Geotechnical investigation and road pavement design

The intersection of Nymagee Street and Nyngan Street on Nymagee-Hermidale Road, Hermidale NSW

Ref: R14212-2.1g
Date: 23 May 2014

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Date: 23 May 2014

Report Number: R14212-2.1g

Contents

1. Introduction

The Hera-Nymagee Project is a mine located approximately 4km south of the village of Nymagee and approximately 80km southwest Hermidale, NSW. Mine concentrate from Hera-Nymagee Project is required to be transported by road to Hermidale siding.

The proposed haulage route from Hera-Nymagee Project to Hermidale Siding utilises Nymagee-Hermidale Road including the Nymagee Street and Nyngan Street intersection at Hermidale NSW.

A geotechnical assessment and pavement condition review is required for the Nymagee Street and Nyngan Street intersection at Hermidale NSW. The assessment is required as part of an amendment to the environmental assessment.

2. Objectives

Envirowest Consulting Pty Ltd was commissioned by Geolyse Pty Ltd on behalf of YTC Resources to undertake road pavement geotechnical investigation at the Hermidale Street and Nyngan Street intersection at Hermidale NSW.

The investigation is required to satisfy the Department of Planning and Infrastructure approval of the haulage route conditions. The investigation objective is assessment of the intersection condition and upgrade recommendations. The assessment includes appropriate upgrade and pavement repair recommendations to ensure that the roads and intersection comply with applicable AUSTROADS standards taking into account the type, volume and direction of mine-related traffic.

3. Site location

The site is located at the Nymagee Street and Nyngan Street intersection on Nymagee-Hermidale Road, Hermidale NSW.

4. General site description

The site is an existing sealed pavement intersection. The intersection primarily contains concrete curbing and guttering with a section of unsealed shoulder to the north.

5. Site condition and environment

5.1 Surface cover

The surface cover on the intersection was densely graded bitumen seal with granite aggregate and sub angular alluvial gravel. The surface cover adjacent to the road was gravel, lawn grasses, pasture grasses and weeds.

5.2 Topography

The site is located on a flat with a southern aspect and a gentle inclination of 4-5%.

5.3 Soils and geology

Natural soils from the boreholes were moist clayey sand, gravelly clayey sand and sandy clay with colour ranging from red to yellowish red. Subsoils have low plasticity and medium density. Quartz gravel were commonly encountered in the profile. The consistency of the subsoil was stiff to very stiff.

The Hermidale region contains a wide range of soil types. Sands, sandy earths, yellow and red earth soils are dominant in the upland areas. The footslopes and lower areas are predominantly colluvial and aeolian (wind deposited) sediments with alluvial sediments associated along streams (Brunker 1967).

The geology on the site is the Cobar Group slate, shale, sandstone and greywacke overlain by quaternary alluvium (Brunker 1967).

5.4 Surface water and groundwater

Surface water and groundwater generally flows south into the concrete gutters and the local stormwater system.

6. Investigation methods

A site inspection and field assessment was conducted on 1 May 2014.

The surface of the pavement area was described and failures identified.

Two boreholes (BH1 to BH2) were constructed up to a depth of 1.5m in different areas of the intersection and sampling undertaken to determine soil engineering properties. The boreholes were constructed with a truck mounted EVH auger drill. The profile of each borehole was described along with moisture, consistency, density, plasticity and rock strength.

The soil was investigated for pavement factors at the two locations in the area of the intersection. Soil was bored to a depth of 1.5m and samples collected from the design subgrade depth. The California Bearing Ratio (CBR) was determined on the samples by the 4 day soak method. The CBR parameter was used in pavement design. Dynamic cone penetrometer (DCP) tests were undertaken adjacent to the CBR boreholes to confirm the soil strength.

Samples were collected from the boreholes for laboratory analysis of liquid limit, plastic limit and plastic index to assess the shrink swell properties of the subgrade.

Pavement design recommendations were made using Austroads guidelines.

The sampling locations and the tests undertaken are given in Table 1 and Figure 2.

Soil sampling was undertaken according to the Australian Standards 2870, by qualified field and laboratory personnel. Soil analysis was undertaken at the NATA accredited laboratory of Envirowest Testing Services.

Table 1. Sampling location and tests undertaken

Borehole (Figure 3)	Location (Figure 3)	Tests undertaken	Testing depths (m)	Investigation total depth (m)
Borehole 1	Northeast corner of intersection	Soil properties description	0 to 1.5	1.5
		DCP	0 to 0.9	
		Index tests	0.8	
		CBR (S14-274)	0.1 to 0.9	
Borehole 2	Southwest corner of intersection	Soil properties description	0 to 1.5	1.5
		DCP	0 to 0.9	
		Index tests	0.8	
		CBR (S14-275)	0.1 to 0.9	

7. Results

7.1 Historical traffic movements

The historical traffic movements for the intersection are expected to be less than 1 x10^5 equivalent standard axles (ESA) per year with occasional heavy vehicle movement.

