



# Hunter Geotechnics

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**McCLOY GROUP PTY LTD**

**IRONBARK RIDGE ESTATE  
STAGES 2c & 3a,  
MUSWELLBROOK**

**PAVEMENT THICKNESS DESIGN  
&  
AS2870 LOT CLASSIFICATIONS**

**REPORT HGS 1962-1**

**JULY 2010**



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HGS 1962-1 GP: gp  
22<sup>nd</sup> July 2010

McCloy Group  
PO Box 2214  
DANGAR NSW 2309

**Attention: Shane Boslem**

Dear Sir,

**Re: Ironbark Ridge Estate, Stages 2c & 3a, Muswellbrook: Pavement Thickness Design & AS2870 Classifications.**

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Find enclosed our report on geotechnical studies at the above site.

The report presents the results of field and laboratory testing and describes surface, subsurface and geotechnical conditions. Report assessment and recommendations cover pavement thickness design in accordance with Austroads and lot classifications in accordance with AS2870-1996 "Residential Slabs and Footings - Construction".

Please contact the undersigned if you require further assistance.

For and on behalf of  
Hunter Geotechnics Pty Ltd

Gary Peake *BE (Civil), GCE, MIE Aust.*  
Principal Geotechnical Engineer

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DRAWING	HGS 1962-01 Site Plan
CSIRO BTF-18	<i>“Foundation Maintenance &amp; Footing Performance: A Homeowners Guide”</i>

## **1.0 INTRODUCTION**

As requested, Hunter Geotechnics Pty Ltd has carried out geotechnical studies at the Ironbark Ridge Estate residential subdivision site in order to provide recommended pavement thickness designs for continuation of Ironbark Road and classifications for Stage 2c and Stage 3a Lots in accordance with AS2870-1996 "Residential Slabs and Footings - Construction".

The Ironbark Road continuation is about 400m long and design finish levels are anticipated to be similar to existing. Stage 2c Lots 201 to 207 and Stage 3a Lots 316 to 329 each range from 4000m<sup>2</sup> to 6575m<sup>2</sup>.

A plan of the site is shown on the attached Drawing HGS 1962-01. This report should be read in conjunction with the attached General Notes.

## **2.0 FIELDWORK**

Fieldwork carried out on 6<sup>th</sup> and 7<sup>th</sup> May 2010 included twenty two test pits (TP01 to TP22) by excavator to depths ranging from 0.8m to 3.1m. Dynamic Cone Penetrometer (DCP) and Pocket Penetrometer (PP) testing was carried out at some of the test pit locations to aid assessment of in-situ consistency/relative density.

The fieldwork was carried out by one of our Engineering staff who selected the test pit locations, performed in-situ testing and sampling and prepared field logs of the profiles encountered.

Test Pit Logs are attached and approximate test pit locations are shown on the above Drawing.

## **3.0 LABORATORY TESTING**

Laboratory testing carried out at our NATA accredited Singleton Laboratory comprised the following:

- 4 day soaked California Bearing Ratio (CBR) on three samples from anticipated subgrade level to aid assessment of subgrade strength and pavement thickness requirements;
- 4 day soaked CBR on two of the above samples with 3% added lime to aid assessment of subgrade strength and pavement thickness requirements utilising subgrade stabilisation;
- Shrink-Swell Index on ten samples of varying clay content to aid assessment of soil volume change characteristics with variations in soil moisture content (soil reactivity).

The laboratory test result are attached and discussed in Section 5.0.

## **4.0 SITE CONDITIONS**

### **4.1 Surface**

Stages 2c and 3a are situated within regionally undulating terrain and in particular occupy generally south facing slopes of about 3° to 5°. Locally surface slopes increase to about 8° to 10° (Lots 316 to 319) and about 20° (east facing slope on western side of Lot 207). The

Stages are located on the northern and southern sides of the proposed continuation of Ironbark Road. The site is bound by recently completed Stage 1 to the north-east, undeveloped land to the north and future Stages to the east and south.

The head of a drainage gully, up to about 8m wide and 1.5m deep, is situated near the common side boundary of Lots 319/320 about 30-40m from the front boundary. The gully extends down slope of the south-west corner of Lot 319.

At the times of investigation and reporting a large fill stockpile existed within the north-east corner of Lot 207 and partially within the north-west corner of Lot 206.

Vegetation at the time of investigation comprised grasses and a sparse scattering of trees. Surface soils generally comprise Silty SAND and Clayey Silty SAND topsoil.

#### **4.2 Subsurface**

*Singleton Soil Landscape Series Sheet SI 56-1 (Soil Conservation Service of NSW)* indicates the site to be situated within the Roxburg (rx) Yellow Earth Landscape which is characterised by undulating low hills on Permian sandstone, shale, mudstone, conglomerate and coal.

Soils of this Landscape typically comprise shallow to moderately deep Yellow Podzolic and Red Solodic Soils. Development limitations are reported to include high erosion hazard.

Subsurface conditions encountered **at TP07, TP12, TP14 and TP15 within the north-east portion of the site** are generalised as follows:

<b><u>Layer/Description</u></b>	<b><u>Depth to Base of Layer (m)</u></b>
TOPSOIL: (SM) Silty SAND & (SC-SM) Clayey Silty SAND, brown, dry, loose	0.1
RESIDUAL: (CH) Silty CLAY, high plasticity, brown, M<Wp, very stiff-hard	1.6 to 2.0
(CL) Sandy Silty CLAY, low to medium plasticity, pale grey mottled red/orange/pale brown, M<Wp, very stiff [TP12 only]	2.4
ROCK: SHALE & SILTSTONE [SANDSTONE at TP15], extremely to highly weathered: bucket refusal (R)	2.6R to >3.0

Subsurface conditions encountered **at TP01 to TP06, TP08 to TP11, TP13 and TP16 to TP22 within the balance of the site** are generalised as follows:

<b><u>Layer/Description</u></b>	<b><u>Depth to Base of Layer (m)</u></b>
TOPSOIL: Silty SAND & Clayey Silty SAND, brown, dry, loose	0.1 to 0.2
RESIDUAL: (CH) Silty CLAY, high plasticity, brown, M<Wp, very stiff-hard [at TP02 to TP04, TP08, TP13, TP16, TP17, TP20, TP21]	0.4 to 1.0
(CL-CH) Silty CLAY, medium to high plasticity, pale brown/pale grey/orange/red-brown, M<Wp, very stiff-hard [at TP01 to TP03, TP05, TP09 to TP11, TP17, TP22]	0.5 to 1.9
	HGS 1962-1

(CL) Silty CLAY, low to medium plasticity, pale grey/pale brown, M<Wp, very stiff-hard [at TP04, TP06, TP09, TP10, TP13, TP18 to TP20]

0.8 to 2.0

ROCK: SHALE & SILTSTONE [SANDSTONE at TP18 to TP22], extremely to highly weathered: bucket refusal (R)

0.8R to >3.0

Groundwater was not encountered within the test pits at the time of investigation however it is pointed out that groundwater levels and seepages may fluctuate with variations in rainfall, site drainage and other factors.

## **5.0 DISCUSSION & RECOMMENDATIONS**

### **5.1 General**

Laboratory test results are summarised in *Table 5.1* as follows:

**Table 5.1 Summary of Laboratory Results**

<b>USCS Symbol</b>	<b>Location</b>	<b>Depth (m)</b>	<b>MDD (t/m<sup>3</sup>)</b>	<b>OMC (%)</b>	<b>FMC (%)</b>	<b>CBR (%)</b>	<b>CBR (%) With 3% lime</b>	<b>Iss (%)</b>
CL-CH	TP1	0.5-0.7	1.65	20.1	15.2	4.0/4.0	19/16	-
CL-CH	TP1	1.1-1.3	-	-	18.1	-	-	2.2
CH	TP3	0.2-0.4	-	-	23.2	-	-	4.3
CL-CH	TP3	1.2-1.4	-	-	16.9	-	-	2.7
CL	TP4	0.8-1.0	-	-	9.0	-	-	1.3
CH	TP7	1.3-1.5	-	-	18.3	-	-	3.7
CL	TP10	1.1-1.3	-	-	19.6	-	-	1.8
CL-CH	TP11	1.4-1.6	-	-	15.9	-	-	2.2
CH	TP13	0.4-0.6	1.52	25.2	20.4	2.5/2.0	-	-
CH	TP14	1.3-1.5	-	-	15.8	-	-	3.5
CH	TP17	0.4-0.6	1.45	28.2	23.3	2.5/2.0	13/10	-
CH	TP18	2.5-2.8	-	-	21.6	-	-	6.6
CL-CH	TP21	2.5-2.7	-	-	18.3	-	-	1.9

Laboratory testing indicates the (CH) high plasticity residual Silty CLAY to be of high reactivity with Shrink Swell Index (Iss) values of 3.5%, 3.7%, 4.3% and 6.6% (4 tests) and the (CL) low to medium and (CL-CH) medium to high plasticity residual Silty CLAY to be of moderate reactivity with Iss values of 1.3%, 1.8%, 1.9%, 2.2%, 2.2% and 2.7% (6 tests). The value of 6.6% was achieved on a localised sample of dark grey Silty CLAY obtained below the adopted depth of soil suction.

Laboratory testing indicates the (CH) high plasticity residual Silty CLAY to be of very low strength with soaked CBR values of 2.5/2.0% (2 tests) and the (CL-CH) medium to high plasticity residual Silty CLAY to be of low strength with a soaked CBR value of 4/4% (1 test). With the addition of 3% lime, CBR values are indicated to increase to 13/10% and 19/16% for the CH and CL-CH Silty CLAY's respectively.

## **5.2 Pavements**

Design long section drawings were not available at the time of reporting however it is anticipated that subgrade conditions will comprise mostly high and medium to high plasticity residual Silty CLAY.

In view of the above, a subgrade CBR value of 2.5% for residual Silty CLAY has been adopted for pavement thickness design. We have also prepared alternative thickness designs using select subgrade replacement and subgrade stabilisation.

Recommended pavement thickness designs are provided in Attachment A, together with notes covering design assumptions, compaction, material quality, drainage and other construction criteria.

## **5.3 Lot Classifications**

Based on the above, we have adopted the following design Iss values for calculation of characteristic surface movement:

- Residual (CH) Silty CLAY Iss 4.0%
- Residual (CL-CH) & (CL) Silty CLAY Iss 2.5%
- Rock: weathered SHALE/SILTSTONE/SANDSTONE Iss 0.5%

Characteristic surface movement ( $y_s$ ) is assessed to range from about 25mm to 85mm for existing site conditions across the Stage 2c and 3a site. This assessment is based on a change in suction at the soil surface ( $\Delta u$ ) of 1.5pF, a 2.4m depth of seasonal moisture variation ( $H_s$ ) and the presence of a 1.2m deep soil cracked zone.

Based on the above, Lots are currently assessed in accordance AS2870-1996 "Residential Slabs and Footings - Construction" as follows:

**Class H (Highly Reactive): Lots 201 to 205, 316 to 318, 321 and 327 to 329 inclusive.**  
**Provisional Class H: Lots 206, 207, 319, 320**  
**Class E (Extremely Reactive): Lots 322 to 326 inclusive.**

A summary table of the above lot classifications is provided in Attachment B.

