terminated at 0.85m				-
					1.0							_
					-							
					<u>1.</u> 5							_
					_							
					_							
					2.0							
Refe	er to Ir	ntorma	ation Shee	ets for T	erms and	1 Symbols						Excavation Log - Revision 9

geotechnical engineering consultants

PO Box 3385 Rouse Hill NSW 2155 Ph: (02) 9836 2144 Fax: (02) 9836 0225 assetgeo@callaustralia.net.au job r

10:	TP14
et:	1 of 1
no.:	0689-1
ted:	4.12.2004

ЕX	EXCAVATION LOG  Exception and the started:  Cooperation    client:  UMWELT (AUSTRALIA) PTY LTD  started:  4.12.2004											
clie						STRAL	IA) PT\	( LTD			started:	4.12.2004
	icipal	l:		EAD							inished:	
	ject: ation:			'ROP 1ARU		HARD R	OCK (	QUARRY			ogged: checked	MAB : MAB
	ipme				BACKH	DE					RL surfa	
	ensi				wide b	y 2.0m					datum:	
exc	avati	on in	Iformatio	on	_	mater	rial info	prmation			_	
pq	ort		les, etc		ø	graphic log	USCS symbol	material	tion	consistency/ density index	hand penetro- meter	structure and additional observations
H method	l support	water	notes samples, tests, etc	Ъ	depth metres	I		soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition		kPa 00 00 00 00 00 00 00 00	
BH	N		D			2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	SM	Silty SAND, fine to medium grained, dark brown, grass roots	D	MD		TOPSOIL
			D		0.1		SM	Gravelly Silty SAND, fine to medium grained, fine gravel, light brown with orange-brown mottle		MD		RESIDUAL
					0.25		CL	Sandy CLAY, medium plasticity, light brown with orange-brown mottle, fine to coarse sand	<=Wp	Н		-
					_							-
		NE	D		<u>0.</u> 5							-
					_							-
					_							-
					_							-
					0.85	+ + + + + + + + + + + +		GROUND, medium to coarse grained, grey, XW — —				BEDROCK
					0.95 <u>1</u> .0			TP14 terminated at 0.95m				
												-
					_							-
					-							-
					_							-
					<u>1.</u> 5							-
					_							-
					_							-
					_							-
					_							-
					2.0							
Refe	er to In	nforma	ition Sheet	ts for T	erms and	Symbols						Excavation Log - Revision 9

geotechnical engineering consultants

PO Box 3385 Rouse Hill NSW 2155 Ph: (02) 9836 2144 Fax: (02) 9836 0225 assetgeo@callaustralia.net.au job r

no:	TP15
et:	1 of 1
no.:	0689-1
ted:	4.12.2004
	4 10 0004

ЕX	LXCAVATION LOG client: UMWELT (AUSTRALIA) PTY LTD started: 4.12.2004												
clie						STRAL	IA) PTY	′ LTD		5	started:	4.12.2004	
prin	icipa	I:	F	READ	YMIX					f	inished	4.12.2004	
proj						HARD F	ROCK	QUARRY			ogged:	MAB	
	ation			/ARU							checked		
	uipment: 4WD BACKHOE RL surface:												
	nensions:  0.45m wide by 2.0m long  datum:    cavation information  material information												
exc													
							8			⇒×e	ġ.		
5	+		stc 's			<u>6</u>	syml	material	еu	ind	hand penetro- meter	structure and additional observations	
method	support	water	notes samples, tests, etc		depth metres	graphic log	USCS symbol	soil type: plasticity or particle characteristics.	moisture condition	consistency/ density index	kPa		
	ns	M	no sa tes	F	a a			soil type: plasticity or particle characteristics, colour, secondary and minor components.		9 e	100 200 300 400		
BH	Z					त स्तृत स्तृत स्तृ इन्ह्र स्तृत स्तृत	ML	SILT, low plasticity, dark to light grey	<wp< td=""><td>F</td><td></td><td>TOPSOIL</td></wp<>	F		TOPSOIL	
						<u>ত হয় হয়</u> উন্দ হয় হয়							
			D		-	976 976 976 1976 976 976 1976 976 976 976						-	
					0.15	<u> 24 (h 28</u>	ML	Sandy SILT, low plasticity, light brown, fine to coarse		St			
					F			sand				-	
			D										
1					L							-	
					Γ							-	
1					0.45		CL		>Wp	VSt			
					0.5			and orange-brown					
		۳			_							-	
			D										
					L							_	
					F							-	
					F							-	
					0.95			PORPHYRY, medium to coarse grained, mottle light					
					1.0	+ + + + + +		grey and orange-brown, XW-HW				-	
						++++							
												_	
1												-	
					1.15			Near refusal on PORPHYRY, medium to coarse grained, MW					
					F			TP15 terminated at 1.15m				-	
1					┝							-	
1					F							-	
1					1.5								
1													
1					F							-	
1					┝							-	
					L							-	
1					F							-	
Rof	ar to le	l	l ation Shee	ts for T	2.0 erms and	Symbolic	:					Excavation Log - Revision 9	
LIVER					sinis anu	ວງການປຣ						ENGLANDINE LOG - NEVISION 9	

geotechnical engineering consultants

PO Box 3385 Rouse Hill NSW 2155 Ph: (02) 9836 2144 Fax: (02) 9836 0225 assetgeo@callaustralia.net.au job 1