7.2 Existing pavement conditions

The existing intersection pavement was a densely graded granite aggregate bitumen seal with sub angular alluvial gravels. The bitumen seal was estimated to be 20mm in depth. The pavement wearing layer contained some minor cracking and deformation on the edges.

The intersection road shoulders were primarily concrete curbing and guttering with a section of unsealed shoulder to the north.

The base and subbase for the intersection was approximately 100mm sandy gravel material. Subgrade was natural clayey sand with gravels and sandy clay.

7.3 Soil profile and subsurface conditions

The soil in the area of the pavement contains dry to moist clayey sand, gravelly clayey sand and sandy clay to the drilling depth of 1.5m. Subsoils have low plasticity. Quartz gravels were encountered in the profile. The consistency of the subsoil was stiff to very stiff with moderate density.

7.4 Californian bearing ratio (CBR)

The CBR samples were collected from representative subgrade depths in the areas of the existing pavement.

The CBR for the samples analysed ranged from 3.5% to 4.5% (Table 2). The limiting CBR result is 3.5%. The CBR laboratory report is presented in Appendix 2.

Table 2. CBR test results

Borehole (Figure 3)	Location	Sample ID	Sampling depth (m)	Soil type	CBR(%)
1	Northeast corner of intersection	S14-274	0.1 to 0.9	CLAYEY SAND	4.0
2	Southwest corner of intersection	S14-275	0.1 to 0.9	CLAYEY SAND	3.5

7.5 Soil index tests

Soil on the site had a low linear shrinkage, liquid limit, plastic limit and plastic index (Table 3). The soil index properties laboratory report is presented in Appendix 4.

Table 3. Soil index test summary

Borehole (Figure 3)	Location	Depth (mm)	Soil description	Liquid limit (%)	Plastic limit (%)	Plastic index (%)	Linear shrinkage (%)
1	Northeast corner of intersection	800	CLAYEY SAND	40	24	16	7.5
2	Southwest corner of intersection	800	CLAYEY SAND	38	22	16	6.0

7.6 Dynamic cone penetrometer (DCP) tests

DCP test were undertaken in locations adjacent to the CBR boreholes to confirm the soil consistency.

The DCP results are outlined in Appendix 3. The DCP results indicate the soil consistency is very stiff to hard.

7.7 Groundwater and surface water

No groundwater was encountered in the boreholes. Surface water flows off the hard pavement on to road shoulders and concrete gutters. The main surface flow direction is south.

8. Recommendations

8.1 Existing pavement suitability

The existing pavement contains 100mm of road base and subbase and is not suitable to adequately manage the increased axle movements and vehicle loads at the intersection. Upgrade to the intersection is recommended.

8.2 Pavement upgrade design

8.2.1 Site preparation

The existing intersection pavement wearing layer, base and subbase requires stripping to a design subgrade level.

8.2.1 Subgrade preparation

Subgrade preparation should include:

- Adjust the in-situ moisture of the subgrade to within 2% of optimum moisture content.
- The exposed subgrade should be compacted to 98% of the dry density ratio. The exposed compacted surface should be rolled to detect soft spots.
- Any soft, weak or saturated material should be removed and replaced by suitable fill material and compacted in layers less than 150mm within 2% of optimum moisture content and to within 98% of the dry density ratio.
- All service trenches and other excavations should be backfilled with suitable material and compacted in layers less than 150mm within 2% of optimum moisture content and to within 98% of the dry density ratio.

8.2.2 Subgrade strength

The CBR samples were collected from the subgrade depth for the intersection upgrade.

The design subgrade (most limiting CBR result) strength is low with a limiting CBR of 3.5%. The subgrade is not expansive and has a low to moderate plasticity.

8.2.3 Pavement thickness

Pavements, based on information contained within the project brief, are expected to contain moderate heavy vehicle movement including loaded rigid trucks, semi-trailers, 36m Road Trains and B-Doubles.

Design Equivalent Standard Axles (DESA) for flexible pavement traffic is estimated to be $5x10^5$. The DESA takes into account the vehicle types, traffic frequency and traffic axles loading.
Recommended pavement parameters are outlined in Table 4.

Table 4. Flexible pavement parameters for traffic design of $5x10^5$ (CBR 3.5%)

Pavement parameter	**$5x10^5$ ESA**
Surface layer	75mm densely graded asphalt
Base	150mm granular material (DGB20 or equivalent)
Sub-base	300mm granular material (DGS40 or equivalent)
Total	450mm
Design subgrade CBR strength	3.5%

8.2.4 Pavement materials
Pavement materials shall be in accordance with Cobar Council engineering construction material requirements.