High level footing systems may be considered for the Lots classified as Class H and should be designed and constructed in accordance with the recommendations and advice in AS2870-1996. In particular, all footings should be founded on suitable natural soil beneath any shallow (<0.4m depth) topsoil, uncontrolled fill or other deleterious material. Notwithstanding the above, if rock is encountered in part of a footing system then the balance of the footing system on that lot should be extended or piered to strata of similar stiffness to reduce the potential effects of differential movement.

Similarly, high level footings may be considered for the Lots classified as Provisional Class H provided the large fill stockpile is removed from Lots 206 and 207, and residential construction is located away from the drainage gully on Lots 319 and 320. The locations of the stockpile and gully are discussed in Section 4.1.

High level footing designs presented in AS2870-1996 do not cover Class E ( $y_s > 70\text{mm}$ ) sites therefore the footing systems for Lots classified as Class E will need to be designed by a Civil/Structural Engineering Consultant.

Drainage and plumbing installation should adhere to requirements of AS2870-1996 Clauses 5.5.3 and 5.5.4.

The above AS2870 Classifications and related advice are provided on the basis that the performance expectations set out in Appendix B of AS2870-1996 are acceptable and that future site maintenance is in accordance with the recommendations and advice contained in CSIRO BTF-18, a copy of which is attached. Appendix B of AS2870-1996 includes restrictions on trees and shrubs, and indicates that tree planting should be restricted to a distance from the building of not less than mature tree height for Class H sites and not less than 1.5 x mature tree height for Class E sites in order to reduce the possibility of drying related damage.

Further geotechnical advice should be sought if there is to be substantial future cut/fill earthworks (>0.4m depth) on any of the Lots during possible benching. Such earthworks may increase the severity of the classification due to the removal of the soil cracked zone which currently mitigates ys. We would be pleased to provide additional geotechnical guidance on a site specific basis if required when house design details are available.

This Company has not made an enquiry with the Mine Subsidence Board regarding residential construction on Stages 2c and 3a. Please contact our Singleton Laboratory Manager Pat Deasy or the undersigned if you require further assistance.

For and on behalf of  
Hunter Geotechnics Pty Ltd



Gary Peake *BE (Civil), GCE, MIE Aust.*  
Principal Geotechnical Engineer

## ATTACHMENT A

### McCloy Group

#### Ironbark Ridge Estate Stages 2c & 3a, Muswellbrook

### PAVEMENT THICKNESS DESIGN SUMMARY

<u>Location</u>	<u>Assumed Traffic Loading (ESA's)</u>	<u>Design Subgrade CBR (%)</u>	<u>Minimum Recommended Pavement Thickness (mm)</u>			
			<u>Select Subgrade</u>	<u>Sub base</u>	<u>Base course</u>	<u>Wearing Course</u>
Ironbark Road:	2x10 <sup>6</sup>	2.5 (Silty CLAY)	See Note 3 below			
Design 1				460 (U)	150 (U)	Twin Coat Seal
Design 2 (Alternative)			400 (SR)	130 (U)	150 (U)	Twin Coat Seal
Design 3 (Alternative)			300 (LS)	190 (U)	150 (U)	Twin Coat Seal

#### Notes:

1. (U) denotes unbound basecourse and subbase material in accordance with RTA 3051N or as approved by Muswellbrook Council; (SR) denotes subgrade replacement with CBR>15%; (LS) denotes in-situ stabilisation with 3% lime by dry mass.
2. The recommended pavement designs have been prepared in accordance with Austroads Guide to Pavement Technology Part 2: Pavement Structural Design AGPT02/08 and are based on the design subgrade CBR value and assumed traffic loading noted above: Please contact this office if other design conditions are anticipated.
3. Subgrade conditions and the recommended pavement thickness design should be verified after proof roll inspection of preliminary boxing during the presence of a Geotechnical Consultant (GC). Any areas of yielding subgrade should be over excavated to a depth determined by the GC and replaced with an approved granular select fill (CBR>15%).
4. The following minimum dry density ratios (AS1289 AS1289 5.4.1 or 5.7.1) should be achieved during construction:

Basecourse	98% Modified
Subbase	95% Modified
Subgrade (Natural or Select)	100% Standard

#### Sub note:

*Subgrade moisture conditions were about 5.0% dry of Standard Optimum at the time of investigation. Some moisture conditioning or subgrade replacement may be required to achieve the specified subgrade compaction if construction is carried out during similar adverse conditions.*

5. Drainage should include Type 2, Type 3 or Type 4 subsoil drains with sand (Grade A4 to A6) filter material for silty clay soil beneath the proposed kerb line in accordance with *Table 3.1 of AGPT10/09 Austroads Guide to Pavement Technology Part 10: Subsurface Drainage*, or as specified by Council.

**ATTACHMENT B**

**McCloy Group**

**Ironbark Ridge Estate**  
**Stages 2c & 3a, Muswellbrook**

**SUMMARY TABLE OF CURRENT AS2870 CLASSIFICATIONS**

<b><i>Lot</i></b>	<b><i>Class</i></b>
201	H
202	H
203	H
204	H
205	H
206	H*
207	H*
316	H
317	H
318	H
319	H*
320	H*
321	H
322	E
323	E
324	E
325	E
326	E
327	H
328	H
329	H

**Notes:**

- *Class E denotes Extremely Reactive.*
- *Class H denotes Highly Reactive.*
- *Class H\* denotes Provisional Class H, provided a large fill stockpile is removed from Lots 206 and 207, and residential construction is located away from a drainage gully on Lots 319 and 320. The locations of the stockpile and gully are discussed in Section 4.1.*

## **APPENDIX A**

**Test Pit Logs (TP01 to TP22)**

**General Notes, Terms and Symbols Sheet**



Hunter Geotechnics Pty Ltd  
 PO Box 7086  
 KARIONG NSW 2250  
 Telephone: 02 43401234  
 Fax: 02 43401234

# TEST PIT NUMBER TP01

CLIENT McCloy Group PROJECT NAME Proposed Residential Subdivision  
 PROJECT NUMBER HGS 1962 PROJECT LOCATION Ironbark Ridge Estate, Stages 2c & 3a, Muswellbrook

DATE STARTED 6/5/10 COMPLETED 6/5/10 R.L. SURFACE \_\_\_\_\_ DATUM \_\_\_\_\_  
 EXCAVATION CONTRACTOR \_\_\_\_\_ SLOPE --- BEARING ---  
 EQUIPMENT 1H1 50NX Excavator TEST PIT LOCATION Refer to Site Plan Drawing HGS 1962-01  
 TEST PIT SIZE 450mm LOGGED BY T.C. CHECKED BY G.P.

NOTES Front of Lots 206/207

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
BH			0.0		SM	Silty SAND, brown, dry	DCP from 0.0m depth: 17, 17, 24 (Blows/150mm)  DD=1.65Mg/m <sup>3</sup> omc=20%, fmc=15%, CBR=4.0/4.0%  Iss=2.2%	TOPSOIL RESIDUAL
			CL		Silty CLAY, medium plasticity, pale brown with pale grey & orange mottling, M<Wp, hard			
			CL		Silty CLAY, medium plasticity, pale grey with orange mottling, M<Wp, hard			
					SILTSTONE, highly weathered, brown	ROCK		
			2.2			Borehole TP01 terminated at 2.2m		Bucket Refusal on Rock
			2.5					
			3.0					
			3.5					
			4.0					
			4.5					
			5.0					

BOREHOLE / TEST PIT HGS 1962.GPJ GINT STD AUSTRALIA.GDT 21/7/10



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# TEST PIT NUMBER TP02

**CLIENT** McCloy Group **PROJECT NAME** Proposed Residential Subdivision  
**PROJECT NUMBER** HGS 1962 **PROJECT LOCATION** Ironbark Ridge Estate, Stages 2c & 3a, Muswellbrook

**DATE STARTED** 6/5/10 **COMPLETED** 6/5/10 **R.L. SURFACE** \_\_\_\_\_ **DATUM** \_\_\_\_\_  
**EXCAVATION CONTRACTOR** \_\_\_\_\_ **SLOPE** --- **BEARING** ---  
**EQUIPMENT** 1H1 50NX Excavator **TEST PIT LOCATION** Refer to Site Plan Drawing HGS 1962-01  
**TEST PIT SIZE** 450mm **LOGGED BY** T.C. **CHECKED BY** G.P.

**NOTES** Rear of Lots 205/206

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
BH			0.5		CL	Sandy Silty CLAY, medium plasticity, brown, M<Wp, stiff to very stiff		RESIDUAL
					CL-CH	Silty CLAY, medium to high plasticity, pale grey with pale brown mottling, M<Wp, hard		
						SILTSTONE, highly weathered, pale brown		ROCK
			1.5			Borehole TP02 terminated at 1.5m		Bucket Refusal on Rock
			2.0					
			2.5					
			3.0					
			3.5					
			4.0					
			4.5					
			5.0					

BOREHOLE / TEST PIT HGS 1962.GPJ GINT STD AUSTRALIA.GDT 21/7/10



Hunter Geotechnics Pty Ltd  
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# TEST PIT NUMBER TP03

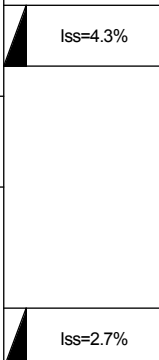
CLIENT McCloy Group PROJECT NAME Proposed Residential Subdivision  
 PROJECT NUMBER HGS 1962 PROJECT LOCATION Ironbark Ridge Estate, Stages 2c & 3a, Muswellbrook

DATE STARTED 6/5/10 COMPLETED 6/5/10 R.L. SURFACE \_\_\_\_\_ DATUM \_\_\_\_\_  
 EXCAVATION CONTRACTOR \_\_\_\_\_ SLOPE --- BEARING ---  
 EQUIPMENT 1H1 50NX Excavator TEST PIT LOCATION Refer to Site Plan Drawing HGS 1962-01  
 TEST PIT SIZE 450mm LOGGED BY T.C. CHECKED BY G.P.

NOTES Front of Lots 204/205

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
BH			0.0		SM	Silty SAND, brown, dry, medium dense		TOPSOIL RESIDUAL
			0.1		CH	Silty CLAY, high plasticity, brown, M<Wp, hard		
			0.5		CL	Silty Sandy CLAY, low to medium plasticity, pale brown, M<Wp, hard		
			1.0		CL-CH	Silty CLAY, medium to high plasticity, dark grey black, M<Wp		
			1.5			SHALE, extremely weathered, black with white mottling		
			3.0			Borehole TP03 terminated at 3m		
			3.5					
			4.0					
			4.5					
			5.0					

BOREHOLE / TEST PIT HGS 1962.GPJ GINT STD AUSTRALIA.GDT 21/7/10





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# TEST PIT NUMBER TP04

**CLIENT** McCloy Group **PROJECT NAME** Proposed Residential Subdivision  
**PROJECT NUMBER** HGS 1962 **PROJECT LOCATION** Ironbark Ridge Estate, Stages 2c & 3a, Muswellbrook

**DATE STARTED** 6/5/10 **COMPLETED** 6/5/10 **R.L. SURFACE** \_\_\_\_\_ **DATUM** \_\_\_\_\_  
**EXCAVATION CONTRACTOR** \_\_\_\_\_ **SLOPE** --- **BEARING** ---  
**EQUIPMENT** 1H1 50NX Excavator **TEST PIT LOCATION** Refer to Site Plan Drawing HGS 1962-01  
**TEST PIT SIZE** 450mm **LOGGED BY** T.C. **CHECKED BY** G.P.