no:	TP16	
et:	1 of 1	
no.:	0689-1	
rted:	4.12.2004	
shad	1 12 2004	

Еx	Excavation Log											
clie					ELT (AU	STRAL	IA) PT	Y LTD		5	started:	4.12.2004
prin	icipa	I:	F	READ	YMIX						inished	: 4.12.2004
proj						HARD F	ROCK	QUARRY			ogged:	MAB
	ation			/ARU							checked	
	ipme				BACKH		long				RL surfa	ice:
	ensi		formati		wide b			ormation		(	datum:	
exc	avati		liormati			mate						
por	oort		notes samples, tests, etc		еs Ч	graphic log	USCS symbol	material	moisture condition	consistency/ density index	hand penetro- meter	structure and additional observations
method	support	water	note sam tests	ᆔ	depth metres	grap	nsc	soil type: plasticity or particle characteristics, colour, secondary and minor components.	mois	cons	kPa ₽ 8 8 8 9	
H	z					1 - 22 - 22 - 22 2 - 2 - 2 - 2 - 2 - 2 -	SM	Silty SAND, medium grained, dark grey, grass roots	M-W	L		TOPSOIL
<b>—</b>			D			20 <u>20 20</u> 20 <u>20 20</u> 2 <u>20 20</u>						
				-	0.1		SC	Clayey SAND, medium grained, light grey, some fine gravel	-	MD		SLOPEWASH
				1	Γ							-
			D									
				1	F							-
1					0.35	1.11	CL	Sandy CLAY, medium plasticity, light grey with	>Wp	VSt		
					F			Sandy CLAY, medium plasticity, light grey with orange-brown mottle, trace fine gravel				-
1						V///						
				1	0.5							_
			_									
1		۳	D		Γ	V//A						-
						$V//\lambda$						
				1	F							-
1												
1					F							-
1												
					L	V//A						_
1												
					1.0							
					1	++++		PORPHYRY, medium to coarse grained, mottled grey,				BEDROCK
						<b> +</b> + <b>+</b> + <b> </b>		brown and white				
					╞	[+ <u>+</u> + <u>+</u> ]						-
						+ + + + + + + + + + +						
					1.2	┟┿╇		TP16 terminated at 1.2m				
					1.2							
					L							-
1												
					F							-
					1 -							
					1.5							–
1					F							-
					L							-
					F							-
					┝							-
					2.0							
Refe	er to Ir	nforma	tion Shee	ets for T	erms and	I Symbols	6					Excavation Log - Revision 9

geotechnical engineering consultants

PO Box 3385 Rouse Hill NSW 2155 Ph: (02) 9836 2144 Fax: (02) 9836 0225 assetgeo@callaustralia.net.au job n

0:	TP17	
et:	1 of 1	
no.:	0689-1	
ed:	4.12.2004	

ЕX	Ca	109	tion		Jg					Ľ		
clie					elt (Au	ISTRAL	IA) PTY	' LTD			started:	4.12.2004
	icipa	I:			YMIX						inished	
proj	lect: ation			/ROP /IARU		HARD F	ROCK	QUARRY			ogged: checked	MAB I: MAB
	ipme				BACKH	OE					RL surfa	
dim	ensi	ons:			wide b						datum:	
exc	avati	on ir	nformati	on	1	mate	rial info	prmation	1			
			- 0			bo	(mbo	material		ncy/ ndex	hand penetro- meter	structure and
method	support	water	notes samples, tests, etc	님	depth metres	graphic log	USCS symbol	soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	kPa	additional observations
H	s Z	>	C 0 2	ш. —	00	88.52.52	ML	Sandy SILT, low plasticity, dark grey, grass roots	M	F	100 300 400	TOPSOIL
						20 <u>22 22 22</u> 26 <u>26 25</u>						
			D		-	યું છે. કેર કેર કેર કેર કેર કેર કેર કેર						-
					0.15	34 34 34	CL	Sandy CLAY, medium plasticity, light grey, medium to	>>Wp	St		
					_		0L	coarse sand	wp	5.		-
			D									
					- 0.3	<i>[[]</i> ]	SC	Clayey SAND, medium to coarse grained, light grey	w	MD		-
					0.3		30	orayey on the internation of the set of all the set of				
					F							-
		age	D									
		slow seepage			<u>0</u> .5	/						_
		NOIS										
					-							-
					- 0.7	$\mathbb{L}$		PORPHYRY, medium to coarse grained, light grey,				BEDROCK
						+ + + + + +		XW-HW				bebrook
					-	+++++						-
					-	+++++++++++++++++++++++++++++++++++++++						-
						++++++						
					1.0	+++++						_
						+ + + + +						
					-	+++++						-
						· + + + · + + + · + + +						
$\vdash$					1.2			TP17 terminated at 1.2m				
					┝							-
					┝							-
					<u>1</u> .5							-
					-							-
					╞							-
					╞							-
1					-							-
1												
Refe	er to Ir	l Iforma	l ation Shee	ts for T	2.0 erms and	Symbols	3	l				Excavation Log - Revision 9
							-					Enderation Log Revision 7

geotechnical engineering consultants

PO Box 3385 Rouse Hill NSW 2155 Ph: (02) 9836 2144 Fax: (02) 9836 0225 assetgeo@callaustralia.net.au job n