8.2.5 Road shoulders
Sealing of road shoulder to the north is recommended to minimise migration of water into the pavement layers and to provide structural support on the pavement edge. Road shoulders in other areas already contain concrete curbing and guttering.

8.2.6 Table drains
Roadside table drains should be constructed to the north to divert water from the pavement.

8.2.7 Extent of works
The extent of upgrade works is the intersection and immediate approaches.

8.3 Earthworks
Vegetation, topsoil and material containing organic matter should be removed prior to construction of the pavement areas. Wet material from low lying areas is not suitable for fill. The topsoil on the site is suitable for use in landscaping works.

The natural material on the site is suitable for use as engineered general fill. The fill should not contain material over 70mm diameter.

Soil should be compacted in layers less than 150mm and be compacted at optimum moisture content to a minimum standard compaction density ratio of 98% in accordance with AS3798.

8.4 Excavations
The natural material up to depths of 1.5m is not expected to pose an excavation limitation.

Shallow rock is known to occur in the area and may require the use of percussion hammer if encountered.

8.5 Fill
Suitable general fill material shall consist of gravelly clay with specifications in accordance with RTA QA Specification 3071.

8.6 Groundwater
No groundwater was encountered in the boreholes constructed on the site. Roadside table drains and sealed road shoulders are recommended in the northern section of the site to divert water and prevent seepage from entering the pavement courses.

8.7 Geotechnical testing

Pavement courses should be inspected by a suitably qualified person at the time of excavation and placement to confirm accordance with design parameters. The specification, execution and control testing of earthworks and site preparation should be undertaken according to AS3798.

Subgrade should be compacted to a minimum 98% of the dry density ratio and no deflection with an 8 tonne roller. Subbase and base courses should be compacted to a minimum 100% of the dry density ratio and no deflection with an 8 tonne roller.

Trenches should be compacted to a comparable condition as the surrounding ground.

Imported fill should be in accordance with AS3798. Type 1 earthworks frequency of field density tests is recommended (AS3798).

9. Limitations of the investigation

The engineering logs describe subsurface conditions only at a specific borehole location and inferred boundaries between geotechnical units may vary.

Ground conditions can vary over relatively short distances and it may be necessary to carry out additional investigations for specific excavation and building sites. Once specific proposals are known a geotechnical review should be undertaken and if necessary additional investigations commissioned to provide the level of information required for assessing design parameters. A geotechnical engineer should be engaged to review subsurface condition during construction stages to confirm that subsurface conditions are consistent with design assumptions.

This report has been prepared for the use of the client to achieve the objectives given the client requirements and cost constraints. The level of confidence of the conclusion reached is governed by the scope of the investigation and the availability and quality of existing data. Where limitations or uncertainties are known, they are identified in the report. No liability can be accepted for failure to identify conditions or issues which arise in the future and which could not reasonably have been predicted using the scope of the investigation and the information obtained.

The investigation identifies the actual subsurface conditions only at those points where samples are taken, when they are taken. Data derived through sampling and subsequent laboratory testing are interpreted by geologists, engineers or scientists who then render an opinion about overall subsurface conditions, the nature and extent of the investigation and its likely impact on the proposed new roads. Actual conditions may differ from those inferred to exist, because no professional, no matter how well qualified, and no sub surface exploration program, no matter how comprehensive, can reveal what is hidden by earth, rock or time. The actual interface between materials may be far more gradual or abrupt than a report indicates. Actual conditions in areas not sampled may differ from predictions. It is thus import to understand the limitations of the investigation and recognise that Envirowest Consulting Pty Ltd are not responsible for these limitations.

10. References

AS2870 (2011) *Residential Slabs and Footings - Construction* (Standards Australia: Homebush)

AS3798 (2007) *Guidance on earthworks for commercial and residential buildings* (Standards Australia: Homebush)

Austroads (2004) *Pavement design-A guide to the structural design of road pavements* (Austroads Inc, Sydney)