**NOTES** Rear of Lots 204/316

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
BH			0.0		SM	Silty SAND, brown, dry		TOPSOIL
			0.5		CH	Silty CLAY, high plasticity, brown, M<Wp, hard		RESIDUAL
			1.0		CL	Sandy CLAY, low to medium plasticity, pale grey with pale brown mottling, fine to coarse sand, M<Wp, very stiff to hard		Iss=1.3%
			1.5					
			2.0			Sandy SILTSTONE, highly weathered, pale grey		ROCK
			2.5			SHALE, highly weathered, brown/orange		
			3.0			Borehole TP04 terminated at 2.9m		Bucket Refusal on Rock
			3.5					
			4.0					
			4.5					
			5.0					

BOREHOLE / TEST PIT HGS 1962.GPJ GINT STD AUSTRALIA.GDT 21/7/10



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# TEST PIT NUMBER TP05

CLIENT McCloy Group PROJECT NAME Proposed Residential Subdivision  
 PROJECT NUMBER HGS 1962 PROJECT LOCATION Ironbark Ridge Estate, Stages 2c & 3a, Muswellbrook

DATE STARTED 6/5/10 COMPLETED 6/5/10 R.L. SURFACE \_\_\_\_\_ DATUM \_\_\_\_\_  
 EXCAVATION CONTRACTOR \_\_\_\_\_ SLOPE --- BEARING ---  
 EQUIPMENT 1H1 50NX Excavator TEST PIT LOCATION Refer to Site Plan Drawing HGS 1962-01  
 TEST PIT SIZE 450mm LOGGED BY T.C. CHECKED BY G.P.

NOTES Front of Lots 316/317

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
BH			0.0		SC-SM	Clayey Silty SAND, brown, dry		TOPSOIL
			0.5		CL-CH	Silty CLAY, medium to high plasticity, red brown, M<Wp, very stiff		RESIDUAL
			1.0			SILTSTONE, highly weathered, pale brown / brown		ROCK
			1.2			Borehole TP05 terminated at 1.2m		Bucket Refusal on Rock
			1.5					
			2.0					
			2.5					
			3.0					
			3.5					
			4.0					
			4.5					
			5.0					

BOREHOLE / TEST PIT HGS 1962.GPJ GINT STD AUSTRALIA.GDT 21/7/10



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# TEST PIT NUMBER TP06

CLIENT McCloy Group PROJECT NAME Proposed Residential Subdivision  
 PROJECT NUMBER HGS 1962 PROJECT LOCATION Ironbark Ridge Estate, Stages 2c & 3a, Muswellbrook

DATE STARTED 6/5/10 COMPLETED 6/5/10 R.L. SURFACE \_\_\_\_\_ DATUM \_\_\_\_\_  
 EXCAVATION CONTRACTOR \_\_\_\_\_ SLOPE --- BEARING ---  
 EQUIPMENT 1H1 50NX Excavator TEST PIT LOCATION Refer to Site Plan Drawing HGS 1962-01  
 TEST PIT SIZE 450mm LOGGED BY T.C. CHECKED BY G.P.

NOTES Rear of Lots 317/318

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
BH			0.0		SC-SM	Clayey Silty SAND, brown, dry, medium dense		TOPSOIL
			0.5		CL	Silty CLAY, low to medium plasticity, brown / dark brown, M<Wp, very stiff to hard		RESIDUAL
			1.0		CL	Silty CLAY, low to medium plasticity, pale grey / pale brown, M<Wp, very stiff to hard		
			1.5			SILTSTONE, highly to moderately weathered, pale grey mottled pale brown		ROCK
			2.0					
			2.5					
			3.0					
			3.5					
			4.0					
			4.5					
			5.0					
						Borehole TP06 terminated at 2.2m		Bucket Refusal on Rock

BOREHOLE / TEST PIT HGS 1962.GPJ GINT STD AUSTRALIA.GDT 21/7/10



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# TEST PIT NUMBER TP07

**CLIENT** McCloy Group **PROJECT NAME** Proposed Residential Subdivision  
**PROJECT NUMBER** HGS 1962 **PROJECT LOCATION** Ironbark Ridge Estate, Stages 2c & 3a, Muswellbrook

**DATE STARTED** 6/5/10 **COMPLETED** 6/5/10 **R.L. SURFACE** \_\_\_\_\_ **DATUM** \_\_\_\_\_  
**EXCAVATION CONTRACTOR** \_\_\_\_\_ **SLOPE** --- **BEARING** ---  
**EQUIPMENT** 1H1 50NX Excavator **TEST PIT LOCATION** Refer to Site Plan Drawing HGS 1962-01  
**TEST PIT SIZE** 450mm **LOGGED BY** T.C. **CHECKED BY** G.P.

**NOTES** Front of Lots 318/319

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
BH			0.0		SC-SM	Clayey Silty SAND, dark brown, dry, medium dense		TOPSOIL RESIDUAL
			0.5		CH	Silty CLAY, high plasticity, dark brown, M<Wp, very stiff		
			1.0		CH	Silty CLAY, high plasticity, pale brown / pale grey becoming dark grey with depth, M<Wp, stiff to very stiff		
			1.5			SILTSTONE, highly weathered, pale grey		
			2.0				Iss=3.7%	ROCK
			2.5					
			3.0			Borehole TP07 terminated at 2.7m		Bucket Refusal on Rock
			3.5					
			4.0					
			4.5					
			5.0					

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# TEST PIT NUMBER TP08

**CLIENT** McCloy Group **PROJECT NAME** Proposed Residential Subdivision  
**PROJECT NUMBER** HGS 1962 **PROJECT LOCATION** Ironbark Ridge Estate, Stages 2c & 3a, Muswellbrook

**DATE STARTED** 6/5/10 **COMPLETED** 6/5/10 **R.L. SURFACE** \_\_\_\_\_ **DATUM** \_\_\_\_\_  
**EXCAVATION CONTRACTOR** \_\_\_\_\_ **SLOPE** --- **BEARING** ---  
**EQUIPMENT** 1H1 50NX Excavator **TEST PIT LOCATION** Refer to Site Plan Drawing HGS 1962-01  
**TEST PIT SIZE** 450mm **LOGGED BY** T.C. **CHECKED BY** G.P.

**NOTES** Rear of Lots 319/320

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
BH			0.5		SM	Silty SAND, fine sand, brown, dry, loose		TOPSOIL
					CH	Silty CLAY, high plasticity, brown, M<Wp, very stiff to hard		RESIDUAL
					CH	Silty CLAY, medium to high plasticity, pale grey, M<Wp, very stiff		
						SILTSTONE, highly weathered, pale brown / pale grey		ROCK
			1.5			Borehole TP08 terminated at 1.4m		Bucket Refusal on Rock
			2.0					
			2.5					
			3.0					
			3.5					
			4.0					
			4.5					
			5.0					

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# TEST PIT NUMBER TP09

**CLIENT** McCloy Group **PROJECT NAME** Proposed Residential Subdivision  
**PROJECT NUMBER** HGS 1962 **PROJECT LOCATION** Ironbark Ridge Estate, Stages 2c & 3a, Muswellbrook

**DATE STARTED** 6/5/10 **COMPLETED** 6/5/10 **R.L. SURFACE** \_\_\_\_\_ **DATUM** \_\_\_\_\_  
**EXCAVATION CONTRACTOR** \_\_\_\_\_ **SLOPE** --- **BEARING** ---  
**EQUIPMENT** 1H1 50NX Excavator **TEST PIT LOCATION** Refer to Site Plan Drawing HGS 1962-01  
**TEST PIT SIZE** 450mm **LOGGED BY** T.C. **CHECKED BY** G.P.

**NOTES** Rear of Lot 321

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
BH			0.5		SM	Silty SAND, fine grained, brown, dry, loose		TOPSOIL
					CL-CH	Silty CLAY, medium plasticity, brown with red brown mottling, M<Wp, very stiff		RESIDUAL
					CL	Silty CLAY, low to medium plasticity, pale grey, some boulders, M<Wp, very stiff		
						SILTSTONE, moderately weathered, pale brown / pale grey		ROCK
			1.5			Borehole TP09 terminated at 1.2m		Bucket Refusal on Rock
			2.0					
			2.5					
			3.0					
			3.5					
			4.0					
			4.5					
			5.0					

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# TEST PIT NUMBER TP10

**CLIENT** McCloy Group **PROJECT NAME** Proposed Residential Subdivision  
**PROJECT NUMBER** HGS 1962 **PROJECT LOCATION** Ironbark Ridge Estate, Stages 2c & 3a, Muswellbrook

**DATE STARTED** 6/5/10 **COMPLETED** 6/5/10 **R.L. SURFACE** \_\_\_\_\_ **DATUM** \_\_\_\_\_  
**EXCAVATION CONTRACTOR** \_\_\_\_\_ **SLOPE** --- **BEARING** ---  
**EQUIPMENT** 1H1 50NX Excavator **TEST PIT LOCATION** Refer to Site Plan Drawing HGS 1962-01  
**TEST PIT SIZE** 450mm **LOGGED BY** T.C. **CHECKED BY** G.P.

**NOTES** Front of Lots 320/321

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
BH			0.0		SM	Silty SAND, fine grained, brown, dry, loose		TOPSOIL
			0.1		CL-CH	Silty CLAY, medium to high plasticity, red brown / orange brown, M<Wp, very stiff	PP=>500kPa	RESIDUAL
			0.5		CL-CH	Silty CLAY, medium to high plasticity, orange / pale brown, M<Wp, very stiff		
			1.0		CL	Silty CLAY, low to medium plasticity, pale grey / pale brown with orange mottling, M<Wp, very stiff	Iss=1.8%	ROCK
			1.5		CL-CH	Silty CLAY, medium plasticity, dark grey / black, M<Wp, very stiff		
			2.0		SHALE	extremely weathered, dark grey / black		
			2.6			Borehole TP10 terminated at 2.6m	Bucket Refusal on Rock	
			3.0					
			3.5					
			4.0					
			4.5					
			5.0					

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# TEST PIT NUMBER TP11

CLIENT McCloy Group PROJECT NAME Proposed Residential Subdivision  
 PROJECT NUMBER HGS 1962 PROJECT LOCATION Ironbark Ridge Estate, Stages 2c & 3a, Muswellbrook

DATE STARTED 6/5/10 COMPLETED 6/5/10 R.L. SURFACE \_\_\_\_\_ DATUM \_\_\_\_\_  
 EXCAVATION CONTRACTOR \_\_\_\_\_ SLOPE --- BEARING ---  
 EQUIPMENT 1H1 50NX Excavator TEST PIT LOCATION Refer to Site Plan Drawing HGS 1962-01  
 TEST PIT SIZE 450mm LOGGED BY T.C. CHECKED BY G.P.