10:	TP18	
et:	1 of 1	
ו.סר:	0689-1	
ed:	4.12.2004	

ЕX	CS	IV3	tion		bg			0		Ľ		
clie					ELT (AU	STRAL	IA) PTY	' LTD		S	started:	4.12.2004
	icipa	I:		READ							inished	
proj	ject: ation			/ROP /IARU		HARD F	ROCK	QUARRY			ogged:	MAB : MAB
	ipme				BACKH	DE					hecked RL surfa	
	ensi				wide b		long				latum:	
exc	avati	on ir	nformati	on	1	mate	rial info	prmation				
	e e		es, etc			<u>bo</u> log	USCS symbol	material	on	tency/ / index	hand penetro- meter	structure and additional observations
method	support	water	notes samples, tests, etc	Ч	depth metres	graphic log		soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	kPa	
BH	Z		D			22 22 22 2 22 22 2 22 22 2 22 22 2 22 22	SM	Silty SAND, fine to medium grained, dark grey to black, grass roots	Μ	L		TOPSOIL
					0.1		SC	Clayey SAND, fine to medium grained, light brown	M-W			SLOPEWASH
			D		0.25		CL	Sandy CLAY, medium plasticity, light grey and light brown with orange-brown mottle	>Wp	St-VSt		RESIDUAL
					-							-
					0.5							_
		Ш										_
			D									
					0.7	. + . + . + + . + . + . + . + . . + . +		GRANITE, medium to coarse grained, mottled light grey and brown, XW-HW				BEDROCK
					_	· + + + + + + + + + + + + + + +						_
					1.0	+ + + + + + + + + + + + + + + +		Near refusal on GRANITE, medium to coarse grained,				
					_ '			MW TP18 terminated at 1m				_
					_							_
					_							-
					_							-
					<u>1.</u> 5							_
												-
												_
												-
												_
					2.0							
Refe	er to Ir	nforma	ation Shee	ts for T	erms and	Symbols						Excavation Log - Revision 9

geotechnical engineering consultants

PO Box 3385 Rouse Hill NSW 2155 Ph: (02) 9836 2144 Fax: (02) 9836 0225 assetgeo@callaustralia.net.au job n

10:	TP19
et:	1 of 1
no.:	0689-1
ted:	4.12.2004

ЕX	Ca	IVS	tion	I LO	рс					Ľ	00110	0009-1
clie					ELT (AU	STRAL	IA) PT	/ LTD		5	started:	4.12.2004
1 ·	ncipa	I:	R	READ	YMIX						inished	
	ject:					HARD F	ROCK	QUARRY			ogged:	MAB
	ation			/ARU							checked	
	ipme ensi				BACKH wide b		long				RL surfa datum:	ice:
			formati		wide b			ormation			Jatum.	
						ŋ	USCS symbol	material		consistency/ density index	hand penetro- meter	structure and
g	ort		etc.		_ v	jic <mark>c</mark>	Syr		ttion	sten ity in	han pen met	additional observations
method	support	water	notes samples, tests, etc	ᆔ	depth metres	graphic log	SCS	soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consi	kPa	
	s Z	>	C 0 2	ш.	00		ML	SILT, low plasticity, grey	M	F	100 300 400	TOPSOIL
H						<u>यतः यतः यतः</u> १ मद्यः यतः यतः इ.स. स्टब्स् स्ट	IVIL	SiET, IOW plasticity, grey	IVI	'		
			D		L	12 12 12 12 12 12 12 12						_
						2.44.44.44 22.44.26						
					0.15		CL	CLAY, medium plasticity, mottled brown and orange/red-brown	>Wp	St-VSt		RESIDUAL
					F			orangeneu-blown				-
						V///						
					┝	V//A						-
						V//A						
					F	V///						-
						V//A						
					0.5	$V//\lambda$						
			D			V/A						
					-	V//A						-
		۳										
					-	V//A						-
					0.75			GRANITE, medium to coarse grained, mottled light				BEDROCK
					_ 0.75	++++		grey, brown and white, XW				-
						++++						
						++++						
					Γ	+ + + + + +						-
					1.0	++++						
					<u>1</u> .0	+ + + + + +						_
						++++						
					-	+ + + + + + +						-
1						<u>+</u> + + + +						
					L	[+ <u>+</u> ++]						_
						<b> </b> ++++						
					1.3			TP19 terminated at 1.3m				
1					F							-
					1.5							_
1												
					L							_
					Γ							-
1												
					┝							-
1					F							-
L					2.0							
Refe	er to Ir	nforma	ation Shee	ts for T	erms and	Symbols	5					Excavation Log - Revision 9

geotechnical engineering consultants

PO Box 3385 Rouse Hill NSW 2155 Ph: (02) 9836 2144 Fax: (02) 9836 0225 assetgeo@callaustralia.net.au job r