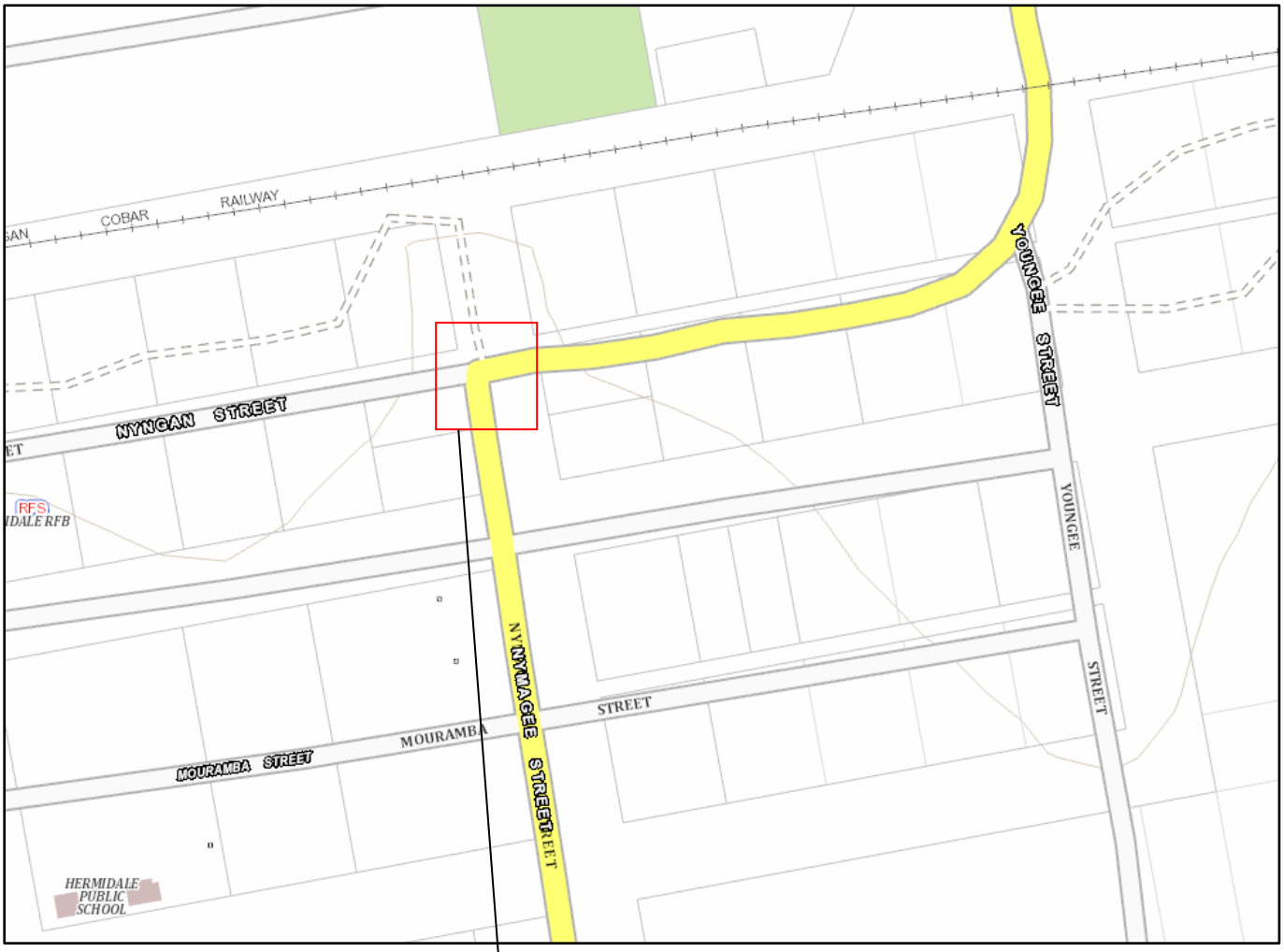
Austroads (2006) *Pavement design for light traffic-A supplement to the Austroads Pavement Design Guide* (Austroads Inc, Sydney)

Brunker, R.J (1967) *Cobar 1:250,000 Geological Sheet SH/55-14* (Geological Survey of New South Wales, Sydney)

CANRI (2001) *Natural Resource Atlas* (http://www.nratlas.nsw.gov.au/wmc/savedapps/nratlas)

Landcom (2004) *Managing Urban Stormwater; Soils and Construction* (New South Wales Government)

North



Intersection of Nymagee Street and Nyngan Street, Nymagee-Hermidale Road, Hermidale