NOTES Front of Lot 322

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
BH			0.0		SM	Silty SAND, fine grained, dark brown, dry, loose		TOPSOIL
			0.5		CL	Sandy Silty CLAY, low to medium plasticity, brown, M<Wp, very stiff	PP=>500kPa	RESIDUAL
			1.5		CL-CH	Silty Sandy CLAY, medium plasticity, red-brown, fine to coarse sand, trace fine gravel, M<Wp, very stiff	Iss=2.2%	
			2.0			SILTSTONE, moderately weathered, red-brown		ROCK
			2.2			Borehole TP11 terminated at 2.2m		Bucket Refusal on Rock
			2.5					
			3.0					
			3.5					
			4.0					
			4.5					
			5.0					

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# TEST PIT NUMBER TP12

**CLIENT** McCloy Group **PROJECT NAME** Proposed Residential Subdivision  
**PROJECT NUMBER** HGS 1962 **PROJECT LOCATION** Ironbark Ridge Estate, Stages 2c & 3a, Muswellbrook

**DATE STARTED** 6/5/10 **COMPLETED** 6/5/10 **R.L. SURFACE** \_\_\_\_\_ **DATUM** \_\_\_\_\_  
**EXCAVATION CONTRACTOR** \_\_\_\_\_ **SLOPE** --- **BEARING** ---  
**EQUIPMENT** 1H1 50NX Excavator **TEST PIT LOCATION** Refer to Site Plan Drawing HGS 1962-01  
**TEST PIT SIZE** 450mm **LOGGED BY** T.C. **CHECKED BY** G.P.

**NOTES** Rear of Lots 322/323

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations		
BH			0.0		SM	Silty SAND, fine to medium sand, brown, dry, loose		TOPSOIL		
			0.1		CH	Silty CLAY, high plasticity, dark brown, M<Wp, very stiff to hard	PP=>500kPa		RESIDUAL	
			0.5							
			1.0		CH	Silty CLAY, high plasticity pale brown, M<Wp, very stiff	PP=>500kPa			
			1.5							
			2.0		CL	Sandy Silty CLAY, low to medium plasticity, pale grey with red orange & pale brown mottling, M<Wp, stiff to very stiff				
			2.5			SHALE, extremely weathered, dark grey / black			ROCK	
3.0		SILTSTONE, extremely weathered, pale grey / white								
			3.0			Borehole TP12 terminated at 3m				
			3.5							
			4.0							
			4.5							
			5.0							

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# TEST PIT NUMBER TP13

CLIENT McCloy Group PROJECT NAME Proposed Residential Subdivision  
 PROJECT NUMBER HGS 1962 PROJECT LOCATION Ironbark Ridge Estate, Stages 2c & 3a, Muswellbrook

DATE STARTED 7/5/10 COMPLETED 7/5/10 R.L. SURFACE \_\_\_\_\_ DATUM \_\_\_\_\_  
 EXCAVATION CONTRACTOR \_\_\_\_\_ SLOPE --- BEARING ---  
 EQUIPMENT 1H1 50NX Excavator TEST PIT LOCATION Refer to Site Plan Drawing HGS 1962-01  
 TEST PIT SIZE 450mm LOGGED BY T.C. CHECKED BY G.P.

NOTES Front of Lots 323/324

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
BH			0.0		SM	Silty SAND, fine to medium grained, brown, dry, loose	DD=1.52Mg/m <sup>3</sup> omc=25%, fmc=20.5%, CBR=2.5/2.0%	TOPSOIL
			0.5		CH	Silty CLAY, high plasticity, brown / dark brown, M<Wp, very stiff to hard		RESIDUAL
			1.0		CL	Sandy Silty CLAY, medium plasticity, brown / pale brown, M<Wp, very stiff to hard		
			1.5		CL	Sandy Silty CLAY, low to medium plasticity, brown with pale grey and orange mottling, M<Wp, very stiff to hard		
			2.0		CH	Silty CLAY, high plasticity, dark grey / black, M<Wp		
			2.5		SHALE	extremely weathered, dark grey / black		ROCK
			2.9		SILTSTONE	highly weathered, grey with pale grey mottling		
			3.0			Borehole TP13 terminated at 2.9m		Bucket Refusal on Rock
			3.5					
			4.0					
			4.5					
			5.0					

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# TEST PIT NUMBER TP14

**CLIENT** McCloy Group **PROJECT NAME** Proposed Residential Subdivision  
**PROJECT NUMBER** HGS 1962 **PROJECT LOCATION** Ironbark Ridge Estate, Stages 2c & 3a, Muswellbrook

**DATE STARTED** 7/5/10 **COMPLETED** 7/5/10 **R.L. SURFACE** \_\_\_\_\_ **DATUM** \_\_\_\_\_  
**EXCAVATION CONTRACTOR** \_\_\_\_\_ **SLOPE** --- **BEARING** ---  
**EQUIPMENT** 1H1 50NX Excavator **TEST PIT LOCATION** Refer to Site Plan Drawing HGS 1962-01  
**TEST PIT SIZE** 450mm **LOGGED BY** T.C. **CHECKED BY** G.P.

**NOTES** Rear of Lots 324/325

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
BH			0.0		SM	Silty SAND, fine to medium grained, brown, dry, loose		TOPSOIL RESIDUAL
			0.1		CH	Silty CLAY, high plasticity, dark brown, M<Wp, very stiff to hard		
			0.5		CH	Silty CLAY, high plasticity, brown, M<Wp, very stiff		
			1.0		CH	Silty CLAY, high plasticity, pale brown with grey and red brown mottling, M<Wp, very stiff		
			1.5			SHALE, extremely weathered, dark grey / black		
			2.0			SILTSTONE, highly weathered, red brown with pale grey and orange mottling		
			3.0			Borehole TP14 terminated at 2.9m		Bucket Refusal on Rock
			3.5					
			4.0					
			4.5					
			5.0					

Iss=3.5%

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# TEST PIT NUMBER TP15

**CLIENT** McCloy Group **PROJECT NAME** Proposed Residential Subdivision  
**PROJECT NUMBER** HGS 1962 **PROJECT LOCATION** Ironbark Ridge Estate, Stages 2c & 3a, Muswellbrook

**DATE STARTED** 7/5/10 **COMPLETED** 7/5/10 **R.L. SURFACE** \_\_\_\_\_ **DATUM** \_\_\_\_\_  
**EXCAVATION CONTRACTOR** \_\_\_\_\_ **SLOPE** --- **BEARING** ---  
**EQUIPMENT** 1H1 50NX Excavator **TEST PIT LOCATION** Refer to Site Plan Drawing HGS 1962-01  
**TEST PIT SIZE** 450mm **LOGGED BY** T.C. **CHECKED BY** G.P.

**NOTES** Front of Lots 325/326

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations	
BH			0.0		SC-SM	Clayey Silty SAND, brown, dry, loose		TOPSOIL RESIDUAL	
			0.5		CH	Silty CLAY, high plasticity, dark brown, M<Wp, very stiff to hard			
			1.0		CH	Silty CLAY, high plasticity, brown / pale brown, M<Wp, very stiff			PP=>500kPa
			1.5		CH	Silty CLAY, high plasticity, pale brown with mottled grey and orange becoming more grey with depth, M<Wp, stiff			
			2.0			SANDSTONE, highly weathered, pale grey with red brown and orange mottling		ROCK	
			2.5						
			3.0			Borehole TP15 terminated at 2.6m		Bucket Refusal on Rock	
			3.5						
			4.0						
			4.5						
			5.0						

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# TEST PIT NUMBER TP16

**CLIENT** McCloy Group **PROJECT NAME** Proposed Residential Subdivision  
**PROJECT NUMBER** HGS 1962 **PROJECT LOCATION** Ironbark Ridge Estate, Stages 2c & 3a, Muswellbrook

**DATE STARTED** 7/5/10 **COMPLETED** 7/5/10 **R.L. SURFACE** \_\_\_\_\_ **DATUM** \_\_\_\_\_  
**EXCAVATION CONTRACTOR** \_\_\_\_\_ **SLOPE** --- **BEARING** ---  
**EQUIPMENT** 1H1 50NX Excavator **TEST PIT LOCATION** Refer to Site Plan Drawing HGS 1962-01  
**TEST PIT SIZE** 450mm **LOGGED BY** T.C. **CHECKED BY** G.P.

**NOTES** Rear of Lots 326/327

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
BH			0.0		SM	Silty SAND, brown, dry, loose		TOPSOIL
			0.5		CH	Silty CLAY, high plasticity, brown / red brown, M<Wp		RESIDUAL
			1.0			SHALE, moderately weathered, orange brown / red brown becoming increasingly red-brown with depth		ROCK
			1.5			Borehole TP16 terminated at 1.6m		Bucket Refusal on Rock
			2.0					
			2.5					
			3.0					
			3.5					
			4.0					
			4.5					
			5.0					

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# TEST PIT NUMBER TP17

CLIENT McCloy Group PROJECT NAME Proposed Residential Subdivision  
 PROJECT NUMBER HGS 1962 PROJECT LOCATION Ironbark Ridge Estate, Stages 2c & 3a, Muswellbrook

DATE STARTED 7/5/10 COMPLETED 7/5/10 R.L. SURFACE \_\_\_\_\_ DATUM \_\_\_\_\_  
 EXCAVATION CONTRACTOR \_\_\_\_\_ SLOPE --- BEARING ---  
 EQUIPMENT 1H1 50NX Excavator TEST PIT LOCATION Refer to Site Plan Drawing HGS 1962-01  
 TEST PIT SIZE 450mm LOGGED BY T.C. CHECKED BY G.P.

NOTES Front of Lots 327/328

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
BH			0.0		SM-SC	Clayey Silty SAND, brown, dry, loose		TOPSOIL
			0.5		CH	Silty CLAY, high plasticity, brown / dark brown, M<Wp, very stiff	DD=1.45Mg/m <sup>3</sup> omc=28%, fmc=23.5%, CBR=2.5/2.0%	RESIDUAL
			1.0		CL-CH	Silty Sandy CLAY, medium plasticity, brown with mottled red brown and orange, M<Wp, stiff	PP=>500kPa	
			1.5			Silty SANDSTONE, highly weathered, pale grey		ROCK
			2.5			Borehole TP17 terminated at 2.3m		Bucket Refusal on Rock
			3.0					
			3.5					
			4.0					
			4.5					
			5.0					

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# TEST PIT NUMBER TP18

**CLIENT** McCloy Group **PROJECT NAME** Proposed Residential Subdivision  
**PROJECT NUMBER** HGS 1962 **PROJECT LOCATION** Ironbark Ridge Estate, Stages 2c & 3a, Muswellbrook

**DATE STARTED** 7/5/10 **COMPLETED** 7/5/10 **R.L. SURFACE** \_\_\_\_\_ **DATUM** \_\_\_\_\_  
**EXCAVATION CONTRACTOR** \_\_\_\_\_ **SLOPE** --- **BEARING** ---  
**EQUIPMENT** 1H1 50NX Excavator **TEST PIT LOCATION** Refer to Site Plan Drawing HGS 1962-01  
**TEST PIT SIZE** 450mm **LOGGED BY** T.C. **CHECKED BY** G.P.