no:	TP20
et:	1 of 1
no.:	0689-1
rted: shed:	4.12.2004 4.12.2004

ЕX	Ca	100	ition									
clie	nt:		ι	JMWE	ELT (AU	JSTRAL	IA) PT	( LTD			started:	4.12.2004
	icipa	I:		READ							inished	
proj						HARD F	KOCK (	QUARRY			ogged:	
	ation: ipme				LAN BACKH	OF					checked RL surfa	
	ensi					y 2.0m	long				datum:	
			formati					prmation				
							0			_ ×		
_			က်ပ			<u>60</u>	gmb	material	e L	ency	hand penetro- meter	structure and additional observations
method	support	water	notes samples, tests, etc		depth metres	graphic log	USCS symbol	soil type: plasticity or particle characteristics.	moisture condition	consistency/ density index	kPa ⊨	
		wa	no <sup>.</sup> sai tes	Я	del	I		soil type: plasticity or particle characteristics, colour, secondary and minor components.			100 200 300 400	
ВН	Z					संस संस स्व १ स्व स्व स्व इस्ट स्व स्व	ML	Sandy SILT, low plasticity, grey, grass roots, fine to medium sand	М	L-MD		TOPSOIL
			D			2 24 22 24						
				]	0.1		ML	Sandy SILT, low plasticity, grey, fine to coarse sand				RESIDUAL
			D	1								
					_							-
					0.3	////	CL	Sandy CLAY, medium plasticity, mottled light brown and orange-brown, fine to medium sand	=Wp	Н		-
					Γ							-
					0.5							
		ЩZ		1								
		2										
			D		-							-
					-							-
					0.8	++++		PORPHYRY, medium to coarse grained, light grey, XW				BEDROCK
						+++++						
					-	+ + + + + +						-
					1.0	+++++++++++++++++++++++++++++++++++++++						
					1.0	+ + + +						_
					1.05			TP20 terminated at 1.05m				
					-							-
					-							-
					-							-
					╞							-
					<u>1.</u> 5							_
					-							-
					F							-
					F							-
					F							-
					2.0							
Refe	er to Ir	nforma	tion Shee	ts for T	erms and	d Symbols	5					Excavation Log - Revision 9

geotechnical engineering consultants

PO Box 3385 Rouse Hill NSW 2155 Ph: (02) 9836 2144 Fax: (02) 9836 0225 assetgeo@callaustralia.net.au job r

no:	TP21
et:	1 of 1
no.:	0689-1
ted:	4.12.2004

ЕX	(CS	IV3	tion		Jg					Ľ		
clie					ELT (AU	STRAL	IA) PT	′ LTD		5	started:	4.12.2004
	ncipa	I:		READ							inished	
	ject:					HARD F	ROCK	QUARRY			ogged:	MAB
	ation				LAN BACKH						checked	
	iipme iensi				wide b		lona				RL surfa datum:	ce:
			formati		whice b			ormation				
						Ŋ	USCS symbol	material		consistency/ density index	hand penetro- meter	structure and
g	bot	L_	s oles, etc		C SS	hic	S sy		ition	ister ity ir	per me	additional observations
method	support	water	notes samples, tests, etc	ᆔ	depth metres	graphic log	nsc	soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	cons dens	kPa ₽ 8 8 8 4	
H	z	-				4 44 44 44 8 44 44 44	SM	Silty SAND, fine grained, dark grey, grass roots	M	L	+ 00 00 <del>4</del>	TOPSOIL
<b>—</b>				-		<u>86 86 86</u>		, , , , , , , , , , , , , , , , , , ,				
			D	-	0.1	2 22 22 22 40 22 22	SC	Clayey SAND, medium grained, light brown				RESIDUAL
							50	orayey of the meaning famea, light brown				NEOBONE
					L							-
						$\langle / \rangle$						
					L	/ /						_
			D			$\left  \right $						
				1	F	$\langle \rangle$						-
					0.5	$\langle \rangle$						
					0.5	////	CL	Sandy CLAY, medium plasticity, mottled light grey, brown and orange-brown, medium to coarse sand	>Wp	VSt		_
								brown and orange-brown, medium to coarse sand				
					-							-
		¥										
				-	-							-
			D		L							_
					0.9	+ + + +		PORPHYRY, medium to coarse grained, mottled orange-brown and grey, XW				BEDROCK
					1.0	+++++						
						+ + + +						_
						+ + + + +						
					-	+ + + +						-
						+ + + + + +						
					┝	++++						-
-	-				1.25	<u>  + + </u>		TP21 terminated at 1.25m				
					F							-
					L							-
1					1.5							
												_
1												
					F							-
					╞							-
1					F							-
1					L							-
					2.0							
Refe	er to Ir	nforma	ation Shee	ts for T	erms and	Symbols	5					Excavation Log - Revision 9

geotechnical engineering consultants

PO Box 3385 Rouse Hill NSW 2155 Ph: (02) 9836 2144 Fax: (02) 9836 0225 assetgeo@callaustralia.net.au job r