Figure 1. Site locality		
Proposed intersection upgrade, intersection of Nymagee Street and Nyngan Street, Nymagee-Hermidale Road, Hermidale NSW		
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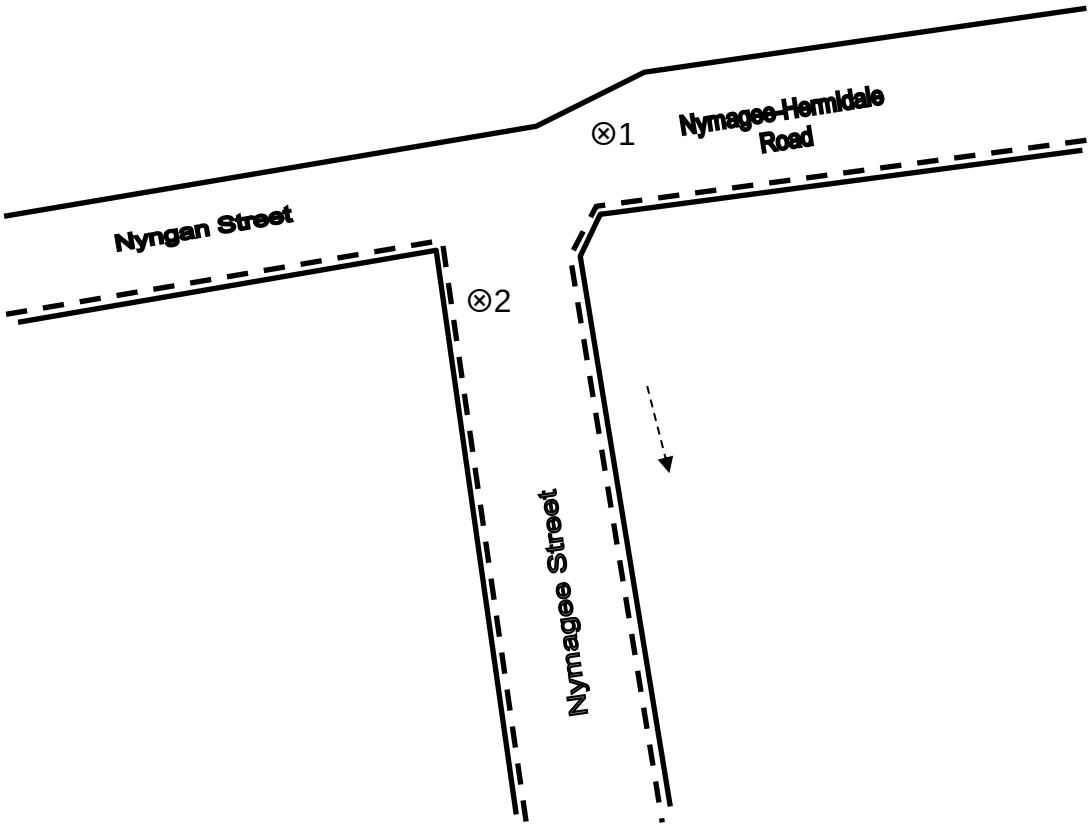
~~Job: R14212-2g~~	~~Drawn by: JH~~	~~Date: 8/05/2014~~

North

Intersection of Nymagee Street and Nyngan Street, Nymagee-Hermidale Road, Hermidale

Figure 2: Aerial photograph		
Proposed intersection upgrade, intersection of Nymagee Street and Nyngan Street, Nymagee-Hermidale Road, Hermidale NSW		
	Envirowest Consulting Pty Ltd	
Job: R14212-2g	Drawn by: JH	Date: 8/05/2014



Legend

⊗ Borehole and sampling location

◄---- Slope

– – Concrete curbing and guttering

Figure 3. Site plan and sampling location		
Proposed intersection upgrade, intersection of Nymagee Street and Nyngan Street, Nymagee-Hermidale Road, Hermidale NSW		
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Job: R14212-2g	Drawn by: JH	Date:8/05/2014

Figure 4. Photographs of the site

Looking south west over the intersection

Cracking and deformation on the southern section of the intersection

Appendices

Appendix 1	Bore logs
Appendix 2	California bearing ratio (CBR) laboratory report
Appendix 3	Dynamic cone penetrometer (DCP) test report
Appendix 4	Soil index properties test report

Appendix 1.

Bore Log Sheet

Job: R14212-2g Client: Geolyse Site: Intersection of Nymagee Street and Nyngan Street, Hermidale NSW	Borehole No: 1 Location: North eastern corner	Sampling method: EVH auger drill Logged by: AR Date: 1/05/2014

Depth (m)	Graphic log strata	DESCRIPTION. Soil type/rock, grain size, structure, colour, minor components	Unified symbol	Samples	Moisture	Consistency	Density	Plasticity	Rock description
		FILL- SILTY GRAVEL, yellowish red with quartz	GM	DCP	D	VSt	M	VL	-
		CLAYEY SAND, red	SC	CBR	M	St	M	L	-
0.5		GRAVELLY CLAYEY SAND, red	SC	D	M	VSt	M	VL	-
1.0		SANDY CLAY, yellowish red with quartz gravel	CL		M	St	M	L	-
1.5		End of hole							
2.0									
2.5									
3.0									
3.5									
4.0									

Soil classification:
Slope/nature of surface: Flat
Ground water: No free water identified in soil profile
Soil salinity: Nil

Remarks (fill, odour, root holes): Fill to 100mm (road base and subbase)