**NOTES** Rear of Lots 328/329

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
BH			0.0		SM	Silty SAND, brown, dry	DCP from 0.0m depth: 11, 10, 21, 20, 20 (Blows/150mm)	TOPSOIL RESIDUAL
			0.5		CL	Silty CLAY, low to medium plasticity, dark brown / black, M<Wp, hard		
			1.0		CL	Sandy Silty CLAY, medium plasticity, brown / pale brown, M<Wp, hard		
			1.5		CL	Sandy Silty CLAY, medium plasticity, pale brown with red brown & orange mottling, M<Wp, very stiff	PP=>500kPa	
			2.0			Silty SANDSTONE, pale brown / orange with mottled red brown & pale grey		ROCK
			2.5		CH	Silty CLAY, high plasticity, grey / dark grey, very stiff	PP=>500kPa Iss=6.6%	Extremely Weathered Layer
			3.0			Borehole TP18 terminated at 3m		
			3.5					
			4.0					
			4.5					
			5.0					

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# TEST PIT NUMBER TP19

**CLIENT** McCloy Group **PROJECT NAME** Proposed Residential Subdivision  
**PROJECT NUMBER** HGS 1962 **PROJECT LOCATION** Ironbark Ridge Estate, Stages 2c & 3a, Muswellbrook

**DATE STARTED** 7/5/10 **COMPLETED** 7/5/10 **R.L. SURFACE** \_\_\_\_\_ **DATUM** \_\_\_\_\_  
**EXCAVATION CONTRACTOR** \_\_\_\_\_ **SLOPE** --- **BEARING** ---  
**EQUIPMENT** 1H1 50NX Excavator **TEST PIT LOCATION** Refer to Site Plan Drawing HGS 1962-01  
**TEST PIT SIZE** 450mm **LOGGED BY** T.C. **CHECKED BY** G.P.

**NOTES** Front of Lots 203/329

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
BH			0.0		SM	Silty SAND, dry, loose		TOPSOIL
			0.5		CL	Silty CLAY, low to medium plasticity, brown / dark brown, M<Wp, very stiff to hard	PP=>500kPa	RESIDUAL
			1.0		CL	Silty CLAY, low to medium plasticity, pale brown, M<Wp, hard	PP=>500kPa	
			2.0			SANDSTONE, highly weathered, pale brown / grey		ROCK
			2.5			Borehole TP19 terminated at 2.2m		Bucket Refusal on Rock
			3.0					
			3.5					
			4.0					
			4.5					
			5.0					

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# TEST PIT NUMBER TP20

CLIENT McCloy Group PROJECT NAME Proposed Residential Subdivision  
 PROJECT NUMBER HGS 1962 PROJECT LOCATION Ironbark Ridge Estate, Stages 2c & 3a, Muswellbrook

DATE STARTED 7/5/10 COMPLETED 7/5/10 R.L. SURFACE \_\_\_\_\_ DATUM \_\_\_\_\_  
 EXCAVATION CONTRACTOR \_\_\_\_\_ SLOPE --- BEARING ---  
 EQUIPMENT 1H1 50NX Excavator TEST PIT LOCATION Refer to Site Plan Drawing HGS 1962-01  
 TEST PIT SIZE 450mm LOGGED BY T.C. CHECKED BY G.P.

NOTES Rear of Lots 202/203

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
BH			0.0		SM	Silty SAND, brown, dry, loose		TOPSOIL
			0.5		CH	Sandy Silty CLAY, high plasticity, dark brown, fine sand, M=Wp, very stiff/hard	PP=>500kPa	RESIDUAL
			1.0		CL	Sandy CLAY, low to medium plasticity, brown, M<Wp, very stiff to hard	PP=>500kPa	
			1.5			SANDSTONE, highly weathered, pale brown		ROCK
			2.0			Borehole TP20 terminated at 1.6m		Bucket Refusal on Rock
			2.5					
			3.0					
			3.5					
			4.0					
			4.5					
			5.0					

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# TEST PIT NUMBER TP21

**CLIENT** McCloy Group **PROJECT NAME** Proposed Residential Subdivision  
**PROJECT NUMBER** HGS 1962 **PROJECT LOCATION** Ironbark Ridge Estate, Stages 2c & 3a, Muswellbrook

**DATE STARTED** 7/5/10 **COMPLETED** 7/5/10 **R.L. SURFACE** \_\_\_\_\_ **DATUM** \_\_\_\_\_  
**EXCAVATION CONTRACTOR** \_\_\_\_\_ **SLOPE** --- **BEARING** ---  
**EQUIPMENT** 1H1 50NX Excavator **TEST PIT LOCATION** Refer to Site Plan Drawing HGS 1962-01  
**TEST PIT SIZE** 450mm **LOGGED BY** T.C. **CHECKED BY** G.P.

**NOTES** Rear of Lot 201

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
BH			0.0		SM	Silty SAND, brown, dry, loose	PP=500kPa	TOPSOIL
			0.1		CH	Silty CLAY, high plasticity, brown, M<Wp, very stiff		RESIDUAL
			0.5			SANDSTONE, highly weathered, pale brown with red brown mottling	ROCK with interbedded extremely weathered layers of Silty CLAY	
			1.0		CL-CH	Silty CLAY, medium to high plasticity, pale grey, M<Wp, very stiff		
			1.5			SANDSTONE, moderately weathered, pale grey / pale brown		
			2.0		CL-CH	Silty CLAY, medium to high plasticity, pale grey, M<Wp, very stiff		
			2.5			SANDSTONE, moderately weathered, pale grey / pale brown		Iss=1.9%
3.0			SILTSTONE, highly weathered, pale grey with pale brown mottling					
3.1			Borehole TP21 terminated at 3.1m					
			3.5					
			4.0					
			4.5					
			5.0					

BOREHOLE / TEST PIT HGS 1962.GPJ GINT STD AUSTRALIA.GDT 21/7/10



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# TEST PIT NUMBER TP22

CLIENT McCloy Group PROJECT NAME Proposed Residential Subdivision  
 PROJECT NUMBER HGS 1962 PROJECT LOCATION Ironbark Ridge Estate, Stages 2c & 3a, Muswellbrook

DATE STARTED 7/5/10 COMPLETED 7/5/10 R.L. SURFACE \_\_\_\_\_ DATUM \_\_\_\_\_  
 EXCAVATION CONTRACTOR \_\_\_\_\_ SLOPE --- BEARING ---  
 EQUIPMENT 1H1 50NX Excavator TEST PIT LOCATION Refer to Site Plan Drawing HGS 1962-01  
 TEST PIT SIZE 450mm LOGGED BY T.C. CHECKED BY G.P.

NOTES Front of Lots 201/202

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
BH			0.5		SM	Silty SAND, brown, dry, loose		TOPSOIL
					CL-CH	Sandy Silty CLAY, medium to high plasticity, red brown, M<Wp, very stiff	PP=400 - 500kPa	RESIDUAL
						SANDSTONE, highly weathered, pale brown / pale grey		ROCK
			1.0			Borehole TP22 terminated at 0.8m		Bucket Refusal on Rock
			1.5					
			2.0					
			2.5					
			3.0					
			3.5					
			4.0					
			4.5					
			5.0					



# General Notes Terms and Symbols

## GENERAL

Geotechnical reports present the results of investigations carried out for a specific project and usually for a specific phase of the project (e.g. preliminary design). The report may not be relevant for other phases of the project (e.g. construction), or where projects details change.

## SOIL AND ROCK DESCRIPTIONS

Soil and rock descriptions are based on AS 1726-1993, using visual and tactile assessment except at discrete locations where field and / or laboratory tests have been carried out. Refer opposite for term and symbol definitions.

## GROUNDWATER

The water levels indicated on the logs are taken at the time of measurement and depending on material permeability may not reflect the actual groundwater level at those specific locations. Also, groundwater levels can vary with time due to seasonal or tidal fluctuations and construction activities.

## INTERPRETATION OF RESULTS

The discussion and recommendations in the accompanying report are based on extrapolation / interpolation from data obtained at discrete locations. The actual interface between the materials may be far more gradual or abrupt than indicated. Also, actual conditions in areas not sampled may differ from those predicted.

## CHANGE IN CONDITIONS

Subsurface conditions can change with time and can vary between test locations. Construction operations at or adjacent to the site and natural events such as floods, earthquakes or groundwater fluctuations can also affect subsurface conditions.

## REPRODUCTION OF REPORTS

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## FURTHER ADVICE

We would be pleased to further discuss how any of the above issues could affect your specific project. We would also be please to provide further advice or assistance including.

- Assessment of suitability of design and construction techniques;
- Contract documentation and specification;
- Construction control testing (earthworks, pavement materials, concrete);
- Construction advice (foundation assessments, excavation support).

## SOIL DESCRIPTIONS

Consistency		Qu (kPa)	Density Index		I <sub>D</sub> (%)
VS	Very Soft	<25	VL	Very Loose	< 15
S	Soft	25 – 50	L	Loose	15 – 35
F	Firm	50 – 100	MD	Medium Dense	35 – 65
St	Stiff	100 – 200	D	Dense	65 – 85
VSt	Very Stiff	200 – 400	VD	Very Dense	> 85
H	Hard	>400			
Fb	Friable	- -			

Moisture Condition					
D	Dry	M	Moist	W	Wet
W <sub>p</sub>	Plastic Limit	WL	Liquid Limit		

## ROCK DESCRIPTIONS

Weathering		Structure	Spacing
RS	Residual Soil	Thinly laminated	< 6 mm
XW	Extremely Weathered	Laminated	6 – 20 mm
HW	Highly Weathered	Very Thinly bedded	20 – 60 mm
MW	Moderately Weathered	Thinly bedded	60 – 200 mm
DW	Distinctly Weathered*	Medium bedded	0.2 – 0.6 m
SW	Slightly Weathered	Thickly bedded	0.6 – 2m
FR	Fresh	Very thickly bedded	> 2 m

\*DW covers HW & MW

Strength	I <sub>s(50)</sub> Mpa	
EL	Extremely Low	< 0.03
VL	Very Low	0.03 – 0.1
L	Low	0.1 – 0.3
M	Medium	0.3 – 1
H	High	1 – 3
VH	Very High	3 – 10
EH	Extremely High	> 10

X = diametral test  
O = axial test

Natural Fractures			
Type	Shape	Infill / Coating	Roughness
JT	Joint	pl planar	pol polished
BP	Bedding plane	cu curved	slk slickensided
SM	Seam	un undulose	smo smooth
FZ	fractured zone	st stepped	rou rough
SZ	Shear zone	ir irregular	vro very rough
VN	Vein	dis discontinuous	
		mi micaceous	
		qz quartz	

Note: Soil and rock descriptions are based on AS 1726 – 1993.