EX no: TP22	
sheet: 1 of 1	
job no.: 0689-1	
started: 4.12.2004	

СΧ	Ca	IVa	ition		Jg					Ľ		
clie	nt:				elt (Au	STRAL	IA) PTY	' LTD		S	started:	4.12.2004
	icipa	I:		EAD							inished:	
proj						HARD F	ROCK	QUARRY			ogged:	MAB
	ation: ipme			1ARU WD E	BACKH	DE					checked RL surfa	
	ensi				wide by		long				datum:	
exc	avati	on in	formati					prmation				
method	support	e	notes samples, tests, etc		es es	graphic log	USCS symbol	material	moisture condition	consistency/ density index	는 hand 8 penetro- meter	structure and additional observations
met	ldns	water	note sam tests	Ц	depth metres	grap	nsc	soil type: plasticity or particle characteristics, colour, secondary and minor components.	con	den	200 200 400 200 400	
H	Z					४ अस्त अस्त स्ट स्टब्स् अस्त स्टब्स्	ML	SILT, low plasticity, grey and brown, grass roots	=Wp	F		TOPSOIL
			D			<u>40 40 40</u> 2 <u>40 40</u> 40						
					0.1		ML	Sandy Clayey SILT, low plasticity, light brown, fine to coarse sand				RESIDUAL — — — — — — — — — — — — — — — — — — —
			D		_							-
					0.3		CL	Sandy CLAY, medium plasticity, mottled brown and	>Wp	VSt		-
			D		_			orange-brown, fine to coarse sand				_
		ШN			0.5							
					0.5 0.5	*///// * + * + *		PORPHYRY, medium to coarse grained, mottled grey and brown, XW-HW				BEDROCK
						+ + + + + + + + + + + + + + + + + + +						
						+ + + + + + + +						
					_	+ + + +						-
						+ + + + + + + + + + + + + + + + + + + +						
					_	· + + + · + + + +						-
$\vdash$					0.85	<b>                                     </b>		TP22 terminated at 0.85m				
					-							-
					1.0							
												_
												-
					_							-
					_							-
					-							-
					1.5							
1					<u>.</u>							
					-							-
												-
1												
					_							-
					_							-
					2.0							
Refe	er to Ir	nforma	tion Shee	ts for T		Symbols	;	1				Excavation Log - Revision 9

# **APPENDIX B**

Laboratory Test Results
Office: PO BOX 48 ERMINGTON NSW 2115

Laboratory: 1/4 ABBOTT ROAD SEVEN HILLS NSW 2147 Telephone: (02) 9838 8903 Fax: (02) 9838 8919 A.C.N. 003 614 695 A.B.N. 81 829 182 852

#### ANALYTICAL REPORT for:

#### ASSET GEOTECHNICAL ENGINEERING PTY LTD

15 SANDLEWOOD CLOSE ROUSE HILL 2155

ATTN: MARK BARTEL

JOB NO:	SAL15321
CLIENT ORDER:	0689-1
DATE RECEIVED:	15/11/04
DATE COMPLETED:	26/11/04
TYPE OF SAMPLES:	SOILS
NO OF SAMPLES:	29

NATA Accredited Laboratory	
Number: 1884	
BATTA A	
NATA ENDORSED TEST REPORT	
This document shall not be reproduced,	
except in full.	

. . . . Issued on 09/12/04

Lance Smith (Chief Chemist)

Page 2 of 5

SYDNEY ANALYTICAL LABORATORIES

# ANALYTICAL REPORT

# JOB NO: SAL15321 CLIENT ORDER: 0689-1

SAMPLES	рН 1 <b>:</b> 5	COND. dS/m	Cl mg/kg	CEC cmol+/kg	*EMERS. Class
1 TP1/0-0.1	5.5	0.090	15		
2 TP2/0-0.1	4.7	0.24	38		
3 TP2/0.2-0.3	5.3	0.080	25		
4  TP2/0.4-0.5	5.0	0.11	47	<u> </u>	2
5  TP4/0-0.1	5.2	0.030	5	3.1	8 6
6  TP4/0.3-0.4	5.4	0.015	<5	2.5	б
7 TP5/0.05-0.15	4.5	0.075	60		
8 TP6/0-0.15	4.8	0.070	15		
9 $TP7/0-0.05$	4.8	0.10	30	го	8
10  TP8/0-0.1	5.4	0.10	8	5.8	8
11 $TP8/0.4-0.6$	5.4	0.030	8		
12  TP9/0-0.1	4.5	0.23	49	г с	c
13 TP10/0-0.05	4.5	0.10	14	5.6	6
14 TP10/0.05-0.15	4.5	0.090	7	<b>C</b> 0	5
15 TP10/0.5-0.6	5.2	0.070	64	6.9	5
16 TP11/0-0.1	4.6	0.33	45		
17 TP13/0-0.05	4.7	0.18	8		
18 TP13/0.1-0.2	4.6	0.070	32	0 2	6
19 TP14/0-0.1	5.8	0.080	12	8.3	0
20 TP14/0.1-0.2	5.4	0.055	29	10 /	5
21 TP14/0.4-0.6	5.3	0.045	26	10.4	5
22 TP16/0-0.1	5.0	0.050	10	2 0	6
23 TP18/0.05-0.1	5.3	0.040	10 18	3.8	0
24 TP18/0.15-0.25	4.8	0.040	35		
25 TP18/0.6-0.7 26 TP19/0.05-0.1	5.5 5.3	0.060 0.090	110	3.3	6
27 TP19/0.5-0.65	5.5	0.12	120	15.8	8
27 TP1970.5-0.85 28 TP21/0.05-0.1	5.0	0.095	79	17.0	0
28  TP21/0.03-0.1 29 TP22/0-0.1	4.8	0.15	150		
DUPLICATES:	4.0	0.13	100		
19 TP14/0-0.1	5.8	0.090	11	8.1	6
19 1814/0-0.1	5.0	0.090	11	0.1	0
MDL	0.1	0.001	5	0.1	
Method Code	WA1	WA2	WA4	S7	C43
Preparation	P5	P5	P5	P5	P1
<u>ь</u>					