Samples	**Moisture**	**Consistency**	**Density**	**Plasticity**	**Rock strength**
U - undisturbed *D* - disturbed *W* - water sample *B* - bulk *E* - environmental sample CBR – California bearing ratio DCP – dynamic cone penetrometer	*D* - Dry *M* - Moist, can be moulded *W* - Wet, free water on hands *Wp* - plastic limit *Wl* - liquid limit	Shear strength (kPa) *VS* - very soft, (<25) *S* – soft (<50) *F* – firm (<100) *St* – stiff (<150) *VSt* - very stiff (<200) *H* – hard (>200)	*VL* - very loose *L* - loose *M* - medium *D* - dense *VD* - very dense	*NP* - non plastic *T* – trace *VL* – very low *L* – low *M* – medium *H* – high *VH* – very high	Point load (mPa) *EL* – extremely low (<0.03) *VL* – very low (<0.1) *L* –low (<0.3) *M* – medium (<1.0) *H* – high (<3.0) *VH* – very high (<10) *EH* – extremely high (>10)

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Bore Log Sheet

Job: R14212-2g Client: Geolyse Site: Intersection of Nymagee Street and Nyngan Street, Hermidale NSW	Borehole No: 2 Location: Southwest corner	Sampling method: EVH auger drill Logged by: AR Date: 1/05/2014

Depth (m)	Graphic log strata	DESCRIPTION. Soil type/rock, grain size, structure, colour, minor components	Unified symbol	Samples	Moisture	Consistency	Density	Plasticity	Rock description
		FILL- SILTY GRAVEL, red brown	GM	DCP	D	VSt	M	VL	-
		CLAYEY SAND, red	SC	CBR	M	St	M	L	-
0.5		Quartz gravel		D					
1.0		GRAVELLY CLAYEY SAND, yellowish red	SC		M	VSt	M	VL	-
1.5		Yellow brown							
		End of hole							
2.0									
2.5									
3.0									
3.5									
4.0									

Soil classification: *Slope/nature of surface*: Flat *Ground water:* No free water identified in soil profile *Soil salinity*: Nil	*Remarks* (fill, odour, root holes): Fill to 100mm (road base and subbase)

Samples	**Moisture**	**Consistency**	**Density**	**Plasticity**	**Rock strength**
U - undisturbed *D* - disturbed *W* - water sample *B* - bulk *E* - environmental sample CBR – California bearing ratio DCP – dynamic cone penetrometer	*D* - Dry *M* - Moist, can be moulded *W* - Wet, free water on hands *Wp* - plastic limit *Wl* - liquid limit	Shear strength (kPa) *VS* - very soft, (<25) *S* – soft (<50) *F* – firm (<100) *St* – stiff (<150) *VSt* - very stiff (<200) *H* – hard (>200)	*VL* - very loose *L* - loose *M* - medium *D* - dense *VD* - very dense	*NP* - non plastic *T* – trace *VL* – very low *L* – low *M* – medium *H* – high *VH* – very high	Point load (mPa) *EL* – extremely low (<0.03) *VL* – very low (<0.1) *L* –low (<0.3) *M* – medium (<1.0) *H* – high (<3.0) *VH* – very high (<10) *EH* – extremely high (>10)

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Appendix 2. California Bearing Ratio laboratory report

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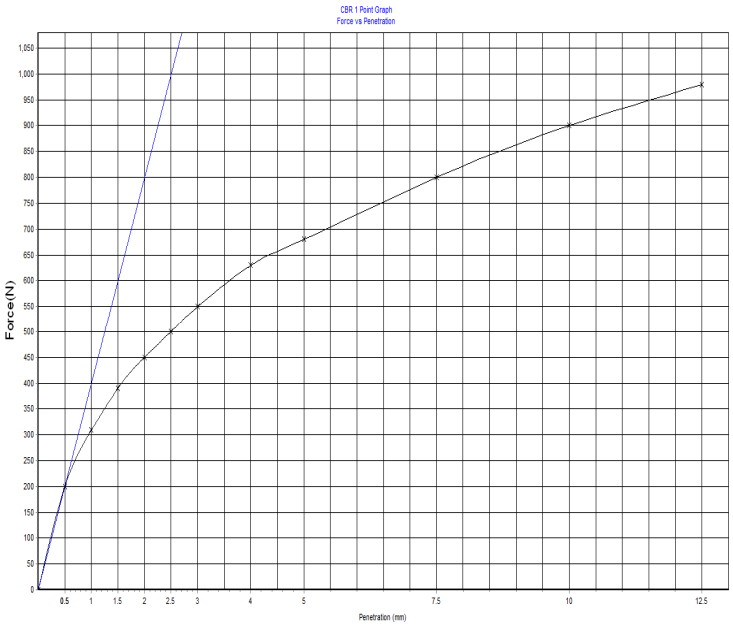
California Bearing Ratio Report (1 Point)