## EXCAVATION / DRILLING METHOD & CASING

BH	Backhoe / excavator bucket
NE	Natural exposure
HE	Hand excavation
AS	Auger screwing*
AD	Auger drilling*
	* bit type shown by suffix
	V = 'V' shaped Bit
	T = Tungsten carbide Bit
	B = Blank Bit
R	Roller / Tricone
W	Washbore
NMLC	NMLC size core drilling
NQ/HQ	Wireline core drilling
C	Casing
M	Mud

## SAMPLES / TESTS & WATER MEASUREMENTS

B	Bulk sample
D	Disturbed sample
U50	Undisturbed sample $\phi$ 50mm
PP	Pocket penetrometer (kPa)
SV	Shear vane test (kPa)
SPT	Standard penetration test
N*	SPT value (blows/300mm)
	* Denotes sample taken
Nc	SPT value with solid cone
DCP	Dynamic cone penetrometer (blows/150mm)
R	Refusal of SPT or DCP
▼	Water Level during drilling
▽	Water Level after drilling
▲-	Water Inflow
-▲	Water Outflow

## **APPENDIX B**

### **Laboratory Test Results**

Shrink Swell Index Report Nos: S1962-01 to S1962-04

CBR Report Nos: S1962-05 to S1962-09



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## SHRINK SWELL INDEX TEST REPORT (Australian Standard 1289.7.1.1)

<b>CLIENT:</b>	McCloy Group	<b>REPORT No:</b>	S1962-01
<b>CLIENT ADDRESS:</b>	PO Box 2214, Dangar NSW 2309	<b>PROJECT No:</b>	HGS 1962
<b>PROJECT:</b>	Site Classifications	<b>DATE OF REPORT:</b>	26/05/2010
<b>DATE OF TESTING:</b>	10, 11 & 18/05/2010	<b>TECHNICIAN:</b>	T.C.
<b>LOCATION:</b>	Ironbark Ridge Estate, Stages 2c & 3a, Muswellbrook		

Sample Number:	2	3	4
Sample Location	TP1	TP3	TP3
Date Sampled	6/05/2010	6/05/2010	6/05/2010
Date Tested	11/05/2010	10/05/2010	18/05/2010
Sample Description	Pale Grey with Orange Mottling Silty Clay	Brown Silty Clay	Dark Grey Black Silty Clay
Depth	1.1 - 1.3m	0.2 - 0.4m	1.2 - 1.4m
<b>Test Procedure</b>			
Shrink Specimen			
Moisture Content (Field) % AS1289.2.1.1	18.1	23.2	16.9
Swell Specimen			
Moisture Content (Before & After) % AS1289.2.1.1	18.3 / 24.5	24.9 / 28.8	17.9 / 26.7
Maximum Swell (Esw) % AS1289.7.1.1	2.1	3.5	1.7
Maximum Shrink (Esh) % As1289.7.1.1	2.9	6.0	4.0
Shrink Swell Index (Iss) %	2.2	4.3	2.7
Cracking :	Minor	None	Moderate - High
Crumbling:	None	None	Very Low
% Inert Inclusions:	<10	<10	<10
Sampled By:	Hunter Geotechnics	Hunter Geotechnics	Hunter Geotechnics

### Remarks

Samples Remoulded

Sample 2 - +2% Moisture Added

Sample 4 - +4% Moisture Added

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Approved Signatory

P Deasy

R-T12

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30-Jul-09



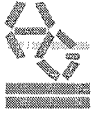
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## SHRINK SWELL INDEX TEST REPORT

(Australian Standard 1289.7.1.1)

**CLIENT:** McCloy Group **REPORT No:** S1962-02  
**CLIENT ADDRESS:** PO Box 2214, Dangar NSW 2309  
**PROJECT:** Site Classifications **PROJECT No:** HGS 1962  
**DATE OF TESTING:** 10 & 11/05/2010 **DATE OF REPORT:** 26/05/2010  
**LOCATION:** Ironbark Ridge Estate, Stages 2c & 3a, Muswellbrook **TECHNICIAN:** T.C.

Sample Number:	5	6	7
Sample Location	TP4	TP7	TP10
Date Sampled	6/05/2010	6/05/2010	6/05/2010
Date Tested	11/05/2010	10/05/2010	11/05/2010
Sample Description	Pale Grey with Pale Brown Mottling Sandy Clay	Pale Brown Dark Grey Silty Clay	Pale Grey Pale Brown with pale Orange Mottling Silty Clay
Depth	0.8 - 1.0m	1.3 - 1.5m	1.1 - 1.3m
<b>Test Procedure</b>			
Shrink Specimen			
Moisture Content (Field) % AS1289.2.1.1	9.0	18.3	19.6
Swell Specimen			
Moisture Content (Before & After) % AS1289.2.1.1	9.3 / 16.8	18.3 / 23.3	19.7 / 29.8
Maximum Swell (Esw) % AS1289.7.1.1	1.4	5.8	2.2
Maximum Shrink (Esh) % As1289.7.1.1	1.6	3.8	2.2
Shrink Swell Index (Iss) %	1.3	3.7	1.8
Cracking :	None	None	Moderate
Crumbling:	Minor	Moderate	Moderate - High
% Inert Inclusions:	<15	<10	<10
Sampled By:	Hunter Geotechnics	Hunter Geotechnics	Hunter Geotechnics

### Remarks

Samples Remoulded

Sample 5 - +4% Moisture Added

Sample 7 - +4% Moisture Added

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**SHRINK SWELL INDEX TEST REPORT****(Australian Standard 1289.7.1.1)**

**CLIENT:** McCloy Group **REPORT No:** S1962-03  
**CLIENT ADDRESS:** PO Box 2214, Dangar NSW 2309  
**PROJECT:** Site Classifications **PROJECT No:** HGS 1962  
**DATE OF TESTING:** 18 & 20/05/2010 **DATE OF REPORT:** 26/05/2010  
**LOCATION:** Ironbark Ridge Estate, Stages 2c & 3a, Muswellbrook **TECHNICIAN:** T.C.

Sample Number:	8	10	12
Sample Location	TP11	TP14	TP18
Date Sampled	6/05/2010	6/05/2010	6/05/2010
Date Tested	18/05/2010	20/05/2010	20/05/2010
Sample Description	Red Brown Silty Sandy Clay, trace Gravel	Pale Brown ith Grey Red Brown Mottling Silty Clay	Grey Dark Grey Silty Clay
Depth	1.4 - 1.6m	1.3 - 1.5m	2.5 - 2.8m
<b>Test Procedure</b>			
Shrink Specimen			
Moisture Content (Field) % AS1289.2.1.1	15.9	15.8	21.6
Swell Specimen			
Moisture Content (Before & After) % AS1289.2.1.1	17.0 / 22.8	16.8 / 24.1	23.4 / 33.8
Maximum Swell (Esw) % AS1289.7.1.1	1.6	6.2	12.6
Maximum Shrink (Esh) % As1289.7.1.1	3.2	3.2	5.6
Shrink Swell Index (Iss) %	2.2	3.5	6.6
Cracking :	High	Moderate	Low
Crumbling:	Low - Moderate	Very Low	Very Low
% Inert Inclusions:	<15	<10	<5
Sampled By:	Hunter Geotechnics	Hunter Geotechnics	Hunter Geotechnics

**Remarks**

Samples Remoulded

Sample 8 - +2% Moisture Added

Sample 10 - +2% Moisture Added

Sample 12 - +2% Moisture Added

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## SHRINK SWELL INDEX TEST REPORT

(Australian Standard 1289.7.1.1)

**CLIENT:** McCloy Group  
**CLIENT ADDRESS:** PO Box 2214, Dangar NSW 2309  
**PROJECT:** Site Classifications  
**DATE OF TESTING:** 11/05/2010  
**LOCATION:** Ironbark Ridge Estate, Stages 2c & 3a, Muswellbrook

**REPORT No:** S1962-04  
**PROJECT No:** HGS 1962  
**DATE OF REPORT:** 26/05/2010  
**TECHNICIAN:** T.C.

Sample Number:	13		
Sample Location	TP21		
Date Sampled	6/05/2010		
Date Tested	11/05/2010		
Sample Description	Pale Grey Silty Clay		
Depth	2.5 - 2.7m		
<b>Test Procedure</b>			
Shrink Specimen			
Moisture Content (Field) %	18.3		
AS1289.2.1.1			
Swell Specimen			
Moisture Content (Before & After) %	18.6 / 23.9		
AS1289.2.1.1			
Maximum Swell (Esw) %	2.4		
AS1289.7.1.1			
Maximum Shrink (Esh) %	2.2		
As1289.7.1.1			
Shrink Swell Index (Iss) %	1.9		
Cracking :	Minor		
Crumbling:	Moderate		
% Inert Inclusions:	<10		
Sampled By:	Hunter Geotechnics		

### Remarks

Samples Remoulded

Sample 13 - +2% Moisture Added

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## CALIFORNIA BEARING RATIO REPORT SHEET

Singleton Laboratory   
Accredited Lab 14490

Tamworth Laboratory   
Accredited Lab 12360

Annexe Laboratory   
Recognition No: 18325  
Attached to Singleton Laboratory  
Location: Mangoola

<b>CLIENT:</b>	McCloy Group	<b>REPORT NO:</b>	S1962-05
<b>CLIENT ADDRESS:</b>	PO Box 2214, Dangar NSW 2309		
<b>PROJECT:</b>	Proposed New Subdivision	<b>PROJECT NO:</b>	HGS 1962
<b>DATE OF TESTING:</b>	17/05/2010	<b>DATE OF REPORT:</b>	26/05/2010
<b>TECHNICIAN:</b>	D.M.	<b>DATE SAMPLED:</b>	6/05/2010
<b>SITE LOCATION:</b>	Ironbark Ridge Estate, Stages 2c & 3a, Muswellbrook		

### SAMPLE DATA

<b>Sample Number</b>	1
<b>Test Location Layer</b>	TP1 - 0.5-0.7m
<b>Material Description</b>	Mottled Orange Brown Silty Clay

Sample Method: AS 1289.1.2.1

- Clause:  Sampling - Stockpile  
 Sampling - Windrow  
 Sampling - Pavement or Earthworks Layers  
 Sampling - Hander Auger

### LABORATORY COMPACTION DATA

#### Australian Standards

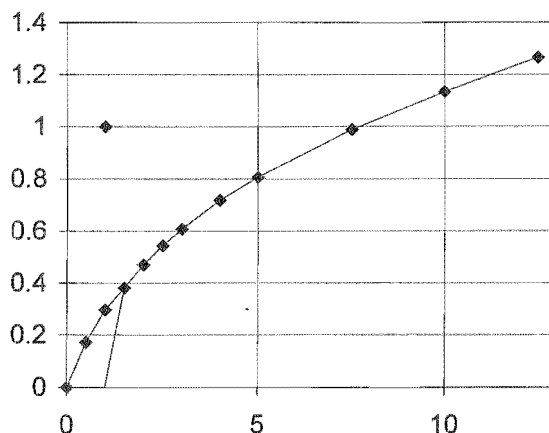
- AS1289.5.1.1 - Standard Compaction  
 AS1289.5.2.1 - Modified Compaction  
 AS1289.2.1.1 - Moisture Content - Oven