# ANALYTICAL REPORT

# JOB NO: SAL15321 CLIENT ORDER: 0689-1

	SAMPLES	Total P mg/kg	*Av.K mg/kg	*Tot.S %
5 6 10 13 15 19 21 23 26 27 DUP 19	TP4/0-0.1 TP4/0.3-0.4 TP8/0-0.1 TP10/0-0.05 TP10/0.5-0.6 TP14/0-0.1 TP14/0.4-0.6 TP18/0.05-0.1 TP19/0.05-0.1 TP19/0.5-0.65 LICATES: TP14/0-0.1	68 42 260 390 200 260 67 120 200 84 230	135 78 180 86 27 135 82 185 50 55 130	0.021 0.007 0.029 0.038 0.020 0.032 0.009 0.017 0.012 0.013 0.029
	od Code aration	5 WA15 P5	1 S4 P5	0.002 HT3 P5

RESULTS ON DRY BASIS

Page 4 of 5

# SYDNEY ANALYTICAL LABORATORIES

# LABORATORY DUPLICATE REPORT

JOB NO: SAL15321 CLIENT ORDER: 0689-1

Sample Number	Analyte	Units	MDL	Sample Result	Duplicate Result	%RPD
TP14/0-0.1 TP14/0-0.1 TP14/0-0.1 TP14/0-0.1 TP14/0-0.1 TP14/0-0.1 TP14/0-0.1 TP14/0-0.1	pH Conductivity Chloride CEC *Emerson Class Total P Available K *Total Sulphur	mg/kg mg/kg	0.1 0.001 5 0.1 5 1 0.002	$5.8 \\ 0.080 \\ 12 \\ 8.3 \\ 6 \\ 260 \\ 135 \\ 0.032$	5.80.090118.162301300.029	0 12 8 2 0 12 4 10

Acceptance criteria:

RPD <50% for low level (<20xMDL)
RPD <30% for medium level (20-100xMDL)
RPD <15% for high level (>100xMDL)
No limit applies at <2xMDL</pre>

MDL = Method Detection Limit

All results are within the acceptance criteria

Page 5 of 5

# SYDNEY ANALYTICAL LABORATORIES

#### ANALYTICAL REPORT

JOB NO: SAL15321 CLIENT ORDER: 0689-1

#### METHODS OF PREPARATION AND ANALYSIS

The tests contained in this report have been carried out on the samples as received by the laboratory.

P5 Sample dried, split and crushed to -150um P1 Analysis performed on sample as received WA1 pH - 1:5 soil/water extract Determined by APHA 4500B WA2 Conductivity - 1:5 soil/water extract Determined by APHA 2510B WA4 Chloride - 1:5 soil/water extract Determined by APHA 4110B **S**7 Cation Exchange Capacity & Exchangeable/Soluble Cations Determined by Silver Thiourea Method CEC-1 Modified Emerson Crumb Test: Based on AS1547-1990 Appendix F \*C43 WA15 Total Phosphorus - H2SO4/HF Digestion Determined by APHA 4500BF Available Phosphorus - Bray Extract (0.03N NH4F) \*S4 Determined by APHA 4500F Total Sulphur - Determined by High Temperature Furnace \*HT3

The laboratory's NATA registration does not cover performance of this service

A preliminary report was faxed on 26/11/04

Office: PO BOX 48 ERMINGTON NSW 2115

Laboratory: 1/4 ABBOTT ROAD SEVEN HILLS NSW 2147 Telephone: (02) 9838 8903 Fax: (02) 9838 8919 A.C.N. 003 614 695 A.B.N. 81 829 182 852

#### ANALYTICAL REPORT for:

#### ASSET GEOTECHNICAL ENGINEERING PTY LTD

15 SANDLEWOOD CLOSE ROUSE HILL 2155

ATTN: MARK BARTEL

JOB 1	10:		SAL15321B
CLIEN	1T (	ORDER:	0698-1
DATE	REC	CEIVED:	15/11/04
DATE	CON	APLETED:	26/11/04
TYPE	OF	SAMPLES:	SOILS

NO OF SAMPLES: 4



. . . . . . . . .

Issued on 09/12/04 Lance Smith (Chief Chemist)

Page 2 of 4

# SYDNEY ANALYTICAL LABORATORIES

: .

# ANALYTICAL REPORT

# JOB NO: SAL15321B CLIENT ORDER: 0698-1

SAMPLES	рН	COND.	CEC	ESP	*Resis.
	1 <b>:</b> 5	dS/m	cmol+/kg	%	ohm.m
1 TP1/0.05-0.15	6.0	0.090	3.1	0.3	>100
2 TP1/0.5-0.6	5.1	0.080	6.2	3.8	63
3 TP3/0.05-0.15	7.1	0.21	7.1	0.4	51
4 TP3/0.25-0.35	7.1	0.070	3.0	0.6	75
MDL	0.1	0.001	0.1	0.1	1
Method Code	C1	WA2	S7	C35	C21
Preparation	P5	P5	P5	P5	P8

۰,

· ·

### ANALYTICAL REPORT

# JOB NO: SAL15321B CLIENT ORDER: 0698-1

SAMPLES	*EMERS.	Cl	SO4
	Class	mg/kg	mg/kg
1 TP1/0.05-0.15	6	33	43
2 TP1/0.5-0.6	5	62	35
3 TP3/0.05-0.15	6	35	19
4 TP3/0.25-0.35	5	22	17
MDL Method Code Preparation	C43 P1	5 WA4 P5	5 WA6 P5

RESULTS ON DRY BASIS

#### ANALYTICAL REPORT

JOB NO: SAL15321B CLIENT ORDER: 0698-1

#### METHODS OF PREPARATION AND ANALYSIS

The tests contained in this report have been carried out on the samples as received by the laboratory.