Client :	**Geolyse**	Report Number:	**LR14212-1cbr**
Address :	**PO Box 1963, Orange, NSW, 2800**	Report Date :	**15/05/2014**
Project Number :	**14212**	Order Number :	
Project Name :	**Hermidale/Nymagee**	Test Method :	**AS1289.6.1.1**
Location:		**Page 1 of 4**	

Sample Number :	S14-274	SAMPLE LOCATION
Date Sampled :	1/05/2014	Borehole: BH 1
Date Tested :	13/05/2014	Depth: 200 - 900mm
Sampled By :	Terry Beasley	Location: Hermidale
Sampling Method :	AS 1289.1.2.1 (clause 6.5.3)	Desc: Subgrade
Material Source :		Lot Number :
Material Type :		Test Number : 0105-301
Remarks :		#REF!

Moisture Method :	AS1289.2.1.1
Maximum Dry Density (t/m³) :	1.788
Optimum Moisture Content (%) :	17.0
Compactive Effort :	Standard
Nominated Percentage of MDD :	100
Nominated Percentage of OMC :	100
Achieved Percentage of MDD :	100
Achieved Percentage of OMC :	100.0
Dry Density Before Soak (t/m³) :	1.788
Dry Density After Soak (t/m³) :	1.786
Moisture Content Before Soak (%) :	17.0
Moisture Content After Soak (%) :	18.7
Density Ratio After Soak (%) :	100
Field Moisture Content (%) :	12.9
Top Moisture Content - After Penetration (%) :	19.1
Total Moisture Content - After Penetration (%) :	
Soak Condition :	Soaked
Soak Period (days) :	4
Swell (%) :	0.0



CBR Surcharge (kg) :	4.5	CBR 2.5mm (%) :	4
Oversize (%) :		CBR 5.0mm (%) :	**3.5**
Oversize Material Replaced (%) :		**CBR Value (%) :**	**4**

Site Selection :	Client Selected
Soil Description :	Clayey sand, red

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Accredited for compliance with ISO/IEC 17025.

APPROVED SIGNATORY

T. Beasley

Terry Beasley - Laboratory Manager
NATA Accreditation Number : 15372

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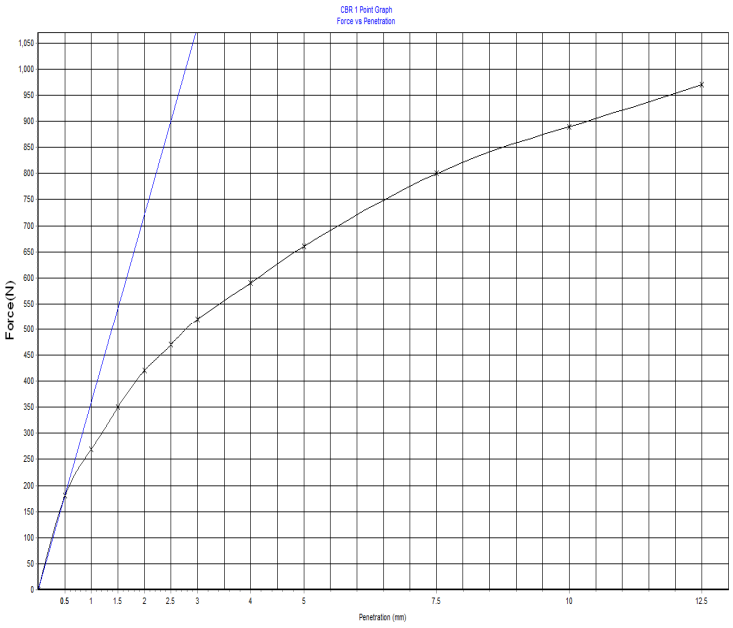
California Bearing Ratio Report (1 Point)

Client :	**Geolyse**	Report Number:	**LR14212-1cbr**
Address :	**PO Box 1963, Orange, NSW, 2800**	Report Date :	**15/05/2014**
Project Number :	**14212**	Order Number :	
Project Name :	**Hermidale/Nymagee**	Test Method :	**AS1289.6.1.1**
Location:		**Page 2 of 4**	

Sample Number :	S14-275	SAMPLE LOCATION
Date Sampled :	1/05/2014	Borehole: BH 2
Date Tested :	13/05/2014	Depth: 100 900mm
Sampled By :	Terry Beasley	Location: Hermidale
Sampling Method :	AS 1289.1.2.1 (clause 6.5.3)	Desc: Subgrade
Material Source :		Lot Number :
Material Type :		Test Number : 0105-302
Remarks :		