#### RTA Methods

- RTA T111 - Standard Compaction  
 RTA T112 - Modified Compaction  
 RTA T120 - Moisture Content - Oven

<b>Maximum Dry Density</b>	t/m <sup>3</sup>	1.65
<b>Optimum Moisture Content</b>	%	20.1
<b>Field Moisture Content</b>	%	15.2

### CBR Curve



### CALIFORNIA BEARING RATIO TEST RESULTS

- AS1289.6.1.1  RTA T117

<b>Dry Density (Before soaking)</b>	t/m <sup>3</sup>	1.64
<b>Density Ratio (Before soaking)</b>	%	99
<b>Moisture Content (Before soaking)</b>	%	20.0
<b>Moisture Ratio (Before soaking)</b>	%	100
<b>Days Soaked</b>		4
<b>Surcharge Weight</b>	kg	9
<b>Swell (After soaking)</b>	%	2.0
<b>Dry Density (After soaking)</b>	t/m <sup>3</sup>	1.61
<b>Density Ratio (After soaking)</b>	%	97
<b>Moisture Content (Top 30mm)</b>	%	25.2
<b>Moisture Content (Remaining Sample)</b>	%	22.7
<b>CBR Value @ 2.5 /5.0mm Penetration</b>	%	<b>4.0/4.0</b>

Sampled By: HG - Singleton

Tested By: HG - Singleton

Comments: oversize retained on the 19mm sieve was not included in CBR test samples

Material retained on AS 19.0mm sieve % 2.2

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## CALIFORNIA BEARING RATIO REPORT SHEET

Singleton Laboratory   
Accredited Lab 14490

Tamworth Laboratory   
Accredited Lab 12360

Annexe Laboratory   
Recognition No: 18325  
Attached to Singleton Laboratory  
Location: Mangoola

<b>CLIENT:</b>	McCloy Group	<b>REPORT NO:</b>	S1962-06
<b>CLIENT ADDRESS:</b>	PO Box 2214, Dangar NSW 2309		
<b>PROJECT:</b>	Proposed New Subdivision	<b>PROJECT NO:</b>	HGS 1962
<b>DATE OF TESTING:</b>	17/05/2010	<b>DATE OF REPORT:</b>	26/05/2010
<b>TECHNICIAN:</b>	D.M.	<b>DATE SAMPLED:</b>	6/05/2010
<b>SITE LOCATION:</b>	Ironbark Ridge Estate, Stages 2c & 3a, Muswellbrook		

### SAMPLE DATA

<b>Sample Number</b>	9
<b>Test Location Layer</b>	TP 13 - 0.4-0.6m
<b>Material Description</b>	Dark Brown Silty Clay

Sample Method: AS 1289.1.2.1

- Clause:  Sampling - Stockpile  
 Sampling - Windrow  
 Sampling - Pavement or Earthworks Layers  
 Sampling - Hander Auger

### LABORATORY COMPACTION DATA

#### Australian Standards

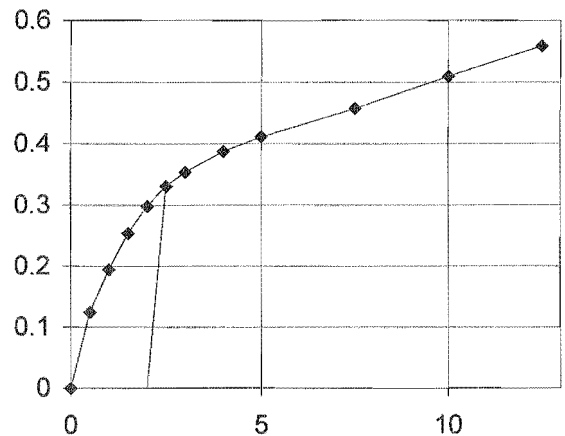
- AS1289.5.1.1 - Standard Compaction  
 AS1289.5.2.1 - Modified Compaction  
 AS1289.2.1.1 - Moisture Content - Oven

#### RTA Methods

- RTA T111 - Standard Compaction  
 RTA T112 - Modified Compaction  
 RTA T120 - Moisture Content - Oven

<b>Maximum Dry Density</b>	t/m <sup>3</sup>	1.52
<b>Optimum Moisture Content</b>	%	25.2
<b>Field Moisture Content</b>	%	20.4

### CBR Curve



### CALIFORNIA BEARING RATIO TEST RESULTS

- AS1289.6.1.1  RTA T117

<b>Dry Density (Before soaking)</b>	t/m <sup>3</sup>	1.50
<b>Density Ratio (Before soaking)</b>	%	99
<b>Moisture Content (Before soaking)</b>	%	25.2
<b>Moisture Ratio (Before soaking)</b>	%	100
<b>Days Soaked</b>		4
<b>Surcharge Weight</b>	kg	9
<b>Swell (After soaking)</b>	%	1.5
<b>Dry Density (After soaking)</b>	t/m <sup>3</sup>	1.48
<b>Density Ratio (After soaking)</b>	%	97
<b>Moisture Content (Top 30mm)</b>	%	33.9
<b>Moisture Content (Remaining Sample)</b>	%	29.8
<b>CBR Value @ 2.5 /5.0mm Penetration</b>	%	<b>2.5/2.0</b>

Sampled By: HG - Singleton

Tested By: HG - Singleton

Comments: oversize retained on the 19mm sieve was not included in CBR test samples

Material retained on AS 19.0mm sieve % Nil

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# Hunter Geotechnics Pty Limited

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Unit 1/22 Macintosh St, (PO Box 3475) Tamworth 2340, ph 02 6762 67123 fx 02 6762 7124

## CALIFORNIA BEARING RATIO REPORT SHEET

Singleton Laboratory   
Accredited Lab 14490

Tamworth Laboratory   
Accredited Lab 12360

Annexe Laboratory   
Recognition No: 18325  
Attached to Singleton Laboratory  
Location: Mangoola

<b>CLIENT:</b>	McCloy Group	<b>REPORT NO:</b>	S1962-07
<b>CLIENT ADDRESS:</b>	PO Box 2214, Dangar NSW 2309		
<b>PROJECT:</b>	Proposed New Subdivision	<b>PROJECT NO:</b>	HGS 1962
<b>DATE OF TESTING:</b>	17/05/2010	<b>DATE OF REPORT:</b>	26/05/2010
<b>TECHNICIAN:</b>	D.M.	<b>DATE SAMPLED:</b>	6/05/2010
<b>SITE LOCATION:</b>	Ironbark Ridge Estate, Stages 2c & 3a, Muswellbrook		

### SAMPLE DATA

<b>Sample Number</b>	11
<b>Test Location</b>	TP 17 - 0.4-0.6m
<b>Layer</b>	
<b>Material Description</b>	Dark Brown Silty Clay

Sample Method: AS 1289.1.2.1

- Clause:  Sampling - Stockpile  
 Sampling - Windrow  
 Sampling - Pavement or Earthworks Layers  
 Sampling - Hander Auger

### LABORATORY COMPACTION DATA

#### Australian Standards

- AS1289.5.1.1 - Standard Compaction  
 AS1289.5.2.1 - Modified Compaction  
 AS1289.2.1.1 - Moisture Content - Oven

#### RTA Methods

- RTA T111 - Standard Compaction  
 RTA T112 - Modified Compaction  
 RTA T120 - Moisture Content - Oven

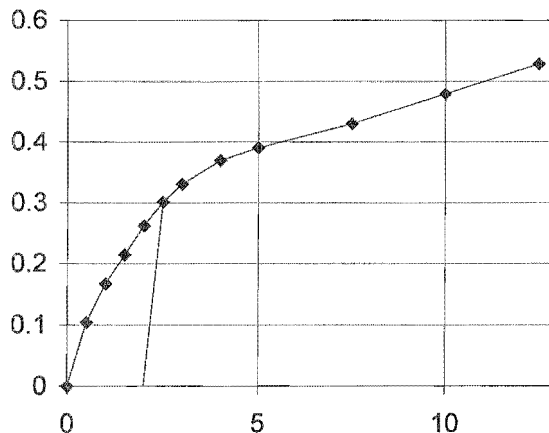
<b>Maximum Dry Density</b>	t/m <sup>3</sup>	1.45
<b>Optimum Moisture Content</b>	%	28.2
<b>Field Moisture Content</b>	%	23.3

### CALIFORNIA BEARING RATIO TEST RESULTS

- AS1289.6.1.1  RTA T117

<b>Dry Density (Before soaking)</b>	t/m <sup>3</sup>	1.44
<b>Density Ratio (Before soaking)</b>	%	99
<b>Moisture Content (Before soaking)</b>	%	28.2
<b>Moisture Ratio (Before soaking)</b>	%	100
<b>Days Soaked</b>		4
<b>Surcharge Weight</b>	kg	9
<b>Swell (After soaking)</b>	%	1.5
<b>Dry Density (After soaking)</b>	t/m <sup>3</sup>	1.42
<b>Density Ratio (After soaking)</b>	%	98
<b>Moisture Content (Top 30mm)</b>	%	39.2
<b>Moisture Content (Remaining Sample)</b>	%	33.0
<b>CBR Value @ 2.5 /5.0mm Penetration</b>	%	2.5/2.0

CBR Curve



Sampled By: HG - Singleton

Tested By: HG - Singleton

Comments: oversize retained on the 19mm sieve was not included in CBR test samples

Material retained on AS 19.0mm sieve % Nil

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This document is issued in accordance with NATA's accreditation requirements. The results of the tests, calibrations and/or measurements included in this document are traceable to Australian / national standards. Accredited for compliance with ISO/IEC 17025.