- P5 Sample dried, split and crushed to -150um
- P8 Sample dried and crushed to pass 6.7mm sieve
- P1 Analysis performed on sample as received
- C1 pH AS1289.4.3.1
- WA2 Conductivity 1:5 soil/water extract Determined by APHA 2510B
- S7 Cation Exchange Capacity & Exchangeable/Soluble Cations
   Determined by Silver Thiourea Method CEC-1
   C35 Exchangeable Sodium Percentage Silver Thiourea Extract
- \*C21 Determined by APHA 3500B Electrical Resistivity - RTA T185
- \*C43 Modified Emerson Crumb Test: Based on AS1547-1990 Appendix F

WA4 Chloride - 1:5 soil/water extract Determined by APHA 4110B WA6 Sulphate - 1:5 soil/water extract Determined by APHA 4110B

The laboratory's NATA registration does not cover performance of this service A preliminary report was faxed on 26/11/04

Office: PO BOX 48 ERMINGTON NSW 2115

Laboratory: 1/4 ABBOTT ROAD SEVEN HILLS NSW 2147 Telephone: (02) 9838 8903 Fax: (02) 9838 8919 A.C.N. 003 614 695 A.B.N. 81 829 182 852

#### ANALYTICAL REPORT for:

#### ASSET GEOTECHNICAL ENGINEERING PTY LTD

15 SANDLEWOOD CLOSE ROUSE HILL 2155

ATTN: MARK BARTEL

JOB NO:	SAL15321C
CLIENT ORDER:	0704-1
DATE RECEIVED:	18/11/04
DATE COMPLETED:	30/11/04
TYPE OF SAMPLES:	SOIL
NO OF SAMPLES:	1

NATA Accredited Laborate Number: 1884	ory
NATA ENDORSED TEST REPO This document shall not be reprodu except in full.	oRT ced,

••• . . . .

Issued on 09/12/04 Lance Smith (Chief Chemist)

Page 2 of 3

# SYDNEY ANALYTICAL LABORATORIES

## ANALYTICAL REPORT

JOB NO: SAL15321C CLIENT ORDER: 0704-1

SAMPLES	рН 1 <b>:</b> 5	COND. dS/m	CEC cmol+/kg	ESP %	*P SORP mg/kg	*EMERS. Class
1 Ex1/0.1-0.5	4.7	0.025	4.6	1.1	580	6
MDL Method Code Preparation	0.1 C1 P5	0.001 WA2 P5	0.1 S7 P5	0.1 C35 P5	1 S9 P5	C43 P1

RESULTS ON DRY BASIS

#### ANALYTICAL REPORT

JOB NO: SAL15321C CLIENT ORDER: 0704-1

#### METHODS OF PREPARATION AND ANALYSIS

The tests contained in this report have been carried out on the samples as received by the laboratory.

P5	Sample dried, split and crushed to -150um
P1	Analysis performed on sample as received
C1	pH - AS1289.4.3.1
WA2	Conductivity - 1:5 soil/water extract Determined by APHA 2510B
S7	Cation Exchange Capacity & Exchangeable/Soluble Cations Determined by Silver Thiourea Method CEC-1
C35	Exchangeable Sodium Percentage - Silver Thiourea Extract Determined by APHA 3500B
*S9	Phosphorus Sorption - Dept of Agriculture Standard Method

[ethod Determined by APHA 4500F

Modified Emerson Crumb Test: Based on AS1547-1990 Appendix F \*C43

The laboratory's NATA registration does not cover performance of this service A preliminary report was faxed on 30/11/04

FIGURES





# **APPENDIX 4B**

# **Soil Landscape Description**

# Appendix 4B - Soil Landscape Description

# Soil landscape descriptions are adapted from DIPNR (2003)

# **Bindook Road Variation A**

Bindook Road variation A is the predominate soil landscape unit in the area north of the Main Southern Railway. The crests and upper slopes of Bindook Road variation A soils are characterised by Paralithic Bleached Leptic Tenosols (Lithosols) with the mid and upper slopes being characterised by Brown Kurosols (Red and Yellow Podzolic Soils). Lower slopes of the soil landscape unit are characterised by Grey Sodosols (Solodic Soils).

The Bindook Road variant A soil landscape typically contains three horizons. The topsoil consists of two horizons (A1 and A2), with the materials comprising the A1 horizon ranging from a weak sandy loam to a silty/fine granular clay loam. pH for the A1 horizon range from 4.5 to 5.5. The A2 horizon is comprised of bleached dilatant sandy clay loam. The pH of the A2 horizon ranges from 4.5 to 5.5 with the texture of the material ranging from sandy clay loam to silty clay loam.