Moisture Method :	AS1289.2.1.1
Maximum Dry Density (t/m³) :	1.851
Optimum Moisture Content (%) :	13.9
Compactive Effort :	Standard
Nominated Percentage of MDD :	100
Nominated Percentage of OMC :	100
Achieved Percentage of MDD :	100
Achieved Percentage of OMC :	96.0
Dry Density Before Soak (t/m³) :	1.858
Dry Density After Soak (t/m³) :	1.857
Moisture Content Before Soak (%) :	13.4
Moisture Content After Soak (%) :	15.0
Density Ratio After Soak (%) :	100
Field Moisture Content (%) :	8.4
Top Moisture Content - After Penetration (%) :	16.5
Total Moisture Content - After Penetration (%) :	
Soak Condition :	Soaked
Soak Period (days) :	4
Swell (%) :	0.0



CBR Surcharge (kg) :	4.5	CBR 2.5mm (%) :	3.5
Oversize (%) :		CBR 5.0mm (%) :	**3.5**
Oversize Material Replaced (%) :		**CBR Value (%) :**	**3.5**

Site Selection :	Client Selected
Soil Description :	Clayey sand, red

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Dynamic cone penetrometer - Test report

Client	Geolyse Pty Ltd	Report no.	LR14212-2
Address	PO Box 1963 Orange NSW	Site location	The intersection of Nymagee Street and Nyngan Street on Nymagee-Hermidale Road, Hermidale NSW

Test information: Date 1/5/14

Test location	**Borehole 1**	**Borehole 2**
Commencement of penetration	0mm	0mm
Soil description	Silty gravel clayey sand	Silty gravel clayey sand
Soil Moisture	Dry to moist	Dry to moist
Groundwater	Nil	Nil

Results

Depth (mm)	Penetration resistance (number of blows)	Penetration resistance (number of blows)
0-100	12	15
100-200	7	6
200-300	8	6
300-400	6	6
400-500	5	6
500-600	8	6
600-700	12	9
700-800	20	20
800-900	-	-
900-1000	-	-
1000-1100	-	-
1100-1200	-	-
1200-1300	-	-
1300-1400	-	-
1400-1500	-	-
1500-1600	-	-
1600-1700	-	-
1700-1800	-	-
1800-1900	-	-
1900-2000	-	-

Method AS1289.6.3.2-1997 Method of testing soil for engineering purposes Method 6.3.2: Soil strength and consolidation tests-Determination of the penetration resistance of a – 9 kg dynamic cone penetrometer test. >20 indicates test discontinued due to refusal

Test authorised by:

G. Madafiglio PhD Date: 11/5/14

Envirowest Consulting Pty Ltd ABN 18 103 955 246 trading as
Envirowest Testing Services
• 9 Cameron Place, PO Box 8158, Orange NSW 2800 • Tel (02) 6361 4954 •
• Fax (02) 6360 3960 • Email admin@envirowest.net.au • Web www.envirowest.net.au •

Environmental
Geotechnical
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Services

Rec 51002 Soil Index Properties - Test Report

Client	Geolyse Pty Ltd	Report no.	LR14212-2
Address	PO Box 1963 Orange NSW	Site location	The intersection of Nymagee Street and Nyngan Street on Nymagee-Hermidale Road, Hermidale NSW

Borehole		1	2
Location		-	-
Depth (mm)		800	800
Tests	***Methods***		
Liquid Limit (%)	AS 1289.3.1.2	40	38
Plastic limit (%)	AS 1289.3.2.1	24	22
Plasticity index (%)	AS 1289.3.3.1	16	16
Linear Shrinkage (%)	AS 1289.3.4.1	7.5	6.0
-characteristics (curling or crumbling)		curling	curling
Field Moisture (%)	AS 1289.2.1.1	-	-
I_{SS}	AS 1289.7.1	-	-
USCS	AS 1726*	SC	SC
Description	AS 1726 *	GRAVELLY CLAYEY SAND	CLAYEY SAND
Colour	AS 1726*	Red	Red

Disturbed samples

Sample preparation:	-drying	-	Air	x	Oven	-	Natural state
	-sieving	-	Wet			x	Dry
	-material	-	Pass 2.36 mm			x	Pass 425 µm
Linear shrinkage:	-mould	x	250 mm			-	125 mm
Liquid Limit:	-method	-	Standard			x	One Point

Undisturbed samples

Inert inclusions in specimen	-	%				
Soil crumbling during shrinkage affecting mass	-	Yes	-	No		
Extent of cracking of sample	-	Major	-	Minor	-	Nil

Samples tested as received
* Not NATA accredited test

Test authorised by:

G. Madafiglio PhD
Date: 16/5/2014

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