Signed:   
Approved Signatory

Signatory Name: P Deasy

Document ID: R-T22

Issue No: 7

Date of Issue: 30-Jul-09



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Accredited Lab 12360

Annexe Laboratory   
Recognition No: 18325  
Attached to Singleton Laboratory  
Location: Mangoola

<b>CLIENT:</b>	McCloy Group	<b>REPORT NO:</b>	S1962-08
<b>CLIENT ADDRESS:</b>	PO Box 2214, Dangar NSW 2309		
<b>PROJECT:</b>	Proposed New Subdivision	<b>PROJECT NO:</b>	HGS 1962
<b>DATE OF TESTING:</b>	14/06/2010	<b>DATE OF REPORT:</b>	17/06/2010
<b>TECHNICIAN:</b>	J.M.	<b>DATE SAMPLED:</b>	6/05/2010
<b>SITE LOCATION:</b>	Ironbark Ridge Estate, Stages 2c & 3a, Muswellbrook		

### SAMPLE DATA

<b>Sample Number</b>	I
<b>Test Location</b>	TP1 - 0.5-0.7m
<b>Layer</b>	
<b>Material Description</b>	Mottled Orange Brown Silty Clay + 3% Lime

Sample Method: AS 1289.1.2.1

- Clause:  Sampling - Stockpile  
 Sampling - Windrow  
 Sampling - Pavement or Earthworks Layers  
 Sampling - Hander Auger

### LABORATORY COMPACTION DATA

#### Australian Standards

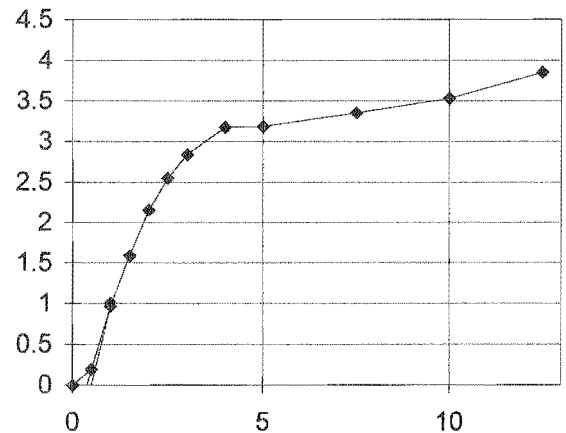
- AS1289.5.1.1 - Standard Compaction  
 AS1289.5.2.1 - Modified Compaction  
 AS1289.2.1.1 - Moisture Content - Oven

#### RTA Methods

- RTA T111 - Standard Compaction  
 RTA T112 - Modified Compaction  
 RTA T120 - Moisture Content - Oven

<b>Maximum Dry Density</b>	t/m <sup>3</sup>	1.65
<b>Optimum Moisture Content</b>	%	20.1
<b>Field Moisture Content</b>	%	14.8

### CBR Curve



### CALIFORNIA BEARING RATIO TEST RESULTS

- AS1289.6.1.1  RTA T117

<b>Dry Density (Before soaking)</b>	t/m <sup>3</sup>	1.63
<b>Density Ratio (Before soaking)</b>	%	99
<b>Moisture Content (Before soaking)</b>	%	19.8
<b>Moisture Ratio (Before soaking)</b>	%	99
<b>Days Soaked</b>		4
<b>Surcharge Weight</b>	kg	9
<b>Swell (After soaking)</b>	%	1.0
<b>Dry Density (After soaking)</b>	t/m <sup>3</sup>	1.62
<b>Density Ratio (After soaking)</b>	%	98
<b>Moisture Content (Top 30mm)</b>	%	26.8
<b>Moisture Content (Remaining Sample)</b>	%	23.8
<b>CBR Value @ 2.5 /5.0mm Penetration</b>	%	<b>19/16</b>

Sampled By: HG - Singleton

Tested By: HG - Singleton

Comments: oversize retained on the 19mm sieve was not included in CBR test samples

Material retained on AS 19.0mm sieve % 2.2

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Approved Signatory

Signatory Name: P Deasy

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Annexe Laboratory   
Recognition No: 18325  
Attached to Singleton Laboratory  
Location: Mangoola

<b>CLIENT:</b>	McCloy Group	<b>REPORT NO:</b>	S1962-09
<b>CLIENT ADDRESS:</b>	PO Box 2214, Dangar NSW 2309		
<b>PROJECT:</b>	Proposed New Subdivision	<b>PROJECT NO:</b>	HGS 1962
<b>DATE OF TESTING:</b>	14/06/2010	<b>DATE OF REPORT:</b>	17/06/2010
<b>TECHNICIAN:</b>	J.B.	<b>DATE SAMPLED:</b>	6/05/2010
<b>SITE LOCATION:</b>	Ironbark Ridge Estate, Stages 2c & 3a, Muswellbrook		

### SAMPLE DATA

<b>Sample Number</b>	11
<b>Test Location Layer</b>	TP 17 - 0.4-0.6m
<b>Material Description</b>	Dark Brown Silty Clay + 3% Lime

Sample Method: AS 1289.1.2.1

- Clause:  Sampling - Stockpile  
 Sampling - Windrow  
 Sampling - Pavement or Earthworks Layers  
 Sampling - Hander Auger

### LABORATORY COMPACTION DATA

#### Australian Standards

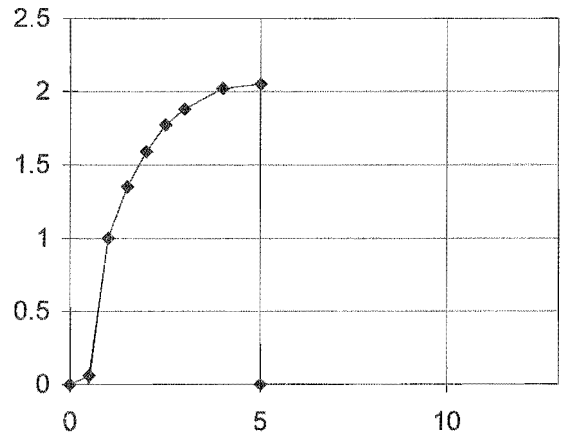
- AS1289.5.1.1 - Standard Compaction  
 AS1289.5.2.1 - Modified Compaction  
 AS1289.2.1.1 - Moisture Content - Oven

#### RTA Methods

- RTA T111 - Standard Compaction  
 RTA T112 - Modified Compaction  
 RTA T120 - Moisture Content - Oven

<b>Maximum Dry Density</b>	t/m <sup>3</sup>	1.45
<b>Optimum Moisture Content</b>	%	28.2
<b>Field Moisture Content</b>	%	22.6

### CBR Curve



### CALIFORNIA BEARING RATIO TEST RESULTS

- AS1289.6.1.1  RTA T117

<b>Dry Density (Before soaking)</b>	t/m <sup>3</sup>	1.42
<b>Density Ratio (Before soaking)</b>	%	98
<b>Moisture Content (Before soaking)</b>	%	28.1
<b>Moisture Ratio (Before soaking)</b>	%	100
<b>Days Soaked</b>		4
<b>Surcharge Weight</b>	kg	9
<b>Swell (After soaking)</b>	%	2.7
<b>Dry Density (After soaking)</b>	t/m <sup>3</sup>	1.38
<b>Density Ratio (After soaking)</b>	%	95
<b>Moisture Content (Top 30mm)</b>	%	39.5
<b>Moisture Content (Remaining Sample)</b>	%	33.6
<b>CBR Value @ 2.5 /5.0mm Penetration</b>	%	<b>13/10</b>

Sampled By: HG - Singleton

Tested By: HG - Singleton

Comments: oversize retained on the 19mm sieve was not included in CBR test samples

Material retained on AS 19.0mm sieve % Nil

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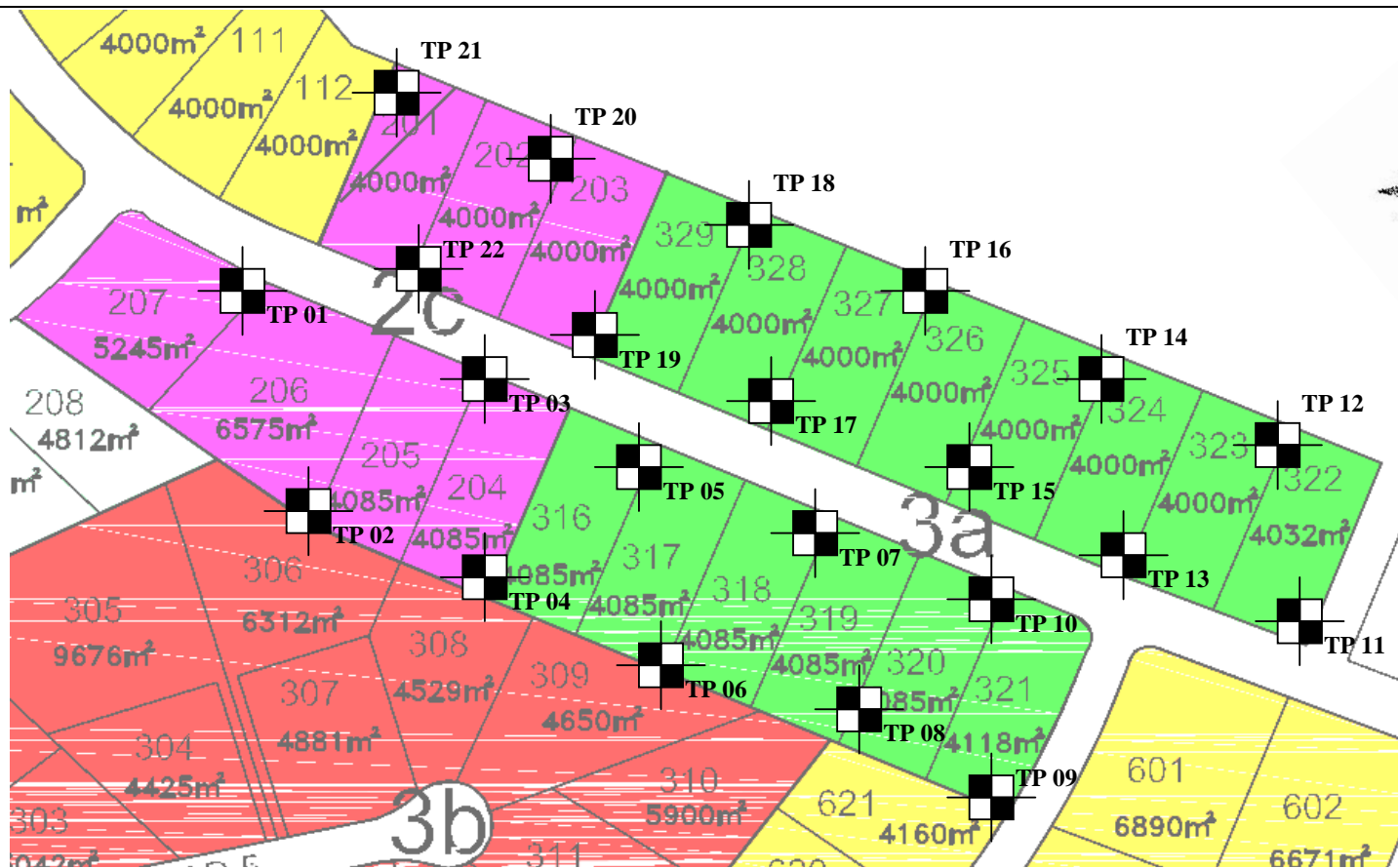
Signed:   
Approved Signatory

Signatory Name: P Deasy

Document ID: R-T22

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**Legend**  
 Approximate Test Pit Location 



**Hunter Geotechnics Pty Ltd**  
 ABN: 80 088 399 124  
 Unit 2/8 Mathry Close  
 PO Box 3003  
 Singleton NSW 2330  
 Ph: 02 65721234  
 Fax: 02 65721572

**Drawing No:**  
HGS 1962-01

**Scale:**  
NTS

**Drawn By:**  
A.C.

**Date:**  
May 2010

**McCloy Group**

Ironbark Ridge Estate  
 Stages 2c & 3a  
 Muswellbrook

**SITE PLAN**