The A1 and A2 horizons of the Bindook Road variant A soil landscape overly a sub-angular medium clay subsoil being reddish brown to yellowish brown in colour. The pH of the subsoil ranges from 5 to 6 with the structure ranging from moderate to strong pedality.

# **Bindook Road**

Bindook Road is the predominate soil landscape unit to the south of the Main Southern Railway. This soil landscape unit also runs along the western edge of the project area, with patches also found in the northeast of the project area as shown on Figure 5.2 of the main text of the Environmental Impact Statement (EIS).

The Bindook Road soil landscape typically has four horizons, being the A1 and A2 horizons as well as the B2 and B3 horizons. The A1 horizon ranges from a weak sandy loam to a silty/fine sandy granular clay loam. Field pH ranges from 4.5 to 5.5. The structure of the A1 horizon ranges from massive to moderate pedality for the silty/fine sandy loam and from massive to weak pedal for the weak sandy loam. Fragment sizes range from coarse gravel to cobbles with the peds being 2-5 mm and angular in shape.

The A2 horizon is comprised of a bleached dilatant sandy clay loam with a pH range of 4.5 to 5.5. The fragment sizes of coarse gravel to cobbles overlies the strong brown sub angular blocky medium clay of the subsoil B2 horizon. The B2 horizon has a pH range of 5 to 6 with fragment sizes ranging from coarse gravel to cobbles. Ped sizes for the B2 horizon are in the order of 20-50 mm. The B2 horizon is characterised by moderate to strong pedality with fragment sizes ranging from coarse gravel to cobbles.

The greyish brown medium heavy sandy clay of the B2/3 horizon underlies the A2 horizon. The sandy clay material is characterised by angular to sub-angular blocky ped shapes ranging from gravel to cobbles. This horizon is highly erodible, dispersive and sodic in nature.

## Jaqua

The Jaqua soil landscape unit is found in the project area along the main channel of Joarimin Creek. The Jaqua soil landscape unit is also located in the southeastern corner of the project area. The rises of the Jaqua soil landscape unit are characterised by Yellow Kurosols (yellow podsolic soils) with the foot slopes being characterised by yellow and brown Sodosols (Soloths, Solidic Soils and Solodized Solonetz). The channels are characterised by Stratic Rudosols comprising alluvial soils.

The Jaqua soil landscape unit is generally composed of A1, A2 and B2 horizons. The A1 and A2 horizon is comprised of a number of materials typically being poorly structured loamy sand to sandy clay loam and a bleached dilatent silty clay loam. The loamy sand to sandy clay loam is brown to dark greyish brown in colour with ped sizes ranging from <2 mm up to 5 mm. Ped shapes are granular and polyhedral with ped structure ranging from single grained to weak pedal. The pH of the poorly structured loamy sand to sandy clay loam is highly variable, ranging from 4.5 to 10 with all materials having a high concentrated flow erodibility. The bleached dilatant silty clay loam displays characteristics similar to the other materials comprising the A1 and A2 horizon.

The subsoils of the Jaqua soil landscape unit are of a clayey nature and include a sodic mottled well structured medium clay, a moderately structured clay and a moderately structured dispersive clay. The pH ranges for the moderately structured clay range from 5 to 6 with the ped structure ranging from moderate to strong pedality. Fragment sizes range from fine gravel to coarse gravel with ped shape being sub-angular blocky to angular blocky.

The moderately structured dispersive clay is greyish yellow in colour and has a pH range of 6 to 9. Fragment sizes are fine gravel to coarse gravel and ped size and shape are consistent with the other materials which comprise the Jaqua sub soil horizon. The concentrated flow erodibility of the dispersive subsoil is high as is the non-concentrated flow erodibility.

# Marulan

The Marulan Soil Landscape unit is found in a small band in southeastern corner of the project area. The upper slopes of the Marulan Soil Landscape Unit contain Paralithic Leptic Rudosols (Lithosols) and Chemic Tenosols (Earthy Sands) with Shallow Red Kandosols (Red Earths) also being present. The mid slopes of the soil landscape unit contain Red Kurosols (Red Podzolic Soils) with the lowers slopes containing Brown Sodosols (Solodic Soils).

The Marulan soil landscape unit typically contains an A1 horizon which consists of a brown coarse sandy loam/sandy clay loam. The fragment sizes range from fine gravel to stones with ped shapes being sub-angular blocky to polyhedral. The structure is massive to weak pedal. The A2 horizon consists of a reddish brown, massive sandy clay loam and a bleached hardsetting sandy loam/clay loam. pH of the A2 horizon ranges from 5 to 6.5 with fragment sizes ranging from fine gravel to gravel. The concentrated flow erodibility and the non-concentrated flow erodibility potential of both the A1 and A2 horizons is considered to be high.

The subsoil of the Marulan soil landscape unit contains two horizons, the B and B2 horizon. The B horizon is composed of an earthy sandy loam with fragment size ranging from fine gravel to gravel. The pH of the B horizon ranges from 5.5 to 7 with the flow erodibility of the horizon being high.

The B2 horizon consists of red subangular blocky clay and a sodic yellow subangular blocky clay. The red subangular blocky clay has a pH range of 4 to 6.5, while the sodic yellow subangular blocky clay has a pH range of 5.5 to 7. Both material are characterised by a high concentrated flow erodibility and a moderate non-concentrated flow erodibility.